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

DECEMBER, 1865.

THE "JOSEPH HALL" AGRICULTURAL AND STEAM ENGINE WORKS, OSHAWA, C. W.

In our account of the Exhibition of the Provincial Agricultural Association at London, in September last, we had occasion to commend, generally, the home workmanship, and practical excellence of the agricultural implements and machinery, showing, as we then said, that Canada "*needed no foreign aid*" in these branches of industry and progress.

Since then we have had the opportunity of inspecting the large machinery works carried on at Oshawa—originally established by a manufacturing "company," which not having succeeded, for want perhaps of experience, were taken hold of by Messrs. Joseph Hall & Co., then largely concerned in a similar enterprise at Rochester,—but Mr. Joseph Hall, the original founder of the present company at Oshawa, being dead, the business is ably and actively continued by Mr. F. W. Glen, manager, for the benefit of the estate; and in support of our assertion, that Canada has only to encourage her own home manufactures to ensure a full supply of reliable machines and implements, we shall proceed to describe, and comment upon what came under our observation.

But, before doing so, it will not be out of place to devote a few lines to a brief notice of Oshawa, which is a thriving "village," some thirty-three miles on the main road east from Toronto, and having a station on the Grand Trunk, inconveniently distant a mile and a half. The population, by the census of 1861, was about 2,000 or perhaps somewhat more, and at present it is estimated at "about" 3,000, say rather less than more. Rejoicing in municipal privileges, it has a reeve and council, with the attendant blessing of taxes, which seem to be expended with praiseworthy discretion, as the streets are not bad, and the sidewalks tolerable. The whole assessment is $35,000, and the rate 17 cents in the dollar, which includes the school rate. In addition to the "Joseph Hall" there are two other manufacturing establishments, namely, Whiting's hoe and scythe works, and a large cabinet-ware factory. There are nine churches and places of worship; about twenty-one "general" stores; and, to its credit be it said, only four taverns. It also enjoys a well conducted Grammar and Common School united, with a head master and four subordinate teachers. The junior pupils are taught free, but the seniors, boys and girls mixed in the Grammar School department, pay a fee per term, of which there are four in the year, ranging from one dollar to three dollars, according to classification. The building is white brick, large and commodious; the premises are roomy; and the institution reflects credit on the educational character of the community. The stores on the main streets are well built, many of them of white brick with handsome show windows; and the private residences, of villa and cottage architecture, are genteel and pretty. Business was stated to be brisk, there had been a large exportation of grain, chiefly barley, and the whole place bore a cheerful and thriving appearance.

The premises occupied by the "Joseph Hall" works cover a whole block of about three acres of ground; all around the block, elm shade trees have been planted by the proprietors, and, being well cared for, are thriving wonderfully. The real estate, that is the block of land, is worth at least $25,000, and the machinery and appliances cost about $30,000 more. With the exception of the warehouse, which was on the ground before the present company commenced operations, all the buildings are of white brick on stone foundations, substantially built, and covered with shingles laid in thick mortar. The woodcut, which heads the advertisement of Joseph Hall & Co. on our last page, will afford an idea of the external appearance of the "works." The machinery of the whole establishment is driven by one powerful steam-engine, capable of working up to a hundred horse-power.

The works employ, at present, over 150 experienced hands, to whom the highest wages, by the day, are paid; none but the best workmen are engaged; and it is stated, as a just matter of congratulation, that a large proportion of the hands are strictly temperance men, and that cases of intoxication rarely occur among the others.

The first place visited was the agricultural room, one hundred feet by forty, where all the iron work required for machines, implements, &c., is made, fitted and finished. There were some twenty machines busily at work: lathes smoothing off a variety of articles, planing machines making other things level and true, drills and punches, with other aids to industry, best known to machinists. This room employs about thirty men at present, but an increase of six more lathes and a corresponding addition of hands, will soon be made

The whole place was alive with activity,—great wheels hummed with a deafening noise, smaller ones whistled as they spun round, hammers and tools rung again, and every man was busy as a bee.

Of the metals used in these works all are of the best quality: for example, the cast iron is obtained from Three Rivers Pig and Car-wheels, Wm. Penn, Hematite, and Gartsherrie. The wrought iron comprises the well-known brands of Glasgow, Elephant, and Thorneycroft. Low Moor is used for machine teeth; and the steel for mould boards, &c., is made to order at Sheffield.

Above stairs is the room where all the wood-work required in the factory is cut out, trimmed, planed, and finished for use. This room is 266 feet long by 40 feet wide. It is fitted with all kinds of machines and work benches. Here circular saws tore their sharp way through the hard wood; there a quick working "planer" deluged you with shavings; close by was a machine by which all the "tenons" used were cut and shaped; and conspicuous over all was a large "mortising" machine, considered to be the only large "power" machine of that kind in Canada. All these machines did their duty cleverly and with wonderful regularity. The wood-work was turned out beautifully neat, and so true was the calculated result, that the one piece fitted into its appropriate fellow with mathematical accuracy. The woods, all carefully selected, are bass or white-wood which the manager thought little of, pine, hard maple, and oak, all obtained within twenty miles around Oshawa,—but the ash, of which large quantities are used, comes all the way from the neighbourhood of Morpeth, where from some cause, perhaps the soil, it grows cleaner in the grain and tougher in substance. This room employs about thirty hands, and in all its arrangements is a model of skill, order, and diligent occupation.

Leaving this hive of industry, we proceeded to what is called the "Forming Room," about a hundred and twenty by forty feet, where the various shapes of certain woodwork for "Thrashers" and "Separators," &c., &c., are cut out, arranged, and fitted. In this department the machinery is of a very superior character, expressly calculated to save time and labour, and utilise skill. In fact, as was explained to us, there has been a very marked improvement in all kinds of machinery in the States, especially in the New England States (whence so much of the machinery used in Canada is brought) in consequence of the war, which, calling away so many operatives to the field of battle, compelled the invention of labour-saving machinery to supply the want of hands thus created. In this room, and in indeed all the others, the principle of "division of labour" is carefully considered and acted on. Each man has his own specified work to perform, and by this system an agricultural machine was able to be finished, not only in much shorter time, but in a much better manner, than could be done by other means. Of the practical utility of agricultural machines, a proof was offered in "Birdsell's Combined Clover Thresher," which at first sight struck our mind as too expensive an article for farmer's use; but we learned that while the price of preparing clover seed by hand used to be quite a dollar per bushel, and a slow process at that, the same result can be accomplished by machine work for forty cents, in a tenth of the time, besides being done much cleaner, and with much less injury to the seed. Clover seed has, of late, been in great demand, and has brought good prices, so that the farmer can well afford to encourage machinery to visit his barns, and get his clover crop ready for sale at a time perhaps when most wanted for market.

The Boiler room, that is, where the tubular boilers for the portable steam engines are made, is also large, and employs about twenty-five men—several boilers were in course of construction, but the clang and noise of so many sledge hammers, making loud discord on iron cylinders, drove us from the place almost as soon as we had entered.

The warehouse, which though of wood, is quite isolated from the other buildings, is 110 feet by 50 feet, and two and a half stories high. Here is kept such work as is ready for sale, or awaiting delivery; but the demand for machines manufactured at the Joseph Hall Works, does not permit of much accumulation of dead stock, and the articles on hand were therefore but few in number. In this room is also kept all the work, or rather portions of work, in course of preparation for next year's business; and in this respect the manager, as in every thing else, shows his judgment and experience, by having all things well forward and ready for instant use when wanted. To judge from the supply of next year's prepared material, next year's business promises to be a rare good operation.

We next enter what is called the "Machinery Department," which is 166 feet long and 40 feet wide; it contains eleven machines of various kinds such as lathes, drills, planers, and so forth, employed in the manufacture of portable steam-engines, which occupy special attention, and command a large business. The portable steam-engines manufactured here, are constructed on the most modern improved principles, compact in

form, substantial, and worked with a small percentage of fuel. Some six or seven were in hand and advanced to various stages of completion. The material and workmanship were both excellent; and some idea of the quantity of work going on may be formed when we say that not less than forty skilled hands were employed, while every man was in the right place.

The Forge room, where many portions of the agricultural machinery are prepared, contains thirteen forges, and employs about twenty-five men. The foundry, where all castings are made, is 110 ft. long by 50 feet wide, and moulders, cleaners and other grimy hands were busy enough preparing to cast, in which work some twenty-five hands are regularly employed. The pattern room, a fire-proof building, contains, systematically arranged, all the patterns either now in use or of modern invention; while, in another place, the old, or "out-of-fashion" patterns, are preserved so as to be ready, as is generally the case in fashions, when the old patterns shall take their turn again as new ones. From three to five hands are employed all the time in making patterns for fresh use; it was pleasing to notice how carefully and skilfully these men carved and chiselled out the accurate form from the rough wood; during the time we were looking on, a pattern of "gearing" was under way, and anything more accurate or more neat in workmanship could hardly be imagined—in fact, the greatest attention is given to the perfect "gearing" of all the machine-work sent out from this manufactory.

In addition to these particulars of the works themselves, it is proper to notice the character of the machines made here, and the extent to which their production reaches. It would be too much to go into *details* regarding all, or possibly many, of the machines manufactured at these works; and it will perhaps suffice if this branch of our subject is disposed of in general terms. Of "reapers and mowers," simple and combined, there are several varieties made, to suit customers; and the best kind of this machine is known to be capable of cutting, on land free of obstructions, at the rate of one acre per hour. Of "threshing machines," little need be said, as they are now sufficiently well known and extensively employed; but it is only right to notice that those manufactured here combine all the latest improvements with the best workmanship. Of Birdsell's "combined clover machine," we have already spoken; it remains then only to explain that it will thresh and separate, fit for market, clover seed from the straw by one process; and reliable certificates have been given that it will prepare from twenty to twenty-five bushels of clover seed in the short space of four hours! Booth's "grain separator" is used to remove chess, cockle, or the seeds of the numerous weeds which infest our fields, from wheat and other grain; and when we consider how necessary it is for Canada wheat and barley to go to market clean, and how desirable it is that our farm crops shall not be smothered by tares, or rather weeds, sown among our grain, the value of this machine commends itself to the notice of every good farmer. Besides these larger machines, the "Works" turn out chaff-cutters, portable sawing machines, weaving looms, grain drills, ploughs, and other agricultural implements. Besides which, special attention is given to repairs. Should any one reading this notice desire to know more particulars on these subjects, an illustrated and priced catalogue can be readily obtained by writing for it to Oshawa. This is not the place for entering upon a discussion of the merits of machine labour on Canadian farms; but we think nobody will attempt to controvert the assertion that in a country where hand-labour is scarce and expensive, and where the harvest season is short and often variable, the employment of machines may be resorted to not only with profit to the agriculturist himself, but with advantage also to the resources of the country, by securing in good time an abundant crop, which might, and most likely would, be greatly injured, if not wholly lost, without such aid and assistance.

