The Desjardins Bridge Catastrophe.

The failure of a timber bridge employed to carry the Great Western Railroad over the Desjardins Canal at Hamilton, in Canada West, on the 12th of March last, and the consequent precipitation of the locomotive *Oxford* and a part of a passenger train through the flooring, to the depth of sixty feet, with a loss of many lives, is a fact more or less familiar to all our readers. Three civil engineers were examined at considerable length before the Coroner's jury, to determine the construction and the degree of safety of the bridge. The construction was a timber truss, built by Mr. Whipple, of Albany. The bridge was three years old, and had been well protected by paint. The material broken was pine timber, the fracture commencing, so far as we learn from the evidence, in the needles or cross-timbers of the flooring, but subsequently extending to the side trusses. The span of this bridge was seventy-one feet eight inches.

Every bridge, as well as every other construction, requires to possess a surplus of strength. According to the testimony of Anthony Sherwood—an engineer on the Buffalo and Lake Huron Railway, who had been employed three years on the London and South-Western, in England, and for some time on other railroads in Great Britain and Spain, part of the time as chief engineer—the structure, taken as a whole, possessed a maximum strength of 429 tuns; while the greatest weight that could be applied by the heaviest train that could be loaded upon it was 98 tuns. By the maximum strength of the bridge is meant the strain under which the chances would be equal, whether it would break or resist, and the 429 tuns are assumed to be equally distributed over the whole length.

Andrew Talcott, chief engineer and superintendent of the Ohio and Mississippi Railroad, and previously employed as chief engineer on several other American roads, estimates that if equally distributed, the bridge would bear 272 tuns, or would bear 136 tuns put on the center; while the greatest load that could be put on it, by coupling two of the company's heaviest engines, could not exceed seventy-two tuns.

Mr. Whipple, the designer of the bridge, who has devoted his whole attention to bridge-building for fifteen years, calculates that 570 nett tuns, equally distributed, would not even endanger the safety of the construction, unless the material be supposed considerably inferior to the average quality of its kind. Having made this *calculation*, however, he does not *think* that the bridge would sustain that weight. His opinion is that the bridge would sustain a weight of between 400 and 500 tuns. He also considers that the greatest weight that could be on the bridge at any time is about 72 tuns.

We give these figures because they contain very important facts with regard to the surplus of strength in bridges, and also to show how in estimating the strength of constructions, as in everything else, the most learned doctors disagree, though not, in this case, so seriously as in many others. Sherwood, of English and Spanish experience, says the superabundant strength required in England is but two and a half to one—that is if a bridge was ever to bear fifty tuns in any emergency, it must be able to bear one hundred and twenty-five tuns; and engineers grumble even at this, and say it is far too much. There was a great deal of discussion concerning a bridge in England which would bear, by calculation, only two and one-fourth times what it was actually required to bear.

According to most of the witnesses, the superabundant strength of the Desjardins bridge was fully four or five to one. The train was of very ordinary weight, and was moving slowly—at a rate of less than seven miles per hour; and although one of the Brunels (the great English engineers) has affirmed that he would rather go over a dangerous bridge at eighty miles an hour than at ten, common consent seems to indicate a superior safety in traveling slowly; and if the theory adopted in explanation of this accident be correct, it is preeminently so.

The floor of the bridge was not planked over, and the cross-timbers and rails are found scratched a trifle by the train before reaching the point ruptured. An axle of the locomotive truck was found broken, and the theory is, that this axle broke before the breaking of the bridge, and was the original and sole cause of the accident. Occurring while the engine was crossing the bridge, or before it entered on it, the wheels became displaced, the truck turned on its pivot, and threw the locomotive off the track, so that it fell with an immensely accumulated force against the naked timbers, and cut them off like a cannon ball, ripping a hole which the other cars successively enlarged as they were precipitated through. Axles, unfortunately, are liable to break at any moment; and the rather startling conclusion arrived at by the scientific witnesses is, that no timber bridge would stand the impact of a locomotive leaping off the track upon it. The impact of the *Oxford*—by no means an extraordinarily heavy engine—in striking the timbers with a perpendicular descent of one foot, and a forward motion of seven miles per hour, or ten feet per second, was estimated by Mr. Sherwood as equal to a dead weight of 324 tuns applied at that one point, while the maximum strength of the floor beams or needles was only 21 1-2 tuns each. This calculation, coupled with the above, presented facts relating to the surplus of strength in the bridge, taken as a whole, seems to indicate a hopelessness of attempting to make a floor sufficiently strong to resist such contingencies. But the bridge in question was of a very rare construction, the only similar one being employed to cross the Welland Canal near Thorold, and it is quite possible that the floor timbers were very weak in proportion to the strength of the trusses, especially in their resistance to a lateral force, such as that produced by the forward motion of the engine. Had the floor timbers been something stronger, and the bridge planked over, it is probable the accident would not have occurred—at least, not in the same manner; but the engine might, in that case, have run off through the lattice-work of the side, and still have dragged the cars with it, or broken down the structure, by so much diminishing its strength, although there would be a strong chance of uncoupling. It would seem highly desirable, on this account, to strongly plank over the floors of all timber bridges. Every consideration should induce the construction of a strong railing at the sides of all high bridges, with a hope that such might effectually check the side motion of such car or locomotive as might be thrown off the rails at those dangerous points.

