

**Diamond Glass Cutting.**

In a recent patent trial concerning the revolving wheel glass cutter, Judge Shipman described the form and action of the diamond in cutting glass as follows:

While almost any diamond will scratch or tear the surface of glass, it is a fact that the value and efficiency of a diamond to be used for the cutting or severing of glass depends not merely on the hardness, but upon the form, of the cutting surface. Other gems than the diamond will successfully cut glass, provided they can be shaped into forms similar to those of the diamonds used for this purpose. Dr. Wollaston, in the "Philosophical Transactions" for 1816, thus explains the peculiarities required for the glazier's diamond: "In the natural diamond there is this peculiarity, in those modifications of the crystals that are chosen for this purpose, that the surfaces are, in general, all curved, and, consequently, the meeting of any two of them presents a curvilinear edge. If the diamond is so placed that the line of the intended cut is a tangent to this edge, near to its extremity, and if the two surfaces of the diamond laterally adjacent be equally inclined to the surface of the glass, then the conditions necessary for effecting a cut are complied with. The curvature is not considerable, and, consequently, the limits of inclination are very confined. If the handle be too much or too little elevated, the one extremity of the curve will be made to bear irregularly upon the glass, and will plow a ragged groove, by pressure of point. But, on the contrary, when the contact is duly formed, a simple fissure is effected, as if by lateral pressure of the adjacent surfaces of the diamond, diverted equally to each side. The effects of inequality in the lateral inclination of the faces of the diamond to the surface of the glass are different according to the degree of inequality. If the difference be very small, the cut may still be clean, but, as the fissure is then not at right angles to the surface, the subsequent fracture is found inclined accordingly. When an attempt is made to cut with an inclination that deviates still more from the perpendicular, the glass is found superficially flawed out on that side to which the greater pressure was diverted, and the cut completely fails."

**The Electrical Condition of Air in the Arctic Region.**

M. Vikjander, during one of the recent Swedish expeditions to the arctic regions, made extended investigations into the electrical condition of the air there existing. All of his observations agree in showing that the atmosphere conducts electricity at temperatures relatively high, a circumstance to which may be attributed the absence of thunder and the presence of the aurora borealis. It has been suggested that this is due to the great humidity of the air in such regions; but it is evident that the phenomenon must be ascribed to other causes, since the same temperature and the same degree of humidity do not produce a like effect in lower latitudes. At less temperatures,  $-4^{\circ}$  and  $-13^{\circ}$  Fah., and below, the air isolates better.

Generally the arctic atmosphere appears to be positively electrified, and the earth negatively. In several instances, the air was effectively electric of itself, and this not due to terrestrial induction. During certain periods of the spring, at a time when the air isolated relatively well, both ground and air were charged with negative electricity. This change of electrical state of the atmosphere was not a constant consequence of greater cold; but when the temperature had been lowered for some time, the air had an evident tendency toward a negative condition.

There seems to be a natural connection between these facts and the aurora. During the months of January and February, the latter phenomenon appeared daily, and was especially noticeable on the 19th and 26th days of the latter month. It then disappeared, to reappear, however, on the 2d of March.

At the same time, changes in the electricity of the air were observed, suggesting the theory that the negative electricity, deprived of the possibility of discharging itself into the aurora, was obliged to accumulate in the lower atmospheric strata, which isolated relatively well. From the 2d to the 11th of March, the aurora returned; and during this period the air was in a good conducting condition, or else, when effecting isolation, was positively charged. Subsequent to the latter date, the auroras ceased entirely, and an interval supervened, of low temperature with negatively electrified air, which lasted until the increasing light of the season of the year precluded further auroral observations.