The machines made at the Joseph Hall Works, Oshawa, are not unknown to fame, but on the contrary they are widely and favorably known through the many "first prizes" which have been awarded to them during several years at our Provincial Exhibitions; and they have been highly commended by the judges in this department. They are sold in great numbers, to go to almost every part of Western Canada, and to some parts of Canada East; and it may be stated as a truism, not to be disputed, that agriculture must be in a very benighted and backward condition, where some one or other of the Oshawa machines is not to be found working. For example, of the improved "combined reaper and mower," manufactured at the Joseph Hall Works, from four to five hundred were sold in Upper Canada during the present year (1865), and twenty-five were sent to Lower Canada. Of their "clover mills," to which special reference has been made already, not less than forty were sold in 1865. Of grain drills, and drag saws for cutting wood into short lengths in the "bush," the sale was equally extensive. At the present time the Works are preparing seven large "Crompton looms," for the weaving of woollen yarn into cloth, five of which are going to Galt,

and the other two to other parts of the country, so that by means of machinery and sheep-breeding throughout the country, there is a good prospect of every Canadian wearing a decent suit of Canadian growth and manufacture. But the crowning achievement of the Joseph Hall Works is, in our judgment, the undertaking they are at present earnestly engaged in, of manufacturing not less than ten portable steam engines, of from fifteen to twenty horse power each, destined for the oil regions. Six of these compact and beautifully made engines are for John Miller & Co., Toronto, and the other four for other enterprising speculators in the same direction. In fact, so complete and so extensive are the facilities afforded by the Joseph Hall Works in this department of their large business, that they fully calculate upon being able to turn out two completely equipped portable steam engines every week.

The importance to a small place like Oshawa of such an establishment for home manufactures, cannot be overrated. When it is considered that a hundred and sixty families, maintained by these works, expend their earnings in rent, provisions clothing, fuel, &c., in the village, the direct benefit is very considerable; but in addition to this, the expenditure in various other different ways, must circulate a large amount of money in all directions, tending to advance prosperity and progress among the community. To give some idea of the money value of the business done at these works, and by inference the benefits derived from them among ourselves as Canadians, rather than by others in the country across the lake, it may be mentioned that the average amount of wages paid *weekly* is in winter $800, and in summer $1000, say, within the year, $50,000, exclusive of other charges for employment. And as the natural comparison of the cost of labour, it is enough to state that the aggregate value of the work done in 1864 was over $125,000; for this year (1865) it will amount to nearly $175,000; and, calculating from the orders already received and in negociation, as well as on the improved circumstances of the country through the abundant harvest and high prices, the manager confidently anticipates that the business of 1866 will certainly be increased to $200,000, and under favourable results to probably $250,000, or a quarter million dollars! an amount of enterprise which speaks largely in favor of home industry and home consumption.

Everything about the Oshawa works is substantial and of the best kind. All modern improvements, which have been tried and found serviceable, have been adopted; and the industrial experiences of the New England States, those great workshops of machine labour, have been freely availed of. The highest wages are paid for skilled labour; all possible encouragement is given to make the hands contented, and feel an interest in the welfare of the factory; and a more intelligent, as well as zealous, set of hands no company could wish for. There is a constant and careful supervision of every particular branch of work going on; no expense is spared to provide the best materials in metal as well as in wood; and it is the pride of the Company to turn out the articles they manufacture in a workmanlike manner, substantial and neat, so as to wear well and bear the test of time.

Trained in the large experience of an extensive and successful manufactory at Rochester, which at one time supplied nearly the whole of the Northern and Western States, and which, in the early history of our Provincial Agricultural Association, contributed almost all the agricultural machines then exhibited in Canada (many of which were in those days not only new, but almost a wonder to our farmers), the manager of the Joseph Hall Works has been able to bring to bear upon the Oshawa enterprize that amount of practical knowledge, tried skill, and systematic oversight, to which, combined with prudence, no doubt the marked success of the Oshawa manufactory owes so much of its prosperity. Nor should it be forgotten that while the Works are conducted with energy, skill and care, the management is equally liberal; though prudent, it is far from being close-handed; and it is worthy of notice that, at the recent Exhibition at London (1865), the "Joseph Hall" Company gave, as the first prize to the most successful ploughman, one of their best "Combined Clover Machines," of the value of three hundred dollars.

We are inclined to think that very few persons have any adequate conception of the magnitude of this establishment, or the extent of business done at these works in the manufacture of engines and machines; and for our own part we were quite as much surprised as gratified to witness such a display of skill and enterprise, which it is true we had heard of, but until now, by actual observation, had never realized.

It would perhaps be invidious to institute comparisons between the Oshawa works and those in other parts of the Province, but we think we are justified in saying, that in extent of enterprise, in sound and accurate workmanship, and in able management, they are second to none. It ought certainly to be a matter of congratulation that Canada can now boast of possessing so many excellent manufactories of steam engines, agricultural and other machines, which economize time and labour, and enable our raw material of home

growth to be thus manufactured by home industry into useful articles for the requirements of daily life. By these means alone can Canada expect to hold her own. Let home manufactures be encouraged in every way they can be directed, and thus assist so materially to render us independent of others for what we ought to make, and can if we choose make, for ourselves. Home productions would soon reduce the existing high tariff on importations, and by circulating our own money among our own people, would speedily enrich the length and breadth of the "land we live in." Among other aids to this desirable end the "Joseph Hall" works occupy a conspicuous place; and congratulating Oshawa upon the possession of such a praiseworthy industrial establishment, we now take leave of the company with our best wishes for its onward progress and further prosperity.

GREAT WESTERN RAILWAY MACHINERY AT THE PROVINCIAL EXHIBITION.

Among the articles in this section of the recent Exhibition, in London, was a large assortment of machinery and other work, exhibited by Mr. Sharp, the Superintendent of the Mechanical Department of the Great Western Railway, which is worthy of more special notice than it has previously received. The articles were as follows:—

One pair of locomotive cylinders, complete with all the valves, spindles and pistons, ready for fitting on the engine.

Two wrought iron piston rod crossheads, with straps and butts complete.

A complete set of brass-work, cocks, &c., for a locomotive engine.

An assortment of forged bolts and nuts, and wood screws, also a set of screw taps, machine finished.

Three locomotive side or wheel coupling rods, fitted with brasses complete.

A wrought iron locomotive axle box, and a tender axle box of a new pattern.

One "Duplex" safety valve for a locomotive boiler, being a patent by Mr. Ramsbottom, Locomotive Superintendent of the London & North Western Railway, England, and a decided improvement on the old form of safety valve.

One large brass steam dome cover, and one brass safety valve cover.

Two wrought iron locomotive axles, and two car axles—one of each finished, and one of each in the rough state.

One sand box of a new pattern for sanding the rails in slippery weather.

Three locomotive engine springs—also one car spring finished and one in the rough.

One wrought iron locomotive driving wheel, finished ready for putting on the axle.

One hand made wrought iron steam dome for a locomotive engine.

One set of parcel racks for a sleeping car.

One diagram model of the valve motion, and working gear of a locomotive.

Also a cast-steel locomotive crank axle. These axles are now being introduced in place of the iron axles, being much more durable.

All these articles, with the exception of the last named, which is of English manufacture, were made in the workshops of the Great Western Railway Company, at Hamilton, and were of very superior workmanship and finish; and by competent judges, said to be equal to anything in the same line at home or abroad.

UPPER CANADA PROVINCIAL EXHIBITION STATISTICS.

Tickets.

	Toronto, 1862.	Kingston, 1863.	Hamilton, 1864.	London 1865.
Tickets sold at gates @ 25c.	43,228	16,000	27,000	45,000
Tickets to members*	9,260	4,700	8,000	5,800
Total	52,488	20,700	35,000	50,880

* In 1862 '3 and '4 each member received a ticket for the whole week of the Show, which in the above estimate we have taken as equivalent to four single admission tickets for each member; the latter plan being the one adopted by the Association at the late Show.

Entries.

	Toronto, 1862.	Kingston, 1863.	Hamilton, 1864.	London, 1865.
Horses	428	381	416	407
Cattle	620	401	541	533
Sheep	633	484	693	700
Pigs	208	106	150	215
Poultry	250	189	284	333
Grains and Seeds ...	460	512	580	792
Roots & Field Crops	386	285	388	554
Horticult'l Products	1,197	582	1,109	1,282
Dairy Products, Bacon, &c.	128	105	160	223
Agricultural Implements—power.....	186	149	172	189
Agricultural Implements—hand.....	142	107	128	188
Cattle Food, Manures, &c.....	8	5	10	13
Ploughing Match†..	.....	.....	73	102
Arts & Manufactures Department	1,676	1,142	1,517	1,690
	6,317	4,448	6,221	7,221

† We have no returns at hand of the entries for "Ploughing Match" for the years 1862-3.

The following table shows the number of entries, amount offered in prizes, and amount actually awarded—including extra prizes, in the Arts and Manufactures department for the present year:—

Class.		No. of Entries.	Amount of Prizes offered.	Amount of Prizes awarded.
40	Cabinet Ware and other Wood Manufactures ...	65	$197 00	$151 00
41	Carriages & Sleighs, and parts thereof	71	188 00	143 00
42	Chemical Manufactures & preparations..... ...	47	116 00	87 00
43	Decorative & Useful Arts, Drawing and Design ...	71	232 00	168 00
44	Fine Arts.....	321	563 00	494 00
45	Groceries and Provisions.	32	140 00	47 00
46	Ladies' Work	504	192 50	215 00
47	Machinery, Castings, and Tools.	58	413 00	177 00
48	Metal Work (Miscellaneous), including Stoves.	97	311 00	173 00
49	Miscellaneous, including Pottery & Indian Work	39	138 00	86 00
50	Musical Instruments.....	25	139 00	74 00
51	Natural History	23	98 00	63 00
52	Paper, Printing, & Bookbinding	25	97 00	64 00
53	Saddle, Engine-hose, Trunk-maker's Work, and Leather	39	239 00	89 00
54	Shoe and Boot-maker's Work, and Leather	72	154 00	90 00
55	Woollen, Flax, & Cotton Goods, Furs, & Wearing Apparel..... ...	190	509 00	309 00
56	Foreign Manufactures (no money prizes offered)	11		
	Totals, 1865.....	1,690	3726 50	2430 00
	Totals, 1864..... ...	1,517	3437 50	2576 00

The following is an abstract of entries and amounts under similar heads in the various Agricultural and Horticultural classes:—

	No. of Entries.	Amount of prizes offered.	Amount of Prizes awarded.
Horses, of all kinds..	407	$1,404 00	$1,262 00
Cattle " "	533	2,569 00	2,283 00
Sheep " "	700	963 00	1,057 00
Pigs " "	215	504 00	448 00
Poultry	333	213 00	202 00
Grains, Seeds, Roots, &c.	1,846	908 00	873 50
Horticultural Products	1,282	767 50	632 50
Dairy Products, &c..	223	203 00	164 25
Agricultural Implements	377	1,395 00	917 50
Cattle Food, Manures, &c.....	13	36 00	22 00
Ploughing Match	102	745 00	745 00
Totals, 1865.....	5,531	$9,707 50	$8,606 75
" 1864.....	4,882	9,131 50	8,035 25

	No. of Entries.	Amount of prizes offered.	Amount of Prizes awarded.
Totals of all Dep'mts:			
1862.....	6,319	$12,036 50	$10,722 00
1863.....	4,756	11,866 00	9,166 00
1864.....	6,392	12,559 50	10,304 25
1865.....	7,221	13,434 00	11,036 75
Increase from 1864 to 1865.....	829	$874 50	$732 50

By the foregoing tables it will be seen that, in the Arts and Manufactures department, the awards are only equal to 65 per cent. of the amount offered, while in the Agricultural and Horticultural departments they reach 89 per cent.; and that the whole amount paid in the first department is about 28 per cent. of what is paid in the latter.