The Secret of Success in Tempering Tools.

A correspondent, D. I. Wells, of Bolivar, Tenn., writes us a few words respecting tempering steel tools. He says:—"I read the communications in No. 27 Scientific American, from three different persons on tempering mill picks, neither of whom gave the true method as I understand it, although one comes very near to it. The main thing in tempering is striking the right heat. From long experience, I have found that the lowest tempering heat at which steel will harden when taken out of the fire and dipt into water is the best. A little experience with any piece of steel will show this to be so, and different kinds require different degrees of heat. It is a mistake to suppose, that by raising the temperature of steel for tempering very high that it will become harder, and of a better temper. Steel is rendered more brittle by a high heat, but no harder. As to the chilling medium, I know of nothing better than clear cold water."

These views of our correspondent agree with those of one of the most skillful and experienced English steel makers—one who stood in the very first rank in Sheffield, and who is now known here as one of the best judges of steel in our country. He told us, in conversation, that every kind of steel required a different degree of heat in tempering, but the lowest heat possible was the best, and the very finest steels required the lowest.

A telegraph wire insulated with spun glass cord has recently been shown to us as being well adapted for marine cables. Glass is superior as a telegraph non-conductor to gutta percha.

Notes on Science and Foreign Inventions.

Wheelbarrows—Numerous canals have been dug in various parts of the world, and thousands of miles of railroad have been constructed; in their excavations and embankments tens of thousands of sturdy *navies* have sweat and toiled from morn to eve in wheeling their barrows, and yet, it seems, none of them ever thought of improving this ancient "man-cart." Was it owing to the odiousness of *caste* attached to it that it seemed beneath the notice of our Yankee utilitarians? Five or six years ago, when an emigrant made the overland journey from Missouri to California, hurling his baggage on a wheelbarrow, this implement was raised to a very dignified position, and yet no improvement in its construction was the result. Even the sweat expended last autumn by the gallant Major Ben. Perley Poore wheeling a barrel of apples sixteen miles into Boston, in payment of a bet on the last election, resulted in no change in the appearance, dignity, or uses of this peculiarly democratic means of transportation.

Antoine Andraud, of Paris, with a mind alive to the very general use of the wheelbarrow, and noticing its defects, has secured a patent for improving it. Instead of using one wheel, he employs two in his improved barrows. The nave or hub is formed to receive two wheels, each placed in such a position as to suit the object or work for which the barrow is to be employed. When it is not intended to dump its load, the wheels are situated wider apart; this gives greater stability to the barrow, preventing it from being easily tipped over. Barrows required in cities for wheeling books, &c., should all be constructed on this excellent principle. When the barrow is designed to be upset with its load, the wheels are set near together, and the body of the vehicle built over them, so as to diminish the weight of the load on the arms of the person who moves it. The body of the barrow and the position of the wheels underneath may thus be so arranged as to be favorably balanced, whereby a much heavier load may be moved with greater ease than with a common barrow.

Treating Oils and Fats.—George Hutchinson, of Glasgow, Scotland, has obtained a patent for treating the above materials with acids and alcohol. The fats or oils are placed in a wooden or earthenware vessel, and sulphuric acid poured among them very cautiously, and well stirred, so as to avoid carbonizing the oil or fat. They are then allowed to stand for about two days, when new products are formed; these are sulpho-oleic, sulpho-margaric, and sulpho-glyceric acids.