**The Royal Albert Bridge.**

The Provincial Parliament some time since passed an act for the construction of a bridge over the St. Lawrence river at Montreal. Up to the present time the surveys have been completed, and the future plan is in process of elaboration. The length of the bridge proper over the river will be 7,300 feet, and of the viaducts in the city 5,000 feet, making the total length of the structure 12,300 feet. The main span, of 600 feet in length and 160 feet above water, will extend over the navigable channel. On each side of this principal span there will be one of about 350 feet, and the remaining spans will average some 300 feet, or such other dimensions as may be established when the cost of stone piers with iron superstructure is fully considered. The piers will be very heavy, and those in the water will be built after the manner of the similar portions of the Victoria Bridge.

The style of iron superstructure will be open lattice work. The rail level will be on the lower chords. Twenty feet above, a floor will support the ordinary carriage traffic; a second floor, twelve feet above the first, will give facilities for city car traffic, several lines of rails being placed and the train drawn by dummy engines; the top of the bridge (to be

floored over, and with strong ornamental iron railings for safety) will furnish all the required facilities for pedestrians. For the convenience of the latter, hydraulic or steam elevators are to be arranged at different streets where the bridge extends over the city, so as to enable passengers readily to reach the footway.

Generally speaking, it is thought the bridge will cost very considerably less than the Victoria, and be built in one half the time, the surveys having revealed much more favorable engineering conditions of line than had been anticipated.

**Wood Ashes as a Fertilizer.**

How can I best utilize that big heap of ashes out by the wood pile? This is a question which we have no doubt that hundreds of the some odd thousands of farmers who read this paper have suggested to themselves, now that the milder weather renders drafts on the wood pile less frequent. In nine cases out of ten, we wager that the speaker's excellent spouse immediately remarks that she is about to sell them to the soap maker; and the money? well, that is her perquisite, and it would be very ungentlemanly on our part to venture a suspicion as to its outlay. Still, we dislike to see these ashes go to the soap boiler, and perhaps a word as to their value to our farmer friend may cause him to think as we do; so with a word of apology to both madame and the soap man for our unwarrantable interference with their little traffic, we venture to suggest that those ashes are very much more valuable as fertilizer than for lye.

We suppose that every agriculturist now-a-days has some general idea of the principle of restitution; that is to say, the elements necessary to the growth of vegetables must be replaced; and if they are not, the crop either fails utterly, or at best is deficient in health and growth. The amount of these elements, phosphorus, lime, potash, and several others, to be replaced varies according to the vegetables cultivated. Thus a potato crop from seven and a half acres of land takes away the seed constituents of four wheat crops, besides about 600 pounds of potash. The average turnip produce of the same area removes the seed constituents of four wheat crops and about 1,000 pounds of potash. Similarly also grapes, clover, peas, beans, lucerne, and nearly all leguminous vegetables remove potash in immense quantities. It is evident that in such cases potash is the material which the land most requires to produce a new crop. To buy potash and add it to the soil would be expensive; true, it may be procured in combination with other substances in various fertilizers, but there is a much simpler source for it, and that source is the ash heap, which otherwise the soap man purchases.

Professor Storer, whose recent paper on the fertilizing properties of wood ashes we find in the *Bulletin* of the Bussey Institution, gives the latest information on the value of this most useful material. He says that the analysis of thirteen samples of house ashes shows a range of from 6 to 10.8 per cent of potash, and from 0.4 to 4.6 per cent of phosphoric acid. The lowest percentages of potash, 6 to 6.5, were from ashes of a mixture of maple, oak, and white pine wood, collected by a soap boiler in a country village. The highest percentages, 10 to 10.8, were in ashes of mixed beech, birch, and maple in one case, and in those of pitch pine in the other. Eight of the samples ranged, as to potash, from 7.4 to 9.5, the average of them, as well as that of all the thirteen samples, being about 8.4 per cent. This, it must be borne in mind, is the proportion of the chemist's potash or oxide of potassium, and corresponds to about 10.4 per cent of the potash of commerce, which is an impure carbonate and hydrate of potassium. The average of phosphoric acid in dry commercial wood ashes, whether unleached or leached, is about two per cent, a much less quantity than would be inferred from the composition of the "pure ash" of many woods.