CANADA AT THE DUBLIN EXHIBITION.

The following list of awards granted to Canadian exhibitors at the Dublin Exhibition, as also tables of numbers of prizes awarded to various countries, and in each class, have been furnished by the Bureau of Agriculture.

It will be noticed that amongst the medals awarded is one to the Toronto Linseed Oil Co.; the Board of Agriculture of Upper Canada; A. S. Whiting & Co., of Oshawa; and Selway & Co., Toronto; and that honourable mention is made of the productions of Brown Brothers, Toronto; J. McCausland, Toronto; C. Heise, Preston; C. Boeckh, Toronto; A. Green, Hamilton; Jacques & Hay, Toronto; Edge Tool Co., Galt; T. Moore, Etobicoke; and Rice Lewis (as agent), Toronto. Although gratified at the success obtained for so many Canadian productions selected by this Board, we cannot but express our surprise that some others of the articles sent have not been noticed. We would here mention the superior assortment of Buggy and Cutter stuff, from McKinley & Co., of St. Catharines; the Rifle by W. P. Marston, of Toronto; the home made Apparatus and Educational Appliances from the Department of Education for Upper Canada; the assortment of Knitted Woollen Goods, by J. G. Crane, of Ancaster; samples of Winter and Summer Tweeds, by Barber Brothers, Streetsville; and the magnificent Woollen Blankets from Slingsby & Kitchen, of Ancaster. We call attention to an article from the *Montreal Transcript*, in which a reason is alleged for the neglect of our woollen and worsted goods by the juries of the Exhibition.

LIST OF AWARDS GRANTED TO CANADIAN EXHIBITORS AT THE DUBLIN EXHIBITION,

(Taken literally from their Official List.).

Medals.

CROWN LAND DEPARTMENT—for an interesting series of ores and minerals.

THE BOARD OF ARTS OF LOWER CANADA—for part of an excellent collection, *(mineral products of Canada)* prepared by the officers of the Geological Survey of Canada.

D. Bogart, of Gaspe—for petroleum discovered by him in Lower Canada.

The Linseed Oil Company, of Toronto—for linseed oil and collection of pigments.

Petrie, Strowger & Co. of Newcastle—for superior wheat and potato starch.

T. J. Foss, of Sherbrooke — for Cedar Oil, as a substitute for oil of turpentine.

Lyman, Clare & Co. of Montreal—for drying oils.

Committee of the Eastern Townships of Lower Canada—for illustrative collection of produce in Section III., also for collection of school books and maps in Section XVII.

The Board of Agriculture of Lower Canada—for illustrative collection of (*agricultural*) produce.

J. McCollum, Howard—for excellent quality of tobacco.

Brunet l'Abbe, Laval University, Quebec—for a large and well arranged collection of polished woods.

A. S. Whiting & Co. Oshawa — for excellence of manufacture and moderate price of collection of scythes hay forks, &c.

P. Sibley, Sherbrooke, C. E.—for excellence of manufacture and moderate price of scythes.

Robertson & Co. Montreal—for goods (40 *specimens of Canadian tweeds*) most creditable to the Colony.

O. Côté, Quebec—for mosaic carriage furs and for merit in dressing and manufacture.

Brown & Childs, Montreal—for real merit of assorted shoe-leathers.

J. C. McLaren, Montreal—for merit in the manufacture of leather pipe-hose.

L. Brousseau, Quebec—for excellent bookbinding.

J. Lovell, Montreal—for cheap and good educational works published by him.

J. DeWitt, Montreal—for good buckskin mits and gloves.

J. Peck, Montreal—for a good collection of nails manufactured in the Colony.

J. Boyd, Montreal—for excellence of manufacture of toilet and horse brushes.

Selway, Irredale & Ward, Toronto—for ingenuity of their patent boot-trees.

Tahourhenché (Huron Chief) Lorette, C. E.—for a beautiful collection of fancy Indian wood-mould.

Honorable Mentions.

— Morris—for good samples of flax in straw.

J. Millar, Montreal—for hemlock bark and decoction for tanning purposes.

F. Baron, Hatley—for good quality of wool.

Shaw & Co. Montreal—for good tannage of buffalo sole leather.

Donovan, Moran & Co. Montreal—for good tannage.

Brown Brothers, Toronto—for well made account books.

A. Buntin, Montreal—for paper made in Canada.

G. Desbarats, Quebec — for good specimens of bookbinding.

J. McCausland, Toronto—for stained glass windows of merit.

C. Heise, Preston—For waved mouldings.

Jacques & Hay, Toronto—for specimens of wood in mosaic table.

A. Geeen, Hamilton—for serviceable quality of brushes.

C. Boeckh, Toronto—for good quality of brushes.

Mrs. J. Martin, Hanstead — for embroidered shawls.

Low & Wilson, Sherbrooke—for sash and Venetian shutters, simplicity and cheapness.

C. H. Fletcher, Sherbrooke—for good confectionery.

G. W. Reed, Montreal—for an ingenious cast for cleaning boots.

Board of Works, Quebec—for the collection exhibited by them (photographs).

A. Henderson, Montreal—for his good manipulation (photographic).

C. S. Henry, Lennoxville—for his good manipulation (photographic).

Notman, Montreal—for his good manipulation (photographic).

Edge Tool Co. of Galt—for carpenters' tools.

T. Moore, Etobicoke—for carpenters' tool handles.

R. Lewis, Toronto, agent for manufacturers—for skates and tools.*

J. Dawson, Montreal—for carpenters' tools.

DUBLIN EXHIBITION, 1865.

Number of Prizes awarded to various Countries.

Countries.	Medals.	Honble Mentions.	Total.
United Kingdom	414	175	589
Bahamas	.....	2	2
Canada	24	25	49
India	3	3	6
Jamaica	2	2	4
Lagos	.....	1	1
Malta	3	.....	3
Mauritius	5	11	16
Natal	3	3	6
Newfoundland	1	.....	1
New South Wales	3	.....	3
New Zealand	.....	1	1
Nova Scotia	20	21	41
Queensland	.....	1	1
Victoria	35	59	94
West Coast of Africa	.....	1	1
Austria	34	17	51
Bavaria	1	2	3
Belgium	94	41	135
China	1	.....	1
Denmark	1	.....	1
France	80	22	102
Italy	93	62	155
Japan	.....	2	2
Liberia	.....	1	1
Low Country	30	13	43
Rome	17	10	27
Prussia	1	.....	1
Saxe	1	.....	1
Siam	.....	1	1
Sweden & Norway	4	7	11
Switzerland	15	4	19
Zolverein	69	32	101
United States	2	.....	2
Total	956	519	1475

* Skates by James Ashton, Toronto; mill saws by J. Flint, St. Catharines; cross-cut and circular saws by Morland & Watson, Montreal.

DUBLIN EXHIBITION, 1865.

Number of Prizes awarded under each class.

Class.	Medals.	Hon'ble Mention.	Total.
No. 1	41	45	86
2	80	27	107
3	132	101	233
4	32	28	60
5	10	6	16
6	54	8	62
7	11	1	12
8	7	3	10
9	21	12	33
10	32	18	50
11	6	7	13
12	16	6	22
13	21	5	26
14	6	2	8
15	11	5	16
16	15	1	16
17	29	3	32
18	23	9	32
19	15	3	18
20	8	3	11
21	26	10	36
22	48	37	85
23	7	3	10
24	24	3	27
25	26	3	29
26	31	12	43
27	11	7	18
28	48	16	64
29	22	16	38
30	10	4	14
31	15	3	18
32	42	31	73
33	10	8	18
34	33	24	57
35	33	49	82
	956	519	1475

OUR FIFTH VOLUME.

The present number will close another year's pleasing duties in connection with this Journal, and will complete the fifth annual volume of the series. We look with some degree of satisfaction on the results of the year's labours, in the large amount of practical and useful information placed in the hands of our readers, at so small an annual charge.

We have endeavoured to select from the large number of British and American Engineering, Mechanical, and Scientific Journals, such articles and notices of new inventions, discoveries and improvements, as appeared to be the most useful and suggestive to Canadian readers; and have repeatedly received assurances from our subscribers, of the most gratifying kind, of the success of our efforts.

In looking over the pages of the present volume, we notice some 50 original articles of a useful or interesting character; 36 selected lectures and papers on important subjects; 103 useful, and in many cases *very* valuable, receipts; 75 articles on machinery and manufactures; 23 on photography; 43 tables and other memoranda of practical value; 56 articles of interesting statistics; 116 shorter articles or notices of a miscellaneous character, but nearly all valuable and of a practical nature; lists of Canadian patents, trade marks, and titles of designs, registered in the Bureau of Patents and Statistics during the year; new books of a useful kind, published in Great Britain and America, and books added to the Free Library of Reference connected with this Board; examination programme and papers; transactions of this Board, leading Mechanics' Institutes, and similar Associations; Provincial Exhibition prizes, awards, and other useful information; notices of books, &c., &c.

Nevertheless, although far more than an equivalent for the trifling annual subscription is given, we regret that the funds of the Board do not allow of a more liberal expenditure on the Journal, in securing talent in some important departments yet scarcely touched in its pages, and in woodcut illustrations for valuable articles that might appear.

To present subscribers to the Journal we would say—we shall be very happy to renew your acquaintance for the coming year, and our best efforts shall be put forth to give satisfaction in its pages. Ere the next issue reaches you, another anniversary of the nativity of our Redeemer, the day that blooms so fresh in the memory of a large portion of Britain's Sons and Daughters, will have *come* and *gone*; we therefore now wish you *all* a very Merry Christmas, and, with the next number, trust to have the privilege of wishing you a very Happy New Year.

CORRECTIONS.

In the list of awards at the late Provincial Exhibition, in the last number of the Journal, class 40, "Veneers," the Post Office address should have been "Newbury," instead of "Newburgh;" and in class 55, "Linen Goods, six varieties," the name of the exhibitor, *L. Aldrich*, of *Thamesford*, was omitted.

Glycerine is the best article for curing cracks in cows teats. It is healing and cooling, and should be applied twice a day after milking.

A London daily paper notices "Mr Russey, No. 482 New Oxford street, the inventor of buttons for trowsers that never come off.

Useful Receipts.

To discover Lead in Tin.

The *Mining Journal* says:—M. Jennel has discovered a new way of easily understanding whether there exists any lead in the tin used for tinning culinary vessels in hospitals. His method consists in this:—Take about five decigrams of scrapings of the metal to be tested, and boil it in an excess of nitric acid diluted with one-third of its weight of water. When the solution is complete, filter, and then put in a crystal of iodide of potassium. If the liquid contains but a ten-thousandth part of lead, a yellow precipitate will be formed, which will not disappear by the addition of an excess of ammonia.

To relieve Pain of Cancer.

Dr. Brandini, of Milan, says that lemon-juice, or a solution of citric acid, relieves the pain of cancer when applied to the sore as a lotion. The discovery was made accidentally, and the value of the application was confirmed by repeated experiments.

Wooden Labels.

In writing on wooden labels, or marking sticks, with a common pencil, if the wood is first wet, the mark will last two years; if written on dry, one or two rains will wash it all away.

A new Rat Trap.

Take a smooth kettle, fill to within six inches of the top with water, cover the surface with chaff or bran, place it where the rats harbor, and it will drown all that get into it. Thirty-six were taken in one night by this process.

Aniline Colors.

