Glass Railway Sleepers.

A new and somewhat singular material for railway and tramway sleepers has lately been introduced into England, this material being glass toughened by a process discovered by Mr. Frederick Siemens, of Dresden. Owing to Mr. Siemens' patents for the most recent improvements in his process not yet being completely secured, we must postpone for the present any details of the toughening process itself, but we may state that its effect appears to be to secure a product differing essentially from glass toughened by the well known process of M. De la Bastie, inasmuch as when broken it does not fly to pieces like glass treated by the last mentioned process, but merely fractures somewhat like cast iron.

The material used by Mr. Siemens for his sleepers is glass of the commonest kind moulded to any desired form. The sleepers are being introduced into this country by Mr. Hamilton Lindsay Bucknall, who has lately laid some of them on the line of the North Metropolitan Tramways at High street, Stratford. The sleepers in this case are of exactly the same section as the wooden longitudinal sleepers they have replaced, namely rectangular, 4 inches wide by 6 inches deep, the upper side being moulded so as to accurately fit the rails. They are laid in lengths of 3 feet, and to avoid the danger of settlement at the joints, bearing plates, 10 inches by 5 inches by 1⅛ inch, are placed at these points, these plates being also utilized for effecting the securing of the rails by a fastening which obviates the necessity of moulding any hole in the glass. We may add that samples of the sleepers above mentioned have been tested by Mr. Kircaldy, and their average breaking weight when resting on supports 30 inches apart has been found to be about five tons, this being probably about two thirds of the resistance which would be afforded by a good pine sleeper of similar dimensions. It must, however, be borne in mind that, whereas the timber would become depreciated by use, the glass promises to be practically indestructible by moisture, etc.

At the works of Mr. William Henderson, a plate of Mr. Siemens' toughened glass, 9 inches square by 1⅛ inch thick, embedded in gravel ballast 9 inches deep, and having on its top a wood packing ⅛ inch thick, and a piece of rail, was subjected to the action of a falling weight, the blows being delivered on the rail. The weight was 9 cwt., and blows were successively delivered by letting this weight fall from heights of 3 feet, 5 feet 6 inches, 7 feet, 10 feet, 12 feet 6 inches, 15 feet, 17 feet 6 inches, and 20 feet. Under the last mentioned blow the rail broke, the glass, however, being uninjured. As a higher fall could not be obtained, and a greater weight was not available, a smaller section of rail was substituted for that previously employed, and the glass was broken by a second blow of the 9 cwt. falling 20 feet, the plate being driven through the ballast into the hard ground. A cast iron plate, 9 inches square and ½ inch thick, tested in a similar way, broke with a blow from the 9 cwt. weight dropped 10 feet.

The cost of the toughened glass is stated to be about the same per ton as that of cast iron, but as its specific gravity is only about one third that of iron, the cost of any article of given dimensions is of course materially less. The material has as yet been too recently introduced, and too little is known of its characteristics, to enable any very decided opinion to be formed as to its future capabilities; but the results of the experiments so far made with the material are certainly of an exceedingly promising character, and the further development of its application will be watched with much interest.—*Engineering.*

Refrigerated Storehouses.

A large six story building, belonging to the Massachusetts Chemical Refrigerating Company, located on North street, Boston, has been fitted up with machinery for generating and distributing cold air, and compartments for the storage of provisions. Ammonia is employed as a chemical agent to produce cold air, the same as is used in the ice-making machines of the South. After the storehouse has been rendered as nearly as possible impervious to outside atmospheric changes, the heat and gases are drawn off from the interior by a powerful exhaust fan, condensed, purified, and returned to do the work of refrigeration. By this continuous process the air is undergoing constant renovation, and is pure, cold, and dry to an extent not attained by other methods of refrigeration. The building referred to contains 94,000 cubic feet, of which 80,000 feet are now occupied by no less than 10,000 packages of butter, 300 barrels of beef, 650 cases of pork, 3,500 dozen eggs, 7,800 lb. evaporated apples, and about two tons of cheese, the property of different produce and commission houses. Similar refrigerators may be soon erected at several mercantile centers, and a line of steamers be fitted up to connect with trains of cars which shall all be similarly furnished.—*American Manufacturer and Exporter.*

Moral and Mental Effects Produced by Foods.