These acids are all soluble in alcohol, a suitable quantity of which is now added, and sulpho-glyceric acid subsides. More alcohol is now added, when the two remaining fatty acids undergo decomposition combinations of meta-olic and meta-margaric acids, with some free alcohol present. The fats must be melted prior to being treated as described. The process is for a purifying of the oils and fats to remove the glycerine and thus to produce stock for superior hard candles.

Water of the Putrid Sea.—At a recent meeting of the London Geographical Society, in a paper by Captain Osborn, R. N., on the geography of the Sea of Azoff, he said that the Putrid Sea presented a remarkable contrast to the Sea of Azoff. Its waters are clear and blue, and so extremely salt as to irritate the skin. The offensive smell of the Putrid Sea he attributes to springs of naphtha, occasioned by volcanic action, of which there were several indications. Though that sea has obtained from its smell the name of "Putrid," residence on the coast is not unhealthy, and an analysis of its water does not show it to possess any noxious properties.

Hardening and Coloring Soft Stone for Buildings.—L. Jacquemier, of London, has taken out a patent for rendering common gypsum rock (which will not stand exposure to the weather) hard, and for coloring it, to fit it for building and other purposes, so as to withstand exposure to the weather. The improvement is thus described in the London *Engineer*:—

"The object of this invention is to change the character of alabaster and of gypsous rocks, and to render them like marble. Gypsous rocks prepared in the manner hereafter described are no longer susceptible of being easily broken or injured by hard bodies, and they are not liable to absorb dust or other matter which would discolor them; on the contrary, various tints can now be given to them, and they will take a polish like marble, resemble marble, and may be used for all purposes of decoration and objects of fancy.—The invention consists in exposing alabaster and other kinds of gypsum and calcareous stones and earths, to a heat of about 212° Fah., in order to expel and drive off therefrom the watery particles contained in it. The time during which the gypsum must be exposed will vary with the nature of the material, but experience will soon dictate the precise time to the operator. When sufficiently dried, or when the aqueous particles have been driven off, the gypsum is plunged several times in succession in clear water at the temperature of the atmosphere, or in any other suitable hardening liquid, or substance, or composition, reduced to a liquid state, and when the operator finds, by experience, that the plunging has been continued for a sufficient length of time, the gypsum is withdrawn, and exposed to the atmosphere to complete the hardening process, which requires from five to thirty days, more or less, after which the gypsum is in a fit state to be polished and treated, in all respects, in a manner similar to marble, which it will be found very much to resemble. In fact, by operating upon gypsum in the manner described, an artificial marble is produced. In order to color the gypsum, any suitable coloring material may be mixed with the water in which it is plunged after the drying process, but the colors most preferred are those produced from minerals reduced to a state of solution, some of which (as, for example, sulphates of iron and copper) not only impart color to the material, but also harden it additionally. The method of hardening and coloring hereinbefore described with reference to gypsum may also be applied to all calcareous stones and earths."

Gypsum is a composition of lime and sulphuric acid, and is abundant in various parts of the United States, being known by different names, on account of its peculiar appearances, these being nearly as varied as those of marble.

Near Lockport, N. Y., beautiful *selenite* and snowy gypsum are found in limestone. Alabaster occurs in the Mammoth Cave of Kentucky, resembling flowers, leaves, shrubbery, and vines. Massive gypsum is found in abundance in New York, from Syracuse west, accompanying the rocks which afford the salt brine; also in Ohio, Illinois, Virginia, Tennessee, and Arkansas.

Nova Scotia gypsum is ground up in mills and employed principally for sowing on clover fields and pasture lands. Plaster of Paris is gypsum, calcined and ground up into powder. As this rock is very abundant, and of little worth, if the process of M. Jacquemier really renders it as hard and durable as common *freestone*, the invention is a valuable one, for gypsum can easily be carved and cut into any form.

Peruvian Bark.

Quinine is a household word in every South American Indian family. The natives of Peru are accustomed to look on fever as one of the common incidents of life, and it is their specific for such diseases. The supply of quinine is decreasing, while the demand for it is always increasing. It is now used in medicine, not only as a remedy for actual fevers, but as a prophylactic.

Camlet.

There are several varieties of such fabrics, and although they are common it is not so generally known of what materials they are composed. Some are made of goats' hair; in others the warp is of hair, and the woof half hair and half silk; others, again, are entirely of wool, and in some the warp is of wool and the woof of thread. There are striped, watered, and figured camlets.

A cotemporary states that owing to the present high price of leather, the Philadelphia boot and shoe manufacturers have determined to make an advance in the price of boots and shoes of twenty per cent. on the cost of the work.