Few of the aniline colors will stand the continued action of light; to which difficulty must be added, in the case of oil painting, their rapid decomposition by the common varnishes, which mostly contain metallic oxides. A recipe has been furnished us for preparing these colors in a manner to avoid all objections. The dye is to be dissolved in alcohol; this solution is to be saturated with gum dammar, the filtrate to be poured into a solution of salt water, and dried. This is then incorporated with an oil varnish, which must be free from lead. —*Druggists' Circular.*

Oaken Barrels.

Oaken barrels may be prevented from coloring spirit by dissolving one part of ammonia alum and two parts of sulphate of iron in one hundred parts. Well wash the casks with this solution, boiling hot, and allow them to stand twenty-four hours. Then rinse out the casks well, dry them, and finally give them a washing with a thin solution of silicate of soda.

Joining and Working Amber.

Amber is Joined and Mended by smearing the surfaces of the pieces with linseed or boiled oil, and then strongly pressing them together, at the same time holding them over a charcoal fire, or heating them in any other way in which they will not be exposed to injury.

Amber is Worked in a lathe, polished with whiting and water or oil, and finished off by friction with flannel. During the operation the pieces often become hot and electrical, and fly into fragments, to avoid which they should be kept cool, and only worked for a short period at a time. The workmen are said to suffer considerably from electrical excitement, often experiencing severe nervous tremors of the hands and arms.

Cement for Aquaria.

I have tried fifty different ones, and find the best composition is, one part common pitch, one-half part gutta-percha; they can be melted in a little turpentine. To make it work easier, there must be no coal oil in the turpentine, or the pitch will soften and be destroyed; a rascally druggist made me lose several dollars' worth of gutta-percha in that way. You will find this mixture gives a little with the material that the tank is made of, as the changes of heat and cold affect it; and it will adhere to glass, wood or iron. E. Bruce.

St. Louis, Mo., July 30, 1865.

[The proportions are one pound glue, one-half pound linseed oil, two pounds whiting. Stir well while melting, and let it cool gradually on a stone covered with powdered whiting; heat it well again until it is tough and firm; cover with a damp cloth when not in use.—Eds. *Scientific American.*]

Preservation of Flowers with their Natural Colors.

Dried flowers, in their natural colors, have, for some time past, appeared for sale in the shops. The mode in which the operation is effected is this:—A vessel, with a movable cover, is provided, and, having removed the cover from it, a piece of metallic gauze of moderate fineness is fixed over it, and the cover replaced. A quantity of sand is then taken sufficient to fill the vessel, and passed through a sieve into an iron pot, where it is heated with the addition of a small quantity of stearin, carefully stirred, so as to thoroughly mix the ingredients. The quantity of stearin to be added is at the rate of half a pound to one hundred pounds of sand. Care must be taken not to add too much, as it would sink to the bottom and injure the flowers. The flowers thus become dried, and they retain their color perfectly.—*Ibid.*

A Solvent of Gold.

A. Reynolds writes to the *Chemical News*, "While examining an alloy of silver and gold for the purpose of ascertaining the percentage of gold that it contained, I found to my surprise, that a mixture of sulphuric acid and nitric acid dissolves gold to a considerable extent. This fact seemed to be of some importance, and being unaware of a similar observation having been hitherto made, I send you a note of it."

Glue.

Common glue, as used by cabinet-makers, is not always sufficiently strong to resist the strain to which the pieces joined together with it may hap-

pen to be exposed; sometimes, even, it is required to make metal, glass, or stone adhere strongly to wood; in which case a mixture of glue and ashes of wood will be found greatly preferable to glue in its ordinary state. The latter should first be reduced to the proper consistency required for wood, and a sufficient quantity of ashes added to give it the tenacity of a varnish. It must be applied hot. —*Builder.*

Selected Articles.

SEASONING LUMBER.

From "Scientific American."

MESSRS EDITORS,—I notice on page 85, current volume of the *Scientific American*, an article, signed "Anthrax," on seasoning of lumber, by which I perceive it to be more and more evident, as I said in a former communication, that the matter of seasoning and drying lumber is very imperfectly understood.

"Anthrax" mentions the Hungarian mode of steaming out the albumen by common escape steam, then plunging the lumber into ice water, and afterward drying it in a close room, which, of course, immediately becomes a steam chamber, provided there is any moisture remaining in the lumber which can be changed into steam.

This placing the lumber in ice water is a regular hocus-pocus, for all the object to be gained by it is to prevent the closing of the pores of the lumber on the outside while going through the farce of changing the lumber from the common steam to the steam drying room. And even in that case common cold, warm or hot water would answer just as well, while it would be far better to leave the lumber in the first steam room, and apply heat to it, so as to preserve a steam atmosphere by steam generated from the drying lumber, which steam excludes the air and prevents closing the pores on the outside until the moisture has passsd out of the centre.

It seems, however, the Hungarians had the idea that lumber must be seasoned as well as dried; and in that respect they were in advance of many would-be wiser persons, who suppose that drying of lumber is also seasoning it. Lumber may be dried and not seasoned; or seasoned and not dried. It needs both as much as either, for most kinds of uses. To season lumber is to deal with its albumen; if this albumen is soaked, boiled or steamed ut, the lumber is seasoned, though the loss of the bumen dimishes its strength and durability, as ell as the beauty of finish of all lumber and timber. When all the strength and beauty of the lumber is desired, the albumen should be coagulated and retained in the pores of the lumber.

It is well known to scientific men that when wood dries the sap retires towards the centre, carrying with it the albumen, while the aqueous portion is evaporated. This albumen follow the medullary rays to the heart wood, and when once dried and again wetted it swells with an uncontrollable force, which checks or bursts the stock. The starch contained in this sap changes to acetic acid as soon as it comes into contact with water or a moist atmosphere, and eramacaus, or dry rot ensues.

The proper way, therefore, is to coagulate this albumen, so as to make it insoluble in cold water and still leave the albumen in the pores of the lumber, where it belongs, and where its presence is as valuable as paint for its preservation, or as pumice stone or shellac to make a smooth or finished surface.

It is evident that "Anthrax" has a very imperfect idea of the American patent mode, as he calls it, for seasoning and drying by superheated steam. He seems to confound superheated steam made under high pressure, requiring strong and expensive boilers—the use of which, he says, is one of "great delicacy," with the new mode, by means of which a much higher degree of heat may be obtained than would be practical or safe when made under pressure; and yet the new mode requires no greater pressure than will just balance the pressure of the atmosphere, requiring no expensive apparatus; no safety valves, and not even a steam boiler, and with the whole apparatus and its management so simple that any boy that can build a fire and read the thermometer can work it perfectly. Besides, where steam is superheated in particles, as in the new mode, the heat can be applied so as to obtain any kind of an atmosphere desired, from 100 to 1,000 degrees or more. In fact, this kind of steam is now used to melt iron, and excels all other modes for that purpose, both in economy and in the quality of the iron produced.

By the new mode of seasoning and drying I placed 3,000 green gun stocks in a kiln say 16 by 24 feet, at one of the large armories, and then took six of the stocks as samples of the remainder, and gaged each stock into $\frac{1}{64}$th of an inch, and weighed them in pounds and ounces. Each 24 hours, or day, these stocks were separated, re-weighed and gaged, to ascertain the daily progress in drying and shrinking. If necessary, I can furnish the weight and gage of each stock, but will at present give the result of the six stocks combined, to wit: The first 24 hours they lost in weight 12 pounds and 13 ounces, or 2 pounds and $2\frac{5}{6}$ ounces each, which, if applied to the whole 9,000 in the kiln, would show over 19,000 pounds of water removed during the first 24 hours. The second 24 hours the six stocks lost 5 pounds, 5 ounces; and, by continuing the fire 12 hours longer, they lost 2 pounds, 13 ounces.

During the first 24 hours the combined gage of the six stocks was diminished $\frac{3}{64}$th of an inch; second 24 hours, $\frac{2}{64}$th of an inch; last 12 hours, none; thus showing that by this process the shrinking is all completed before the drying is all done, while the seasoning and drying occupied only $2\frac{1}{2}$ days,

There is no necessity for drying any lumber after the shrinking is all completed. It is worthy of note, however, that in the finishing of these stocks it was ascertained that the usual wetting of the stock after the first finishing did not raise an grain on the wood, thus showing that the seasoning, as well as the shrinking, was performed in the same kiln in $2\frac{1}{2}$ days, while the albumen was so thoroughly coagulated as to become practically insoluble in cold water.

I have extracted at the rate of over 1,900 pounds of water from 1,000 feet of green lumber, as a part of a large kiln, in four days.

H. G. BULKLEY.

Cleveland, Ohio, Aug. 17, 1865.

REVIVIFICATION OF ANIMAL CHARCOAL.

By HENRY MEDLOCK, Ph.D., F.C.S., M.P.S.

The principal source of expense in a sugar refinery is that of animal charcoal; and it is a great desideratum to the refiner, commencing with the use of new animal black, to adopt a means of keeping his coal in good condition, and retaining, unimpaired, its decolorising powers after each successive use. I will treat the subject very briefly under the following heads:—

1st. The composition of bone and animal charcoal.

2nd. Its decolorising property, and the causes of its becoming inactive.

3rd. The means of restoring its primitive powers of absorption and decolorization.

1. *The composition of Bone and Animal Charcoal.*—Bone, as is well known to anatomists, is a solid structure composed principally of phosphate of lime and osseine, a modified form of gelatine. The phosphate of lime, or solid portion of the bone, is composed of an infinite number of minute, almost microscopic cells, which are filled up by osseine, and bound thereby, as with cement, into a solid mass.

The composition of bone, after the removal of adhering fat by boiling, is as follows:—

Phosphate of lime	63·1	per cent.
Carbonate of lime	1·4	"
Phosphate of magnesia	2·1	"
Other salts.....	2·4	"
Osseine	31·0	"
	100·0	

When submitted to heat in a closed vessel, to which air cannot gain access, the osseine is decomposed, evolving oily and ammoniacal products, which are, by suitable arrangements, collected and applied to many useful and economical purposes. In the retort remains the cellular structure of the bone in a most porous condition, each cell and pore being coated with a thin film of finely divided carbon, resulting from the decomposition of the organic osseine.

The purely chemical reasons why the porous animal charcoal should possess such extraordinary decolorising and general absorptive properties, is a question which I need not now enter into, but I shall do so fully in a forthcoming pamphlet.

2. *The Decolorising Properties of Animal Charcoal, and the causes of its becoming inactive.*—It is well known to the refiner that his charcoal too soon loses the power of decolorising his syrups, and the question arises, what is this owing to? It is *à priori* assumed that it is owing to the grains of coal becoming coated on the surface with the slimy albuminous and mucilaginous matters contained in the raw sugar, which destroy to a great extent its porosity. This is doubtlessly one cause, but the principal, and by far the most serious cause, is the presence of lime in the raw sugar, and which, in a short time, effectually chokes up the pores, and, in the process of re-burning, cannot be removed, although the mucilaginous materials are destroyed.

3. *The Means of Restoring its Primary Powers of Absorption and Decolorisation.*—When the charcoal ceases to decolorise, it is usually washed with hot water to remove the syrup remaining therein, and then re-burned in closed furnaces of various construction, the object of re-burning being to carbonize the colouring matters extracted from the syrups. This restores to some extent the decolorizing powers of the charcoal; but at each successive re-burning the coal ceases to act as a decoloriser, unless it be mixed after each re-burning with a certain portion of new charcoal.