Dr. Bock, of Leipsic, writes on the effect of food and drink:

"Beer is brutalizing, wine impassions, whisky infuriates, but eventually unmans. Alcoholic drinks, combined with a flesh and fat diet, totally subjugate the moral man, unless their influence be counteracted by violent exercise. But with sedentary habits they produce those unhappy flesh sponges which may be studied in metropolitan bachelor halls, but better yet in wealthy convents. The soul that may still linger in a fat Austrian abbot is functional to his body only as salt is to pork—in preventing imminent putrefaction."

FIRE SCREEN.

The accompanying illustration represents a charming piece of work designed and executed under the auspices of the Royal School of Art Needlework, in London. The

FIRE SCREEN—ROYAL SCHOOL OF ART NEEDLEWORK.

design was doubtless made by one of the artists employed by that institution, after which it was embroidered upon the cloth and mounted as we see it here. A fourth panel, concealed from view in the illustration, but similar in character to the one on the right, completes the harmony of the design, which is in every way admirable.

Terrestrial Magnetism and Electricity.

Professors Ayrton and Perry, of the College of Engineering, Tokio, Japan, communicate to the *Philosophical Magazine* a short note, proposing the hypothesis that the phenomena of earth currents, terrestrial magnetism, and atmospheric electricity are due to the fact that the earth is an electrified condenser, whose capacity or potential is continually changing on account of its rotation and its annual orbital motion, the successive cooling and warming of the air, the formation of clouds and rain, etc., etc. These changes produce electric currents tending always to restore the equilibrium, whence follow the phenomena in question. They suggest that observations of atmospheric electricity may be used to predict atmospheric changes.

William Leroy Broun describes, in *Nature*, a new lecture experiment, to show the action of terrestrial magnetism. A rectangular frame of light wood, carrying twenty coils of insulated wire, was suspended in a horizontal position from the pans of a balance, so that the long sides of the rectangle were at right angles to the beam; and mercury connections were arranged at the middle of the short sides, so that a current could be sent through the wire. This apparatus being placed with the long sides of the rectangle perpendicular to the magnetic meridian, when the battery current passed from east to west on the northern side, and from west to east on the southern side, the north side would be attracted, and the south side repelled by the earth currents, both influences combining to deflect the beam of the balance. On reversing the current the deflection was in the opposite direction.

The Simplon Tunnel.

Our French neighbors, recognizing the vast importance of the proposed Simplon tunnel to their commerce, have, during the last few months, been in negotiation with the Swiss Government, and a treaty similar to the one which was concluded in 1871 between Germany, Switzerland, and Italy concerning the St. Gothard tunnel, will shortly be signed, by which permission will be granted to the French Government to subsidize the Simplon Railway Company to the amount of some 48,000,000 francs. M. Léon Say, the French Minister of Finance, arrived at Vevay on August 16 to make a personal inspection of the site of the tunnel and of the works which have already been carried out, in order that he may possess full *connaissance de cause* in recommending his government to grant the subsidy in question. The works alluded to consist of a line of railway lately completed and opened to traffic, which extends from Lausanne up the Rhone Valley to Brigue, at the foot of the Simplon—the very spot where it is proposed to pierce the tunnel.