This phosphoric acid is also a valuable fertilizing material in the majority of soils. The balance of the elements contained in the ash, namely, silica, alumina, iron and manganese oxide, lime, soda, etc., are of no or little account, so that, on what the potash, first, and the phosphoric acid, second, contained, mainly depends the value of wood ashes as a fertilizer. The material is besides a useful dressing for the ground about orchard trees, as it not only improves the soil, but prevents in considerable degree the inroads of insects in the roots and bark.

It only remains for us to show that there is not merely a loss to the land effected, but that a direct expenditure of money is the result of using ashes in a manner otherwise than we have pointed out. In order to thrive, the farmer must keep his land in producing condition, and, as we have already remarked, to soils which require potash, potash must be returned. Potash is worth about six cents a pound, and phosphoric acid is sold in the New York markets for about 12.5 cents for the same quantity. A barrel of wood ashes is bought by the soap maker for say twenty-two cents, and it weighs 125 pounds. These ashes contain on an average, as we have already shown, 8 per cent, or 10 pounds, of potash, and besides include two per cent, or two and a half pounds, of phosphoric acid. According to the above prices, the total value of these substances is 91 cents, and therefore a barrel of ashes is intrinsically worth as a fertilizer nearly five times the amount for which it can be sold to the soap manufacturer.

"Ashes," says the *Rural New Yorker*, "contain essential components of all crops. They should not be mixed with compost (there is no gain in so mixing them) but applied broadcast directly to the soil, whether it is grass or arable land. We never knew a farmer who could get more ashes than it was profitable to apply to his land. One hundred

bushels per acre is not too much to apply to old cultivated lands. Especially are ashes excellent for orchards. They should not be heaped right about the bodies of the trees, but spread over the roots, which extend as far from the bodies of the trees as the branches do. Ashes are especially valuable as top dressing on old grass lands, or on lands cropped with grain. For root crops they are equally important; indeed, as we say above, there is no crop grown and no land cultivated that is not benefited in a greater or less degree by the application of leached or unleached ashes, the latter being the more valuable."

Most farmers still sell wood in the cities and villages; and rather than go home empty, they should carry back ashes and other fertilizers to replace the potash, lime, and phosphoric acid that have been carried off in the crops and animals sold. Ashes show immediate effect from their application, and at the same time last long in the soil.

**DECISIONS OF THE COURTS.****United States Circuit Court.—District of Massachusetts.**

PATENT BRUSH—THOMAS E. MURPHY *et al.* vs. LAURENT KISSLING *et al.*  
[In Equity.—Before SHEPLEY, J.—October, 1874.]

This was a suit under letters patent for an improved brush, granted to Francis McLaughlin, January 11, 1870, being the same patent that was involved in the suit of *Murphy et al. vs. Eastham et al.* The object of the McLaughlin invention was to obviate the danger of breaking glass and injuring the surface of wood or other substances to be washed or dusted by contact with the brush head. To this end the patentee proposed to form a groove in the brush head or stock near the bristles, and in this groove to insert a rubber band, one edge or angle of which should project outward and prevent injurious contact between the brush head and the surface to be cleaned. The novelty of the invention and the scope of the patent were fully discussed in the case above referred to.

Decree for injunction and account as prayed for in the bill.  
J. L. Newton, for complainants.  
J. T. Wilson, for defendants.

**NEW BOOKS AND PUBLICATIONS.**

WOODEN AND BRICK BUILDINGS, WITH DETAILS, containing One Hundred and Sixty Plates of Plans, Elevations, etc., with Descriptive Letter Press. Two Volumes, Large Quarto. Price \$18. New York city: A. J. Bicknell & Co.