Another process, and one frequently adopted, is to destroy the organic matters by keeping the charcoal in water, and allowing it to ferment for several days, draining off the water, and adding fresh water containing about ¼ to ½ per cent. of hydrochloric acid. The little acetic acid formed and the hydrochloric acid added, dissolve a small quantity of lime, and so far act beneficially. But the good effect is more than neutralised by the fact of the acids attacking the structure of the bone itself—namely, the phosphate of lime, thus rendering the coal friable, and consequently making much dust and waste.

Having referred to the two methods in common use of revivifying the decolorizing powers of charcoal, and alluded to their inutility and defects, I will describe a new method, as simple as it is ingenious, of rendering old and comparatively useless charcoal as good, and, indeed, better than new. Corenwinder, an eminent German chemist, has, by numerous experiments, established this axiom—namely, "That the decolorizing power of charcoal used in sugar refining is correlative to its power of absorbing lime." In other words, the more the coal becomes choked up with lime, the less is its power of decolorising. Now, to remove the obnoxious lime without attacking the structure of the bone itself, is a question which has occupied for many years the ingenious mind of my friend, Edward Beanes, C.E., F.C.S.*

Mr. Beanes, who by his chemical researches on the sugar plantations of Cuba has enabled the planters not only to produce much finer qualities of sugar, but considerably to augment their produce, has recently patented a process of restoring to charcoal its primitive properties of decolorizing syrups. Mr. Beanes found that charcoal perfectly dry and hot absorbs dry hydrochloric gas with the greatest avidity and in enormous quantity. The gas combines with the lime and converts it into soluble chloride of calcium. After the charcoal has been treated with gas, a portion of untreated charcoal is mixed up with it; the uncombined gas remaining in the pores of the former is taken up by the latter, and the whole becomes neutral; the chloride of calcium is then washed out—requiring only a few hours—and the charcoal is afterwards re-burned in the usual way. It is then found that the decolorising power of the charcoal is augmented at least 100 per cent.

* Lately a resident of Toronto.—ED. JOURNAL.

The advantages of Mr. Beanes' process are as follows:—

1st. It removes the whole of the lime and carbonate of lime from the pores without attacking the phosphate.

2nd. It augments the decolorising powers of the coal upwards of 100 per cent.

3rd. It requires no expensive apparatus, and the process is almost costless, two saleable products being obtained nearly equal in value to the materials employed.

I have thus ventured to introduce Mr. Beanes' process to the notice of English refiners, not simply from feelings of personal friendship, but from the firm conviction that by its general adoption he will confer as great a benefit on his own countrymen as he has already conferred upon the sugar manufacturers of Cuba.

Chemical Laboratory,
20, Gt. Marlborough-st., London, W.

CANADA AT THE DUBLIN EXHIBITION.

On comparing the success of Canada at the Dublin International Exhibition, in obtaining Medals and Honorable Mention, we consider the comparison highly creditable. The Juries in their reports make reference to Canada in flattering terms: "In the Canadian Department we get a specimen of oil from the Mineral Springs, exhibited by D. Bogart Gaspé, and also a specimen marked Cedar oil. * * In this Department chrome yellows are exhibited, procured from the native chrome iron, considerable quantities of which are found among the mineral "riches of Canada." And further, in the report on "Substances used as Food," which rather incidentally notices the high price of beef in Great Britain, there is the following remark: "Canada, Nova Scotia, and New Brunswick, have extensive pasturages on which vast quantities of animal food could be supplied. * * * The agriculture of Canada is fairly represented by three illustrative collections contributed by official bodies. A sample of tobacco shown by Mr. McCollum is of extremely good quality." From the report on "Vegetables and animal substances chiefly used in the manufacture of implements, or for ornament," we take the following extract: "Canada sends a fine collection of wool, flax, &c." We expected that in the section for "Woollen and Worsted," Canada would have carried off more than one prize. However we find our credit well sustained by Robertson & Co., Montreal, who get a medal "for goods most creditable to the Colony." In the same section, Belgium got only one prize, France one, the Netherlands one, and the Zollverein one. We do not know what were the rules which guided the Jury, as no report is given, in their decision. But it would be manifestly unfair to pit the products in Woollens from a young country, where almost every manufacture is in its infancy, against those of the United Kingdom. Goods of the same class might reasonably compete, and in this respect, the coarser Woollen manufactures of Canada would be found, as to cheapness and quality, not inferior perhaps to those of Great Britain itself. We know that the gentleman in charge of the Canadian Department complains of the indifference purposely manifested to Woollens on exhibition from this Province. He alleges that it was feared, and the fear was openly expressed, that by giving this description of product too much prominence, Canadians might be induced to export their Woollens to the United Kingdom. He asserts he could dispose of 1,000 yards per day of Canadian Cloth. In fact it was difficult, he says, to get the Juries to inspect the Colonial articles, particularly those sent from this country, and that not above "half the things have been looked at. We are disposed to place much confidence in the statements of this gentleman, who is highly intelligent and who is jealous of the good name of Canada. However, under the disadvantages to which a colony must submit at such an exhibition, we have no cause to blush, as the list of awards will show. In the section—Mining, Quarrying, &c.—we took as many prizes as France and Rome, and are only one behind Belgium. In that of "Chemical Processes and Products Generally," we are equal with France, and exceed India, Austria, Belgium, Rome, and Switzerland. In that of "Substances for Food," we obtain three medals; while Natal, Newfoundland, and New South Wales, obtain only one each. In that of "Vegetable and Animal Substances, &c," we get one medal; while India gets no more. In that of "Agricultural and Horticultural Machines and Implements," Canada secures two medals, ; while France and Denmark get only one each. In the section for "Woollen and Worsted," we get one prize; but Belgium, France, Netherlands, and the Zollverein, get no more. In the section for "Leather, Skins, Fur, Feathers, and Hair," Canada is awarded three medals; Nova Scotia, one; Victoria, one; France, two; Italy, two; Netherland, two; Russia, one. Some of these countries have, according to their specialties, exceeded us in the number of prizes they have secured; but this has been mostly in products which have taken generations to bring to perfection, and against which of course we cannot compete.—*Montreal Transcript.*

Machinery and Manufactures.

THE WAY TAR IS OBTAINED.

Tar, a thick, black, viscid material, a product of the destructive distillation of carbonaceous substances, as wood, peat, bituminous coals and shales. It is a commercial article, largely produced, and applied to a variety of uses. It was known to the ancient Greeks, and Dr. Clarke, who describes the method of manufacturing it in the forests of Bothnia, states that there is not the smallest difference between the processes there practiced and those of ancient Greece. Along the whole coast of the Gulf of Bothnia the inhabitants are very generally engaged in this occupation. They make use of the roots of the fir trees, with logs and billets of the same, which they arrange in a stack of conical shape, fitted to a cavity in the ground, generally made in the side of a bank. In the bottom of this cavity is placed a cast iron pan from which a spout leads out through the bank. The heap is covered over with turf, and is then fired, as in making charcoal. Tar collects in the latter part of the process of charring, and runs off through the spout into

barrels placed to receive it. Tar is a product, where charcoal is the chief object of the process, but is seldom obtained in quantities sufficient to render it an object to collect it, except in charring the resinous woods of the pine family. In Sweden, where the business is also an important one, some peculiar methods are adopted to increase the yield of tar in wood. Trees of no value for the saw-mill are partially peeled of their bark a fathom or two up from the ground, not enough to kill them, but only to check their growth. After five or six years, when cut down, the wood is found to be much richer in resinous matters which produce tar. It is noticed that the condition of the weather during the process of charring may make a difference of 15 or 20 per cent. in the yield of tar. In the United States tar is produced in almost all parts of the country where pitch pine and the *pinus australis* are found. Along the coast of the Southern States, especially of North Carolina, Virginia, and Georgia, the business has been carried on upon a large scale in connection with the manufacture of turpentine, rosin, and pitch. Old trees, which have ceased to produce turpentine, and dead wood which is rich in resinous matter, are selected for the coal pits. The process does not materially differ from that already described.—*American Encyclopædia.*

SHOT MAKING IN NEW YORK.

One of the most interesting manufactures which this busy city of ours presents to the inquiring mind is that of shot-making, of which most people have no other idea than an indistinct one of a huge and lofty tower through which melted lead falls into a water-pit at the bottom.

A visit to the establishment of the New York Lead Co. on Centre Street, will disclose all the details of this interesting process. The brick tower is something less than 200 feet in height and about 60 or 70 in circumference. At the bottom is a well of cold water, and the summit is entirely devoted to the melting machinery—the pan or sieve through which the shot falls being situated in the centre and quite small, say a foot and a half in diameter. The lead is conveyed to the summit in pigs or bars, and there melted. Before being poured into the pan it is slightly mixed with crude arsenic, to prevent oxidation. Much of the lead, in passing through the holes of the sieve, comes out in elongated drops, in the same way as the dripping of water, thus causing imperfect shot, which are increased by the soft shot touching each other in falling, and adhering together.

Standing on the ground floor of the tower, the shot can be seen and heard falling and hissing into the well beneath, the water of which is splashed up high as it receives the driving, seething rain.

From the well, the shot is transferred to a drying machine, lightly rolled by hot flannel rollers, and, after being thoroughly dry, it passes through the next process, which separates the imperfect from the perfect shot. This consists of a long, smooth, wooden inclined plane, divided into regular ledges, each one a little lower than its predecessor, with a slight break or open space of about half an inch between. The round, perfect shot, in rolling down this plane, leap the openings, while the imperfect, not having the same momentum, fall through, and are gathered up to be re-melted.

The next process is separating the different sizes. This is done by a sort of chest of drawers, the top of each drawer being covered by a sieve—the coarser at the top, and thence becoming finer toward the bottom. This cabinet is kept in a swinging motion to and fro by machinery, thus shaking the mixed shot, which is poured in at the top, from drawer to drawer, until all the different sizes are duly assorted into separate drawers.

The shot has now a dull, dusty color, the finer appearing more like sand or black meal than a mass of separate and uniform globules; and the next operation is to polish. This is performed by putting it into revolving cylinders, with black lead, and from which the shot is at length projected, bright and shining as beads of glass. It is next put in bags, and is ready for shipment.

The shot business is now very brisk. More is shipped at the present time than for a number of years past. During the war a large business was done in Minie balls, or slugs hollowed at the butt. The trade is now almost altogether in shot, not including the three sizes of buck-shot, which are molded like bullets.

There are four shot towers in New York and vicinity, viz.:—The New York Lead Co. Centre Street; Tatham & Brother, Beekman Street; T. O. Leroy, Water Street, and McCullough's Lead Co. Staten Island. The capacity of all these works is very nearly equal, that of the former being from ten to fifteen thousand pounds of shot per day—or a total of forty to fifty thousand pounds.—*N. Y. Tribune.*

HYDRAULIC LIFTS FOR WAREHOUSES.

In England water power is employed to a much greater extent for minor purposes than it is with us. We have published in former numbers of the *Scientific American* many instances where small turbines have been applied to blowing organs and driving light machinery. Other applications of water power are common abroad which are unknown here—as in hydraulic cranes, water engines, "hydraulic lifts," and similar machines. The water-rate is much lower in England than in this country; that is, the rent for so much water, annually, is less; but that is no reason why water power should not be introduced for many purposes where steam is now used.