On the other side of the mountain the Italian Government is engaged in constructing, at the cost of 28,000,000 francs, a line of railway which will unite Iselle at the southern end of the tunnel with Arona on the Lake Maggiore, the present northern terminus of the Haute Italie railways. The Simplon Railway Company are now, therefore, about to commence the tunnel, which, when terminated, will complete the straight line of railway extending from Paris to Brindisi, *via* Pontarlier, Lausanne, the Simplon, and Milan, thus obviating the immense angle described by the Mont Cenis route. It may be remembered that the proposal to subsidize the Simplon route was already submitted to the French Chambers in 1873, when it was indefinitely postponed without discussion. This want of proper consideration must be attributed to several reasons. In the first place, the resignation of M. Thiers and other political events absorbed men's minds in France at that moment; secondly, the Compagnie de la Ligne d'Italie, in whose favor the concession had originally been granted, had just failed in an exceedingly discreditable manner, and had been wound up by order of the Swiss Government. Lastly, at that time, when the prospect of completing the St. Gothard tunnel was apparently hopeless, the Simplon route not only seemed to offer no very special advantages to French commerce, but even appeared in the light of a competitor with the Corniche and Mont Cenis Railways, nor were the Paris-Lyon-Mediterranée Railway Company in favor of the undertaking. Now, however, the aspect of affairs has entirely changed. Since 1874 a new company has been intrusted with the execution of the enterprise, and has given most satisfactory proofs of its activity by the completion of the railway up to the very entrance of the proposed tunnel at Brigue. Colonel Cérésole, formerly president of the Swiss Confederation, is the leading spirit and managing director of this company, and is encouraged in his work by the earnest support of such men as Gambetta, Grévy, Léon Say, etc.

Although the tunnel will be rather longer than that of the Mont Cenis or of the St. Gothard, it will be constructed and worked under very much more favorable conditions than either of them. The entrances to the St. Gothard and Mont Cenis tunnels are both situated at a considerable altitude—the former being at 1,152 meters, and the latter at 1,560 meters above the level of the sea. Consequently, costly zigzag and corkscrew lines of access have been resorted to in order to reach the entrance of the tunnels, and owing to the very steep gradients, the power of traction required is something enormous. The Simplon tunnel, on the other hand, enters the mountain at its very base. The railway extending from Lausanne up the lower part of the Rhone Valley, is perfectly straight and without any curves, while the gradient nowhere exceeds 10 millimeters—1 in 100. At its exit on the southern side of the mountain, in the Diviera

Valley, the gradient is somewhat stronger—13 in 100. In fact, when the tunnel is completed, the highest point of the line between Paris and Milan will not be in the Simplon, but between Dijon and Lausanne. Owing to the low level of the tunnel, the line will not suffer from the frequent interruptions which the snow causes in winter on the Mont Cenis and St. Gothard routes.

Competent geologists declare that the granite and rock of the Simplon are less hard and compact, and that the infiltrations are less serious than those of the St. Gothard and the Mont Cenis. The Rhone at the Swiss, and the Diviera at the Italian extremity of the tunnel, will provide the hydraulic power necessary for the boring, while, thanks to the temperate climate of the Valais, the works will not be exposed to the risk of being deprived of their motive power during severe winters, as were those of the Mont Cenis and the St. Gothard.

The tunnel will be 18½ kilometers in length, as compared with the 15 kilometers of the St. Gothard and the 12 kilometers of the Mont Cenis tunnels; and, as it is estimated that a daily advance will be made of 9 to 10 meters in the boring, we may look for its completion in seven or even six years' time. Eighty million francs are to be devoted to the undertaking under the following items: 74,000,000 francs for the tunnel itself, estimated at the rate of 4,000,000 francs per kilometer. This estimate appears somewhat high when compared with that of the St. Gothard, which is being pierced at the rate of 2,500,000 francs per kilometer. One million francs are required for the completion of the roadway in the tunnel, and 5,000,000 francs for the construction of a great international station at Brigue, similar to that at Modane, on the Mont Cenis Railway.

Only a very small portion of this sum, namely 13,500,000 francs, consists of stock subscriptions, the balance of 66,500,000 francs being granted to the company in the form of the following subsidies: 4,500,000 francs from the Swiss Federal Government; 5,000,000 from the government of the Canton de Vaud; 1,000,000 from the government of the Canton du Valais; 3,000,000 from the governments of the Cantons de Berne, Fribourg, and Geneva; a grant of 5,000,000 from the Swiss Occidental Railway Company, which will derive great advantages from the undertaking; and, lastly, 48,000,000 francs, the subsidy about to be granted by France.—*London Times.*

Argan Oil.