We know of no recent publication which will prove of so much utility to architects and builders as that the title of which is above written. The first volume, just issued and now before us, contains fifty-four designs, carefully drawn and evidently reproduced in facsimile from the handwork of some of the foremost architects in the country. These are accompanied with forms of specifications, descriptions of details, and other explanatory matter calculated to be of direct practical use to the profession. To architects residing in country and suburban towns, we can especially commend the work, as it abounds in designs for rural dwellings, all of which are handsome, and some artistically elegant. Mr. A. J. Bicknell, publisher of the *American Builder*, under whose supervision the book has been compiled, deserves great praise for the admirable and painstaking care exhibited in its pages. Both to him and to the publishing house of which he is the head, the public has long been indebted for the production of architectural works, the effect of which must be gradually to substitute, for the normally uncouth edifices of American towns, structures which combine the principles of scientific building with exteriors denoting taste and artistic skill.

THE PRIVATE LIFE OF A KING. Compiled by John Banvard, Artist. 670 pages. Price \$2.25. New York city: The Literary and Art Publishing Company, 806 Broadway.

This book is alleged to contain a truthful memoir of the Prince of Wales afterwards George IV., of England.

**NEW YORK STATE RAILROAD REPORT.**

We are indebted to Hiram Calkins, Esq., Clerk of Assembly, for a copy of the State Engineer's Report for 1873. We also acknowledge the receipt, from same source, of a copy of the "Clerk's Manual" for 1875.

**Recent American and Foreign Patents.****Improved Trellis.**

Timothy L. Buell, Marietta, Ohio.—This is a trellis made of wire bands or rings and stakes and posts, the rings being attached to the stakes and posts, so that the trellis may be folded up when not in use.

**Improved Water Closet Valve.**

Edwin O. Brinckerhoff, New York city.—The weight of the person using this water closet forces down rods and valves, compressing springs and bringing the openings of the valves opposite the open ends of the pipe, so that the water may flow freely, and may continue to flow as long as the weight of the person rests upon the seat. As the weight of the person is removed, the elasticity of the springs raises the rod and the valve, stopping the flow of the water.

**Improved Saw-Burring Tool.**

Franklin J. Martin, Williamsport, Pa.—Two angle plates, about the length of four or five saw teeth, are bolted together adjustably, so that a channel is obtained between the plates for the reception of the edge of the saw between them. The channel being widened or narrowed, according to the gage of the saw to be burred, by shifting one of the plates on the other, this tool is placed on the edge of the saw, with the bottom wall of the channel against the points of the teeth, after the saw has been filed. The operator then gently taps it with a hammer, and thereby burrs the points of the teeth a little, flattening them slightly on the points, and making them of uniform width and length. By this burring of the teeth the saw is prevented from dodging out of its course, and it makes the lumber much smoother than the teeth are capable of as ordinarily dressed.

**Improved Safe.**

George Damen, Brooklyn, N. Y.—This invention consists of a safe having a series of pigeon holes or recesses arranged equidistant from a center spindle, which carries a revolving face plate with apertures fitting the pigeon holes, so as to open one of them at the time while closing the others, and locking them all by means of suitable spring bolts entering rear holes of the face disk in moving the disk forward.

**Improved Car Axle Box.**

Benjamin K. Verbruyck and Thomas Newberry, Chicago, Ill.—The object of this invention is to improve the axle boxes of railway cars in such a manner that the covers or lids are locked or fastened in an absolutely secure manner without the use of set screws, springs, or other devices. The lid is hinged to one side of the axle box, and provided at the other side with a groove and cam, into which a pivoted latch piece with eccentric cam is swung, thus locking rigidly the cover.

**Improved Attachment for Injector.**

David Lees, of Birmingham, assignor to himself and S. C. Stewart, of Tyrone Forges, Pa.—Between the valve and nozzle of the injector is a lateral tube, in which is placed a valve held inwardly and away from its seat by a spring, until the pressure of steam is sufficient to close it. Until this occurs, the water of condensation is afforded an outlet, and thereby the starting of the injector greatly facilitated.