Our large importers and jobbing houses on Broadway and other streets, use steam power to a great extent. In their immense buildings are one or more hatchways, up and down which goods are continually sent from one story to another. To do the work, however, there must be a steam engine and boiler, which requires costly fuel, attendance, and supplies, and is, in dull seasons, an investment on which there is no return. By the use of water power for this purpose, these outlays would be unnecessary, and a comparatively simple system introduced in place of a complicated one. The saving to be made by this substitution lies not in an increase of power—for a pound of water, turned into steam, will do much more than the same quantity on a wheel—but in the conditions under which power is given out under the two plans there is a vast economy.

Ordinary steam engines burn from eight to ten pounds of coal per horse-power in one hour. By common engines we mean those constructed rudely, with improperly made and set valves, and in a bad state of repair, as nearly all engines used in warehouses are. At present prices of coal—$12 per tun—one horse-power would, therefore, cost 16⅔ cents per hour, exclusive of engineer's wages. A competent engineer ought to receive $3 per day at least; this would make a horse-power nearly $5 a day, without waste, packing, oil, repairs, supplies, or any incidental expenses whatever. This power must be maintained, ready for use, at all times, whether needed or not at the moment. It increases the rate of insurance, and is a continual source of anxiety.

It seems quite reasonable to deduce from these facts that it would be a saving to pay the Croton, or Cochituate, or Fairmount Water Works, ten times the amount they charge for one horse-power to users of steam. By the use of water-power the wages of an engineer would be saved, no repairs of any moment would be needed, the rate of insurance would remain the same as in other buildings, there would be no liability of explosion, no great depreciation in value as there is by using a steam engine and boiler; and, what is of great importance, the power would be ready at all times, and could be managed by any person.

Of the means by which power is to be applied it is not necessary to speak. A stand pipe suggests itself as a simple and safe reservoir of power where head enough could be had to fill the pipe. From such a pipe a water engine or turbine wheel could be driven with no more gearing or mechanical fixtures than are in use at present.

In some places there are printing presses running, driven by small turbine wheels. The New Haven *Palladium*, we are told, is printed on a press driven by a small turbine wheel; the supply pipe is one inch; the head we do not know.

This matter is worthy of attention by those principally interested.—*Scientific American.*

ARTIFICIAL STONE.

To obtain a factitious stone which may take the place of the ordinary Turkey, Water of Ayre, and Arkansas stones used for sharpening cutting tools, and for kindred purposes, is the object of an invention recently patented by Mr. E. Parnacott, of Leeds. To this end he prepares a compound which will admit of being molded to any required form, and which when molded may be hardened and brought to the consistency of stone. In carrying out the improved manufacture, the chips and dust obtained in preparing lithographic stones are reduced to fine granules, emery powder, borax, and saltpetre are added, and the whole thoroughly mixed in a mill. The mixture thus obtained is molded to any required shape—for example, cutting and polishing tools; the same is first submitted to hydraulic pressure, and then to furnace heat, whereby the hardness and consistency for stone is imparted to the molded articles. The following proportions will produce a good result, viz.:—pounded lithographic stone twelve ounces, borax two ounces, salpetre half an ounce, and very fine emery two ounces. Place these substances together in an ordinary incorporating mill with edge runners [such as is used for preparing and mixing mastic and sand], the pan of the mill being heated by means of steam or gas, and subject the substances to the action of the mill until they are well mixed and incorporated. Then remove the compound thus formed, and place it in strong iron molds for the purpose of being submitted to pressure. These molds are made of various shapes, to suit the purposes for which the artificial stone is to be used.

The pressure necessary to effect a proper consolidation of the compound may be conveniently given by means of a strong hydraulic press. The amount of pressure which has proved satisfactory is about twenty tuns per square inch of surface of the molded article. When the requisite mechanical consolidation of the molded article is subjected to a white heat in any suitable construction of furnace, or to such a heat as will serve to fuse the borax and saltpetre and effect the binding together of the granules of stone and emery. The time required for attaining this object will in general be from half an hour to one hour. To prevent the warping and running of the molded compound under heat, it is clamped in molds made of plumbago, fire-clay, or other like heat-resisting material, before being placed in the furnace. When it is required to produce cutting or polishing wheels, hones, or other like articles with a less cutting power than those made from the before-named mixture, ordinary chalk is substituted for a portion of the lithographic stone granules. The proportions of the chalk and the granules should be half of each to produce a good result, the proportions of the other materials being retained.—*Mechanics' Magazine.*

PATENT WINDOW CLEANER.

An ingenious instrument for cleaning windows of every description has been lately invented in England. It consists of a long wooden rod, with an elbow joint, and the person using it has no need to stand or even to sit on the window sill. The long arm is supplied with a nut and double cord, and the short arm has a movable bolt on it, to which may be attached a brush, sponge, or washleather; and by moving the nut up and down, the brush or other article on the short arm is brought in contact with the window panes. The instrument seems to answer its purpose admirably. It is light, portable, adapts itself to any angle and any sized window; and what is most important of all, its manufacture will not cost at the utmost more than $2 50. The inventor and patentee is Mr. Smeaton, of Birkenhead, opposite Liverpool.

A NEW FIRE ANNIHILATOR.

A number of scientific gentlemen in England have been witnessing experiments at Mr. Whilling's premises, King's Cross, with a new fire extinguisher, the patent of Dr. Carlier and Mr. Vignon. A huge fire was lighted three times, each more powerful than its predecessor, and a man with one of the machines, it is said, completely mastered the conflagration in a few seconds. The machine is portable, and costs from £4 to £6. It is always charged, may be slung upon a person's shoulders,

and can be used by a child. The charge simply consists of a large seidlitz compound; and, the vessel being air-tight and capable of bearing a pressure of 150 lbs. to the inch, the liquid containing the gas can be projected to a considerable distance. The experiments were deemed satisfactory by the parties who witnessed them.

Practical Memoranda.

Speed and Force of Wind, at different Velocities.

Velocity of Wind in Miles p. hour.	Velocity of Wind in Feet per second.	Force in lbs. avoidupois per square inch.	Common Appellations given to the Wind.
1	1·47	·005	Hardly perceptible.
2	2·93	·020	Just perceptible.
3	4·40	·044	
4	5 87	·079	Gentle, pleasant wind.
5	7·33	·123	
10	14·67	·492	Pleasant, brisk gale.
15	22·00	1·107	
20	29·34	1·968	Very brisk.
25	36·67	3·075	
30	44·01	4·429	High winds.
35	51·34	6·027	
40	58 68	7·873	Very high.
45	66 01	9·963	
50	73·35	12·300	A storm or tempest.
60	88·02	17·715	A great storm.
80	117·36	31·490	A hurricane.
100	146·70	49·200	A violent hurricane, which wrenches and tears up trees, forces dwellings and minor buildings from their foundations, & drives them before it.

Note.—The following rule is used to find the force of wind acting perpendicularly upon a surface:—Multiply the surface in feet by the square of the velocity in feet. and the product by ·002288. The result is the force in pounds avoirdupois.

Sizes of Nuts, equal in Strength to their Bolts.

Diam. of bolt in inches.	Short diameter of nut in in.	Diam. of bolt in inches.	Short diameter of nut in in.	Diam. of bolt in inches.	Short diam. of nut in in.
½	⅝	1⅜	2 7/16	2½	4 7/16
9/16	⅝	1½	2 11/16	2⅝	4¾
¾	⅞	1⅝	2⅞	2¾	4 15/16
⅞	1 1/16	1¾	3⅛	2⅞	5⅛
15/16	1 5/16	1⅞	3⅜	3	5⅜
1	1 3/16	2	3 9/16	3¼	5⅞
1	1¼	2⅛	3¾	3⅜	6 5/16
1⅛	2	2¼	4	3½	6¾
1¼	2¼	2⅜	4¼	4	7⅛

Note—The depth of the head should equal the diameter of the bolt; the depth of the nut should exceed it, in the proportion of 9 or 10 to 8.

Statistical Information.

Municipal Debts and Taxation.
(From Provincial Auditor's Report.)

Statement of the number of Acres Assessed, Annual Value of Real Estate, and the rate of Taxation for Municipal and Educational purposes in the Cities and Towns of Upper Canada in the year 1864.

CITIES.	Acres within limits.	Assessed An. Value of Real Estate.	Taxation for Mun. purp.	Taxation for Educ. purp.
		$	cts.	cts.
Hamilton	2,307	468,445	21	1
Kingston	2,930	239,654	17½	2½
London	1,245	301,068	17	3
Ottawa	1,829	228,756	19 5/12	2
Toronto	4,885	1,150,403	20¾	1¾
Total	13,196	2,388,326	.....	.....
TOWNS (separated from Counties.)				
Cobourg	2,600	86,197	21¾	3¼
Port Hope	1,095	72,717	12	3
Peterborough	600	76,800	11½	2½
St. Thomas	600	22,738	16½	3
St. Mary's †	3,000	28,405	11	6
Total	7,895	286,857	.....	.....
TOWNS (not separated).				
Amherstburg	561	16,625	15½	41
Barrie	2,100	18,069	14	6½
Belleville	1,400	135,807	10	4
Berlin	3,000	29,413	15	5
Bowmanville	3,400	44,978	14 9/10	4
Brantford	1,781	126,333	6½	3½
Brockville	550	66,443	12½	5¼
Chatham	1,650	60,147	14	4
Clifton	987	23,393	7½	4¼
Collingwood	4,400	17,720	5½	10½
Cornwall	486	26,172	12½	4
Dundas	550	47,444	27	3
Galt	1,012	57,346	17	.....
Goderich	1,400	65,950	2½	6¾
Guelph	3,480	119,418	12½	3
Lindsay	1,600	46,477	16⅜	7⅛
Milton	400	15,539	11½	1
Niagara	*555	23,330	9	3½
Oakville	1,200	26,759	7	3
Owen Sound	3,000	37,535	19¾	.....
Paris	685	46,128	24½	4½
Perth (a)	1,000	36,760	15	.....
Picton	586	32,054	8½	2½
Prescott	900	39,723	11¼	3¾
Sandwich	2,000	12,723	5¼	8¼
Sarnia	830	37,887	12	3½
Simcoe (a)	400	22,000	20	.....
Stratford (a)	1,000	40,065	25	.....
St. Catharines	1,200	139,158	21½	2½
Whitby	3,800	53,555	7	5
Windsor	1,763	36,533	17	8
Woodstock	1,640	43,128	12	4
Total	49,816	1,544,612	.....	.....

* Niagara Ordnance Lands 270 acres—assessed lands 55.=325.
† St. Mary's was not separated until 1861.

The assessed annual value of "Personal Property" in cities is about one-fifth of "Real Estate;" in towns separated from counties, one-tenth; and in towns not separated, one-eighth.

Debenture Debt and Revenues of Cities and Separated Towns, for 1864.

NAMES.	Debenture Debt.		Revenue.	
	Corporation Debentures.	M. L. F. Debentures.	Collected under the year's taxes.	Other Revenues.
CITIES.				
Hamilton..	2,295,997	.....	110,007	49,000
Kingston ..	328,733	.....	44,352	29,091
London ...	529,055	375,400	41,320	32,771
Ottawa.....	160,441	.....	71,262	12,203
Toronto....	2,383,584	.....	177,611	877,274
Total....	5,697,810	375,400	380,552	1,000,339
SEP. TOWNS				
Cobourg...	200,000	600,000	10,807	2,026
Port Hope	40,395	860,000	8,677	9,987
Peterboro'	82,200	100,000	3,280	11,149
St. Thomas	109,015	.....	2,954	1,044
St. Mary's	27,000	.....	4,688	3,331
Total....	458,610	1,560,000	30,406	27,587

Emigration Returns.