Except the description given by Sir Joseph Hooker in his recent Book of Travels in North Africa (see SCIENTIFIC AMERICAN, April 12, 1879), and a brief notice of the exportation into Europe of argan oil by the Danish Counsellor of State, Georges Höst, who traveled in the kingdoms of Marocco and Fez during the years 1766–1768, the only published account of the uses of the argan is given in a very little known Danish work, published by P. K. A. Schousboe, entitled "Iagttagelser over Vœxtriget i Marokko." Forste Stycke. Kiobnhavn, 1800, 4, 7 tab., of which a German edition appeared in 1801, in 8vo, by J. A. Markussen. It gives an account of some Marocco plants; and, after an introductory sketch of the physical geography of Marocco, it contains descriptions of the plants of the country in Latin and German, with occasional observations in German. The account of the argan under Retz's name of *Elæodendron argan* is long: first comes a technical description, followed by a history of its synonymy, and then the following notes (translated for the *Gardener's Chronicle,* by Mr. Bentham):

"It is surprising that this tree should hitherto have been so little known, as it is found in a country near Europe, and visited by many travelers, who speak in their diaries and descriptions of oil of argan and of argan trees, these last as constituting a considerable proportion of the forests of the country. It is, however, not to be met with in the northern provinces, but only toward the south. All those persons from whom I have sought more accurate information on the subject are unanimous in stating that it only grows between the rivers Tansif and Sus—that is, between the 29° and 32° N. lat.—and there constitutes forests of considerable extent. It flowers in the middle of June, and the fruit remains on the tree the greater part of the year. The young fruit sets in the end of July or beginning of August, and grows slowly till the rainy season commences toward the end of September. It now enlarges rapidly and attains its full size during that season, so as that by the middle or end of March it is ripe enough to be gathered for economical uses. Both the fruit and the wood are serviceable, but especially the former; for from the kernel an oil is extracted which is much employed for domestic purposes by the Moors, and is an important production of the country, as it saves much olive oil, which can thus be thrown into commerce and made to bring money into the country. It is calculated that in the whole argan region 1,000 cwt. of oil is annually consumed, thus setting free an equal quantity of olive oil for exportation to Europe. Our countryman, Höst, in his 'Efterretninger om Marokos,' p. 285, says that the argan oil is exported to Europe, where it is used in manufactures. Such may have been the case in former times when it might be cheaper; but now there would be no advantage in doing so, as it costs almost as much as olive oil. At present no argan oil whatever is exported,

"As the practice in preparing this oil is somewhat different from that of common olive oil, it may be useful to enter into some details on the subject. I have myself been present during the whole operation, and consequently speak from experience:

"In the end of March the countryman goes into the wood, where the fruits are shaken down from the trees and stripped of their husks on the spot. The green, fleshy pericarp, which is good for nothing else, is greedily eaten by ruminating animals, such as camels, goats, sheep, and cows, but especially by the first two. Therefore, when the Arab goes into the wood to collect argan nuts, he gladly takes with him his herds of the above animals, that they may eat their fill of the green husks whilst he and his family are collecting and shelling the nuts. The horse, the ass, and the mule, on the contrary, do not like this food. When a sufficient quantity of nuts are collected they are brought home, the hard wooden shell is cracked between stones, and the inner white kernels are carefully extracted. These are roasted or burnt like coffee on earthen, stone, or iron plates; in order that they may not be too much done they are constantly stirred with a stick. When properly roasted they should be all over of a brown color, but not charred on the outside. The smoke which is disengaged during the process has a very agreeable odor. As soon as the kernels have cooled, they are ground in a handmill into a thick meal, not unlike that of pounded almonds, only that it is of a brown color, and the meal is put into a vessel in which the oil is separated, which is done by sprinkling the mass now and then with hot water, and keeping it constantly stirred and kneaded with the hand. This process is carried on until the mass becomes so hard that it can no longer be kneaded; the harder and firmer are the residuary coarse parts, the more completely is the oil extracted. At the last, cold water is sprinkled upon it, in order, as they say, to expel the last particles of the oil. During the operation the oil runs out at the sides, and is from time to time poured into a clean vessel. The main point to be attended to in order to extract the greatest quantity and the best quality of oil, is that it should be well kneaded, and that the proper proportion of hot water for the extraction of the oil should be used; it is always safer to be sparing of it than to be too profuse. The residuary mass, often as hard as a stone, is of a black-brown color, and has a disagreeable, bitter flavor. The oil itself, when it has settled, is clear, of a light brown color, and has a rancid smell and flavor. When it is used without other preparations in cooking, it has a stimulating and pungent taste which is long felt on the gums. The vapor which arises when anything is fried in it affects the lungs and occasions coughing. The common people use it generally without preparation, but in better houses it is the custom, in order to take off that pungency, to mix it previously with water, or to put a bit of bread into it and let it simmer before the fire. "The wood, which is hard, tough, fine-grained, and of a yellow color, is used in house carpentry and for other purposes."