The official returns give the number of emigrants who have arrived at Quebec during the past season, up to the 1st of November, as follows:—

From England	$7,343
" Ireland.....	4,227
" Scotland	2,366
" Germany	1,408
" Norway & Sweden.....	3,378
Total.....	18,722
Increase over 1864	1,001

The destination given is, Canada, 3,460; United States, 12,046; unaccounted for, 3,216.

Steam-Engine Exports from Great Britain.

Steam-engines to the value of £990,671 were exported from Great Britain during the first six months of this year, as against £733,155 in the same period of last year.

India-rubber.

A paragraph in the *North American Review* says there are now in America and Europe more than a hundred and fifty manufactories of india-rubber articles, employing from four to five hundred operatives each, and consuming more than ten millions of pounds of gum per annum. The business, too, is considered to be still in its infancy. Certainly it is increasing. Nevertheless there is no possibility of the demand exceeding the supply. The belt of land around the globe, five hundred miles north and five hundred south of the equator, abounds in trees producing the gum, and they can be tapped, it is said, for twenty successive seasons. Forty-three thousand of these trees were counted in a tract of country thirty miles long and eight wide. Each tree yields an average of three table-spoonfuls of sap daily, but the trees are so close together that one man can gather the sap of eighty in a day.

The Human Race.

From the statistics carefully compiled by Dieterici, president of a scientific academy at Berlin, we find that this globe contains 1,288,000,000 of human beings, of which the Caucasian race count 369,000,000; Mongolian, 552,000,000; Negro and Ethiopians, 196,000,000; the Malay race, 200,000,000; American Indian, 1,000,000. The classification of mankind as to religious persuasions is thus set forth: Asiatic Buddhist, 600,000,000; downright Pagans, 200,000,000; Mahomedan, 160,000,000; Jews, 5,000,000. Christians, 335,000,000, namely, Latin Roman Catholic, 170,000,000; Greek Orthodox, 89,000,000; Protestant, 76,000,000.

Steam Vessels of the United Kingdom.

The number of steam vessels belonging to Great Britain at the present moment is enormous, and during the last three or four years, their number has increased at an enormous rate. Independent of the vessels of the Royal Navy there is now between 2,000 and 3,000 vessels sailing under the mercantile flag of Britain, with a tonnage of over a million tons, being in excess of the tonnage of all the steam navies of the world combined, besides exceeding all others in point of speed and sea-going capabilities. During the year 1864 more than 90 steamers were registered at the port of Liverpool alone, and 364 were registered in the British Isles. Of course these vessels find abundant employment in the peaceful pursuits of commerce; but it must be regarded as a great source of military power to this country to have at command this vast fleet of fine steamers with the large body of trained seamen who man them. The mercantile navy has been and always will be the main support of the Royal Navy, and the admirable system of the naval reserve will now render them more than ever serviceable.

Boiler Explosion Statistics.

In an interestiug paper read on Wednesday evening by Mr. Paget, C.E., before the Society of Arts, it is stated that last year there were at least forty-eight explosions in the United Kingdom, causing the death of seventy-five and the injury of one hundred and twenty persons. Compared with the continental system for preventing explosions, that adopted by the new Assurance Company, and by the Marine Department of the Board of Trade, is much superior in its results. In an average of 277 boilers, there were two explosions in the French department of the haut-Rhin within ten years; and, from 1856 to 1861, or within five years, there were only two explosions in an average of 1,371 boilers. Under the care of the Manchester Association, about four explosions occur annually amongst the 6,500 locomotives of the United Kingdom; three have already taken place this year. In an average of 600 passenger vessels

inspected under the Marine Shipping Acts, only three explosions had occurred since 1846–7 in Great Britain, viz., one at Lowestoft, another at Southampton, and a third at Dublin.—*Builder.*

Railways in England.

There is about £400,000,000 invested in railways in great Britain; of this £300,000,000 is in shares, and the remaining £100,000,000 is on mortgage. Upon this latter probably an average interest of 4½ to 3¾ per cent. is paid. The cost of working the railways is about 49 per cent. The gross receipts from railway traffic for 1863 were £38,000,000, which would leave about £16,000,000, after deducting working expenses, for interest on capital and loans. If the Government borrowed the whole amount invested at 3½ per cent., the interest would amount to £14,000,000, leaving £2,000,000 for the reduction of rates, or barely one-fifteenth of the receipts.

The United States' Wealth in Lands.

The United States owns upward of 1,000,000,000 acres of public lands susceptible of cultivation. They own at least 2,000,000 acres of gold and silver-bearing lands. The arable lands are worth at least $1,200,000,000, and the mineral lands are worth at least $8,000,000,000, making together a total of $9,000,000,000.

Photography.

PHOTOGRAPHY AT THE DUBLIN EXBIBITION.

(*Extract from Juries' Report.*)

"It is satisfactory to see that photography is extending its ramifications to the remotest parts of the world, and that the English colonies have furnished some very good contributions to the Dublin Exhibition. Such productions have a double interest; they show that photography is appreciated and encouraged in these far off regions, and that this offspring of science is following civilization everywhere; besides, it brings to us faithful representations of countries which only few have had, and will ever have, the opportunity of visiting. Photography alone can illustrate with truth the descriptive records of travellers, giving to us the history of the progress of the colonies which the Old World is establishing in every part of our globe for the improvement, enterprize, and development of the human race.

The Dublin Exhibition affords us a very interesting and manifest proof of all the advantages and merits of photography, and shows that the new art has become the indispensable auxiliary of both art and manufactures in furnishing the illustrations of all their productions. There is hardly a department of the Exhibition in which the exhibitors have not availed themselves of photography to represent the articles they exhibit or the instruments by which they are made. But it is particularly in the Department of Machinery that photography has rendered eminent services in showing the mode of their production and their various applications. A remarkable example of such illustrations is seen in the Prussian Department, showing the machines under their various aspects, and the extensive works in which they have been manufactured, with the appliances which have been used in their construction.

Thus the exhibition of photography has not been confined to the particular department which has been devoted to it; it has indeed invaded the whole of the elegant Palace, being in fact the indispensable adjunct of every specimen of art and manufactures from all parts of the world.

Not only the contents of the Exhibition have been reproduced by photography, but the Palace itself, in all its most elegant and picturesque aspects, has been represented in photographs executed by the Stereoscopic Company. The beautiful stereoscopic views taken by that spirited association will remain for a long time interesting subjects of observation, and afford a pleasing recollection of the International Exhibition of Dublin in 1865. It will enable those who have been deprived of visiting it personally to see it in all its actual reality."

OBTAINING PHOTOGRAPHS.

M. Regnault has succeeded in obtaining photographs with bromide, iodide and fluoride of copper; the bromide proved the most sensitive.

PHOTOGRAPHY WITHOUT A NITRATE-OF-SILVER BATH—WET & DRY NEGATIVE PROCESSES WITH COLLODIO-BROMIDE OF SILVER.

BY S. E SAYGE.

In September 1864, I published a process by which negatives could be obtained in a simple and certain manner, without the aid of a nitrate-of-silver bath. Since that date I have not in one single instance made use of the bath, and have experimented upon upwards of 200 plates with unvarying certainty and cleanliness, accompanied by a considerable saving of *labor, time,* and *expense* in the preparation of the negatives.

Although the formulæ first announced will be found to work as at the time it was made public, I have since adopted some slight modifications, and the following contains the mode of manipulation which I would recommend to those interested in the process:—

Preparation of the Collodion.

Take bromized collodion, containing 8 grains of bromide in each ounce; mine is prepared as follows, and is that which I have used for two years and a half with a 60-grain bath for rapid exposure:—

Bromide of cadmium	6	grains,
Bromide of ammonium	2	,,
Soluble pyroxyline of fair ordinary quality	6	,,
Ether	½	ounce,
Alcohol	½	,,

Prepare as much as required, and, when mixed and allow to stand for a week, then pass through a retort-filter. The filteration is not absolutely necessary, but I find it a certain cure for the transparent spots respecting which so many complaints were made last summer.

When the above bromized collodion is ready for use, take crystallized nitrate of silver 12 grains, reduce it to a *fine* powder in a glass mortar, and then add one or two drops of water, or say sufficient to produce a kind of pulp; then in a yellow or non-actinic light, mix the collodion with the silver, stirring with a glass rod or pestle, as the mixture is being poured into the bottle intended for its reception, then shake up well, and allow to stand.

In an hour it is ready for use, and should be dissolved in alcohol, and then mixed with the collodion. This plan, doubtless, would work well, but I prefer to be satisfied that the bromized collodion is in perfect condition before adding the nitrate of silver, for afterwards I do not believe it possible to remove any defect in the preparation.

Another mode of producing a collodion for use without a bath is by forming bromide of silver by precipitation from aqueous solutions of bromide, potassium, and nitrate of silver, then washing the precipitate in alcohol until water is eradicated, and adding to plain collodion sufficient to produce a creamy film.

To render this method most successful it is desirable to add to the collodion a few drops of an alcoholic saturated solution of bromide of cadmium. I do *not* adopt this mode of preparing collodio-bromide of silver, but give the suggestion for the use of those who may make the experiment.

Having tried each way, I prefer the original method, *i. e.* that of adding nitrate of silver to bromized collodion in the proportion above mentioned; and fortunately it boasts of a further advantage, viz. that of occupying less time in practice than in description.

Use of the Collodion in a Wet State.

Take a perfectly clean plate of glass free from scratches, tip the edges for an eighth of an inch with a solution of 1 grain of india-rubber in 1 ounce of benzine, and then coat with the collodio-bromide of silver, allow to set the usual time, and then place in a dish of water until the greasy appearance has vanished.

If *warm water* can be obtained conveniently, use it in preference, there being a great saving in time, and the plates are more sensitive.

When the water flows freely over the film, take the plate out of the dish, wipe the back, and drain for a moment upon a piece of blotting-paper, then place in the dark-slide for exposure in the camera.

Expose a little longer than wet collodion with nitrate bath before development, wet the film with a little water, and pour over

Protosulphate of iron	25 grains,
Glacial acetic acid	25 minims,
Water	1 ounce.

to 3 drachms of which add 2 drops of solution of nitrate of silver, 20 grains to 1 ounce of distilled water.

The image appears quickly, and in every respect like an ordinary wet plate, and a few trials will show the proper exposure.

Intensification may be accomplished by any of the methods adapted to wet plates,—and the fixing with cyanide of potassium, 20 grains to the ounce of water.

Use of the Collodio-Bromide of Silver in the preparation of Tannin Plates.

Coat a clean plate of glass, previously nipped at both edges with india-rubber in benzine, with collodio-bromide of silver, and when the film has set, place in a tank of water; then coat another plate, which also place in the tank until the number required is completed.

Then have ready a dish of water from the kettle, as hot as the hand can bear. Take the plates out of the tank in rotation, and place them in the hot water for about thirty seconds, and then in a bath of tannin solution, 15 grains to the ounce of water, well filtered, or in the following solution, suggested to me by Mr. Verity, of Manchester, which I find superior to the ordinary tannin solution, viz.:—

Tannin	10 grains,
Gallic acid	5 ,,
Water	1 ounce,
Grape sugar	5 grains,
Alcohol	10 minims.

Prepare *quantum suff.* as follows:—Dissolve the tannin in a portion of the water, and filter; dissolve the gallic acid by heat in another portion, and, when filtered, mix with the tannin, then add the grape sugar, and again filter; the alcohol may now be added, and it is ready for use.

If the plate is allowed to remain in the above solution three minutes, and is properly exposed, very little intensification is necessary.

When ready, take out the plate, and drain and dry evenly and quickly in any convenient and suitable manner. I have a drying-box with hot water over, the plates standing in racks, and the whole closed up with a door.

Expose about one half the time required for tannin plates with bromo-iodized collodion.

Development. — Prepare the following solutions:—

No. 1.—Alcohol	½	ounce,
Water	½	,,
No. 2.—Carbonate of ammonia	40	grains,
Water	20	ounces.
No. 3.—Pyrogallic acid	96	grains,
Alcohol	1	ounce.
No. 4.—Bromide of potassium	10	grains,
Water	1	ounce.
No. 5.—Nitrate of silver	30	grains,
Citric acid	15	,,
Distilled water	1	ounce.

Pour over the dry plate once or twice sufficient of No. 1 to cover it, and then return to the bottle for use with the next plate.

Then place in a dish of water until the greasy appearance has vanished.

Then pour over evenly sufficient of No. 2, with a few drops of No. 3, and two drops of No. 4 added, and wave *to* and *fro* with a rocking motion.

The image should very soon appear, and may be developed until the *shadows* become *slightly* tinged, then wash surface and back of plate freely with water, and rinse surface and back with a little very dilute acetic acid (say two drops glacial acid to 1 ounce water), wash off the acid; and if any intensification is required, it may be effected by adding to (say) two drahms water three drops No. 3 and three drops No. 5 solutions.

When sufficiently dense, wash and fix with cyanide of the same strength as for the wet plates, and wash thoroughly afterwards.

Strong cyanide solution answers better than weak. When the latter is used, I have found a tendency in the films to split up on drying, which has not happened when strong cyanide has been used.

The above is an unreserved statement of the process by which I have worked, and is accompanied by prints from negatives produced by it, which probably the editor will criticise according to their merits; they are only the productions of a hurried trip in the Lake district, and from untouched negatives.

I shall be happy to furnish through you any further information that may be of assistance to those who give the process a trial.—*Photographic News.*

HERR WORTHLY'S FORMULA FOR NEGATIVES.

When we first heard of the Wöthlytype, we were informed of the extreme beauty of the negatives from which his were taken; and having been permitted to inspect them, were astonished at their delicacy and great excellence. Colonel Wortley has published the following details of Herr Wöthly's manipulation in the "News." We heartily hope that the Association which holds his patent may meet with the same degree of success which has attended the discoverer of the process.

"*The Collodion.*—In 4 lbs. of alcohol, of from 90 to 95 per cent., dissolve 680 grains of iodide of ammonium, 240 grains of bromide of cadmium, and 120 grains of iodide of cadmium.—*Photographic Journal.*

A NEW ARTIFICIAL LIGHT.

Mr. James Wilkinson, of Chelsea, is endeavouring to rival the magnesium light, for photographic purposes, by means of a mixture of phosphorous and nitrate of potash. He recently burnt a quarter of a pound of this mixture in his garden, at night, with a view to obtain a photograph of a wind engine which was being erected in an adjoining garden, and he states that "the length of time when it was first lit until it was finally burnt out was nearly six minutes. The utmost cost was a fraction over fourpence. The reflection of the light might be seen for two miles round. So bright was it that the fire-engine authorities mistook it for an ordinary conflagration, and hurried their engines to the spot. Upon finding no trace of the fire they returned, rather chagrined, not, however, without first satisfying themselves by a thorough examination of the premises. All around appeared one blaze of light, the sky looked like a mass of fire." The picture taken during this startling illumination "came out," we are told, "with great sharpness and vividness, the houses near being brought out prominently. It, in fact, equalled any picture taken on a bright day."—*Mechanics' Magazine.*

The smaller the calibre of the mind, the greater the *bore* of a perpetually open mouth.

Miscellaneous.

Lead Poisoning.

Poisoning by drinking water which has acted on lead happens far more frequently than is often suspected, and the mode in which the water is rendered poisonous is frequently difficult of discovery. A correspondent of the *Times* states that, from a rural parish where the drinking water is got from draw-wells, and there are neither leaden pumps nor leaden pipes to contaminate the water, several of the peasantry went lately to the neighbouring country infirmary suffering from lead poisoning. Careful investigation led to the discovery of the source of the evil—the so-called "tinned" kettles in which the water used for tea and for cooking was boiled. It was ascertained that the "tin" with which the kettles were lined was an amalgam of tin and lead. The adulteration of tin with lead is one of the most common frauds. It is of very great importance to public health that some way of escaping from poisoning by leaded tin should be discovered, and it would be desirable that we should know whether there is any coating for iron which would resist heat and the ordinary action of water, and which could be substituted for what is called "tin." About a year ago a French patent was taken out for such a coating, and the coating is said to have stood very severe tests of heat and acids. Such a coating has also been discovered lately in England. Any one giving accurate information respecting such coatings would confer a boon upon the public. A very ready test for lead in water consists in taking two tumblers and filling one with water which is known not to have been in contact with lead; the other being filled with the suspected water. Dissolve in each about as much bichromate of potash as will stand on a groat. By daylight the water in each tumbler will be of the color of pale sherry and water. Cover the tumblers so as to keep out dust, and let them stand in a warm place in a room with a fire in it for twenty-four hours. If the suspected water be free from lead, it will still have the same color as the other, but if there be lead in the water it will have a more or less opalescent tint, as if a drop or more of milk had been put into it. If there be a great quantity of lead in the water a very slight film of lead will be deposited on the glass.—*Mechanics' Magazine.*

[To discover lead in tin, see "Useful Receipts" in this number of the Journal.—Ed. Jour.]

An Industrious Monarch.

Peter the Great once passed a whole month at the forges of Muller, during which time, after giving due attention to the affairs of State, which he never neglected, he amused himself with seeing and examining everything in the most minute manner, and even employed himself in learning the business of a blacksmith. He succeeded so well, that one day before he left the place he forged eighteen poods of iron, and put his own particular mark on each bar. The boyars and other noblemen of his suite were employed in blowing the bellows, stirring the fire, carrying coals, and performing the other duties of a blacksmith's assistant. When

Peter had finished, he went to the proprietor and praised his manufactory, and asked him how much he gave his workmen per pood.

"Three kopecks, or an altina," answered Muller.

"Very well, then," replied the Czar, "I have earned eighteen altinas."

Muller brought eighteen ducats, offered them to Peter, and told him that he could not give a workman like his majesty less per pood.

Peter refused the sum, saying, "keep thy ducats, I have not wrought better than any other man; give me what you would give to another; I want the money to buy a pair of shoes, of which I am in great need."

At the same time he showed him his shoes, which had been once mended and were again full of holes. Peter accepted the eighteen altinas, and bought himself a pair of new shoes which he used to show with much pleasure, saying, "these I earned with the sweat of my brow."

One of the bars of iron forged by Peter the Great and authenticated by his mark, is still to be seen in Istia, in the forge of Muller. Another similar bar is preserved in the cabinet of curiosities in St. Petersburg.

Metallic Tungsten.

We learn that a Swedish metallurgist has discovered a method of reducing tungsten, by which he obtains it at once in a state of fusion, and that ingots of the pure metal weighing several pounds each are now on exhibition at Stockholm. We are informed, too, that the cost of obtaining tungsten by the new method does not exceed a few shillings per pound. If really obtainable thus cheaply, a metal which will bear exposure to so intense a heat without undergoing either fusion or oxydation must prove of incalculable value to certain of the arts, provided that the difficulties in the way of working it are not insuperable. With the exception of gold and platinum, tungsten is the heaviest metal yet known. Its specific gravity is about 81, that of gold being 19·36, and that of platinum, 21·53.—*Mechanics' Magazine.*

Horse Taming.

Anything a horse can touch with his nose without being harmed, he does not fear. Therefore, the hand, the halter, girt, blanket, saddle, harness, umbrella, buffalo robe, or whatever is brought in proximity to him should be introduced to and touched by that delicate organ. A knowledge of such important facts as we learned by attending a course of lectures, is the main secret of Rarey's success in horse taming.—*Mass. Plowman.*

The Ocean a source of Electricity

An important experiment has been made by M. Duchemin, of Paris, during a holiday at the seaside. He made a small cork buoy, and fixed to it a disk of charcoal containing a small plate of zinc. He then threw the buoy, into the sea, and connected it with copper wires to an electric alarum on the shore. The alarum instantly began to ring, and has gone on ringing ever since, and it is added that sparks may be drawn between the two ends of the wires. Thus the ocean seems to be a powerful and inexhaustible source of electricity, and the small experiment M. Duchemin may lead to most important results.

Bleaching.

Perhaps there is more prejudice than taste in the preference of pure white to a tint such as that of unbleached cotton, or linen that has been prepared by a process that does not darken it. During the siege of Granada, Queen Isabella, to insure the success of an assault, vowed that she would not change her linen until the city should be taken. The assault failed, and many weeks elapsed before the queen changed her linen. All her ladies, of course, followed suit, and before the city was taken the linen had acquired a warm *Titianesque* tone that was greatly admired by the cavaliers; and continued to be admired and imitated long after the incident that gave it a chance to be appreciated. We have been told that ladies tint their lace with coffee, to give it an agreeable tone. Others put blue into their starch to neutralize the warm tone of cottons that have been long shut up, and, perhaps not properly cleansed from soap. Altogether the evidence by no means proves that pure white is the best foil for flesh of any and every hue, from the sickliest shade-grown young or old lady, down to the healthy brunette who delights in sunshine. And artists incline to warmer hues—whether because Titian and Reynolds were so inclined, or because they are really more beautiful, is a question that may as well be considered before we rot more cloth by bleaching.

From some observation and inquiry, we believe that bleaching takes half the durability out of cotton and linen; and we believe that it is more a matter of fashion and prejudice than of good taste.—*American Artisan.*

Sunken Lake in Oregon.

The Jacksonville (Oregon) *Sentinel* describes a remarkable curiosity, known as the "Great Sunken Lake," and situated in the Cascade mountains, about seventy-five miles northeast from Jacksonville. The lake rivals the famous valley of "Sinbad the Sailor." It is thought to average 2,000 feet down to the water all round. The walls are almost perpendicular, running down into the water and leaving no beach. The depth of the water is unknown, and its surface is smooth and unruffled, as it lies so far below the surface of the mountain that the currents of the air do not affect it. Its length is estimated at twelve miles, and its width at ten. There is an island in its centre, having trees upon it. No living man has ever been able, nor probably ever will be, to reach the water's edge. It lies silent, still, and mysterious in the bosom of the "everlasting hills," like a huge well scooped out by the hands of the giant genii of the mountains, in the unknown ages gone by, and around it the primeval forests watch and ward are keeping. The visiting party fired a rifle several times into the water at an angle of forty-five degrees, and were able to note several seconds of time from the report of the gun until the ball struck the water. Such seems incredible, but is vouched for by some of the most reliable citizens. This lake is certainly a most remarkable curiosity.