American Jute.—(*Arbutilon Avicennæ.*)

In a communication to the *Ohio Farmer*, the Secretary of the New Jersey Bureau of Statistics of Labor and Industry confirms the high opinion that has been expressed with regard to the utility of the common arbutilon as a fiber plant. Hitherto this plant has been a common weed—too often a common nuisance—throughout the Middle States. For half a century or so it has had a hard fight with our farmers, whose efforts to eradicate it have been unavailing.

Having thus proved its right to grow, by inherent vitality and stubbornness, the arbutilon is now promoted from the order of weeds to the ranks of the useful plants, thus demonstrating anew Emerson's dictum that a weed is only a plant whose utility has not been found out. The Secretary, Mr. Sam'l C. Brown, says:

We need anticipate no difficulty in growing this jute-producing plant upon any good, well fertilized upland, or well drained bottom lands, but we always state that our success in producing the fiber, owing to the cheap labor of India, is wholly dependent upon obtaining it through mechanical appliances. This problem I regard as well nigh solved already. If not by contrivances now in hand, through modifications or substitution of others, success will be achieved sooner or later. The inventive genius of our country is not exhausted, but more alert and aggressive than ever.

The quality of this domestic jute, for a diversity of purposes, is established beyond question. Hitherto gunny cloths, cordage, and other coarse products have absorbed most of the jute manufactured in India, England, and in this country, but Mr. Lafranc, who is an expert in fibers, and giving special attention to the development of jute and ramie in New Jersey, thinks we will be able to turn jute to other and more profitable uses, in combination with wool, cotton, silk, etc. This will be effected by cottonizing the long staple, thus making a vegetable wool which in fineness and strength will be in close proximity to the coarser grades of animal wool. Samples of jute, thus manipulated into a higher priced commodity, have been submitted to carpet manufacturers and other consumers of coarse wool, and they have elicited unqualified approval for the purposes indicated.

The range of uses to which jute in its various forms can be utilized under a system of cheap production, is without limit, so that instead of consuming for domestic purposes, as we now do, about five million dollars per annum of raw and manufactured jute, the quantity could be increased many fold, and our agricultural and manufacturing interests be vastly augmented thereby. Any one who has seen spontaneous patches of the arbutilon growing under ordinarily favorable conditions, can see that the product of a cultivated field per acre would necessarily be heavy, for its growth is often eight feet, and we have seen it twelve feet high. Our calculation, based upon observation of wild and cultivated growths, is that with appropriate fertilizers and rich soil, from four to seven tons of dry stalks can be grown per acre. Mr. Lafranc offers to pay, this fall, eight dollars per ton for jute stalks, and ten dollars for ramie, delivered in Camden in a dry state. All these are proximate figures, and are furnished to meet a natural inquiry respecting the profit of growth to the farmers. We always take occasion to advise the farmers to collect all the seed within their reach for future use. It is generally believed that the best results will be obtained in jute culture from sowing the seed broadcast, and in soil as free from weeds and grass as possible.

A New Theory of Sea Sickness.

The singular benefit derived by the use of amyl nitrite in sea sickness has suggested a new theory of the cause of that distressing malady, namely, that it is due to cerebral anæmia. The proposer, Henry Naylor, L.R.C.P., L.R.C.S., Edinburgh, says:

"The rapid swinging of the vessel and the body with it irritates the eyes and vision, and this by reflex action produces a spasm of the cerebral capillaries; this explains the feeling of faintness and giddiness that comes on suddenly, just as the vessel gives a big swing. The sudden emptying of the cerebral vessels causes the stomach to sympathize, resulting in efforts of vomiting, whether the stomach be full or empty. These symptoms are most distressing when the subject is in a standing or sitting position, with the eyes open. If he lies down the change of position relieves the anæmia, the faintness and giddiness pass off, and the sickness ceases. But occasionally even the recumbent position does not give relief if the eyes are kept open. When they are shut the symptoms are not felt in the least. I have known this to be the case with several ladies who were never comfortable while at sea unless they were lying down with their eyes closed. They were able to eat meals and retain them if they lay down and closed their eyes immediately afterwards. In fact, I have been obliged to keep some constantly in bed to prevent their dying of starvation. A fact that helps to show the feasibility of the anæmic theory is that brandy and other stimulants give considerable relief for a time, which would not be the case if cerebral congestion had to do with sea sickuess. The explanation of how sea sickness continues so persistently in some, is that the sickness weakens the heart's action, and this keeps up the cerebral anæmia, and that in turn again produces the sickness; so that prolonged sea sickness is due to a circuit of causes, the one producing the other—the visional irritation, cerebral anæmia, sickness, weak heart's action."

Mr. Naylor adds that amyl nitrite usually does good in sea sickness, if used at once, because, being an anti-spasmodic, it relieves the spasm of the cerebral vessels, and thus the brain is refilled with blood. But if it fails, then the persistent sickness, by its effect on the contractions of the heart, prevents the brain from getting a sufficient supply of blood, and thus the brain becomes anæmic, not from a spasm of the capillaries, but from an insufficient power of the heart. It is at this stage that alcoholic stimulants in small doses, frequently repeated, give great relief.

Clearing Harbors of Torpedoes, Etc.

A trial has lately been made on board the Bloodhound, gunboat, at Portsmouth, Eng., of a new means which has been suggested by Captain Arthur, while in command of the Vernon, for clearing harbors of sunken mines and fixed torpedoes. At present the method adopted is to destroy the engines by countermining or by the hazardous process of "creeping." This is effected by boats being sent out to grapple for the cable connections, and then serving them by small charges of gun cotton. This mode, however, is very slow. The new method of opening a free channel for the passage of ships, as tried in the Bloodhound, consists in running out a couple of booms, 30 feet in length, from the bows of the ship. Across the submerged ends is fixed a horizontal beam, 38 feet in length, having a zigzag arrangement of iron rods in the form of a W; the idea being that the open space of each V of the series, as it is pushed through the water, will inclose the torpedo fastenings or connections, and lead them to the point at the bottom, which is fitted with a scissor contrivance, the blades of which are worked by levers in connection with the capstan on board. The beam searcher has a sweep of 50 feet, and the mechanism is capable of cutting through the strongest electric cable. A net, which is supported from the whiskers of the bowsprit, receives the liberated torpedo, and prevents it exploding against the operating craft. The trial proved a great success.

Comparative Strength of Explosives.

The report of the United States Board of Army Engineers, just published, presents the following interesting table as the result of two years' thorough trial of the relative efficiency of the various modern explosives, taking ordinary dynamite as the standard:

Dynamite, No. 1	100
Gun cotton	87
Dualin	111
Rendrock	94
Dynamite, No. 2	83
Vulcan powder	82
Mica powder	83
Nitro-glycerine	81
Hercules powder, No. 1	106
Hercules powder, No. 2	83