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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 203,

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INCENDIARY SILK.

The extent to which the adulteration of certain textile fabrics, notably silk and cotton, is carried in many European factories, is little suspected by the buyers of such goods, and it is only by some event outside the regular course of trade that the enormity of the practice is ever brought to light.

Thus, about a year ago, a suit brought in an English court to recover payment for sizing a quantity of cotton, revealed the extent to which that form of adulteration is carried. In the course of the trial the plaintiff was forced to explain that his process of sizing involved the loading of cotton goods with flour, clay, Epsom salts, chlorates of zinc and magnesia, and glue, to the extent of 70 per cent. He had used as high an average as 130 per cent; and he confessed that there were men in the business who loaded their goods with size as much as 230 per cent.

Silk fares even worse. The steamship Mosel, on the way from Bremen to this port, last month, mysteriously took fire in mid-ocean. Fortunately the fire was promptly discovered, and after a hard fight of five hours was put out. When the Mosel reached this city an examination was made, resulting in clear evidence that the fire spontaneously originated in certain silk goods. Samples were placed in the hands of a chemist, who reported that, under the microscope, the silk presented a remarkable appearance. The fibers ran very irregularly, and were partly covered with scales of a metallic luster, while on other fibers heavy sponge-like knots of dark color could be observed. The physical structure of the fiber seemed unimpaired. A careful chemical analysis disclosed that 100 parts of the silk were made up as follows: Moisture, 9·15; pure silken fiber, 21·35; oxide of iron, 13·45; other minerals, not determined, 3·30; fatty oils, 1·85; organic dye-stuffs and coloring matters, 50·90. The silk was free from cotton or wool fibers. For each part of fiber, 0·75 part of oxide of iron and nearly 2·50 parts of organic dyes were used for coloring. The coloring substances for this silk most probably contained tannic acids or similar substances. As much of the dyestuff and iron salt was not absorbed, it lay upon the surface of the fiber. Iron salts, when precipitated and combined with tannic or similar acids, will undergo, by action of the oxygen in the atmosphere, a certain chemical change, and in doing so give out heat. The combustion thus started was assisted by the inflammable silk fibers and fatty oils.

The report further stated that for several years manufacturers of silk goods in Germany and France have supplied the market with an article remarkable for its fine luster and heaviness, combined with extraordinary cheapness. Frequent fires in warehouses and railway cars, where such silks had been stored, led to a close investigation, and its dangerous character was discovered. Its liability to spontaneous combustion arose from its being overloaded with dyestuffs and chemicals. Steps were at once taken by insurance and railway companies to secure themselves against loss from this cause.

The steamship company to which the Mosel belongs announce that hereafter silk of this incendiary character will be stowed in a separate compartment of their steamers, where it can be constantly under observation, the officers being provided with means for flooding that part of the cargo at a moment's notice. This is no doubt a good rule; but a better and surer preventive of risk from spontaneous combustion in such dangerous materials would be to stop buying them.

A gentleman who was in Lyons at the time of a fire, from a similar cause, on the Oder, is quoted as saying that then the matter was brought to the notice of the silk manufacturers in that city. They acknowledged that there was danger from spontaneous combustion in heavily-weighted cord and sewing silk, as instances had been known of its flaming up when thrown in heaps in the factories. They, however, doubted whether there could be any danger in manufactured silk. This, after coming from the dyer, went through so many processes, that they thought all danger was worked out. The gentleman further stated that at one time sewing silk was regarded with such suspicion by the Russian authorities, that its carriage on passenger trains in Russia was prohibited. He stated that the dangerous quality in silk arose entirely from the chemicals used in the dyeing to give it weight. He knew of silk which came from the dyer's with an increased weight of over 275 per cent.

Ladies who complain that American silks do not show the brilliant luster of certain foreign brands, may now estimate the actual percentage of silk in their brilliant but brittle imported gowns. Dyestuffs may be bright of luster, but they are not cheap at the price of silk, nor are they durable or particularly desirable for wearing apparel, let alone any risk from spontaneous combustion.

ORIENTAL SAND AND MUD BATHS.

In many low plains in the neighborhood of the sea, in Greece, immense quantities of sand are constantly being deposited from the inrolling waves, particularly at the promontory Sunium, near Missolonghi, near Corinth, and on some of the islands, as Noxos and Mykone. Professor Landerer, writing from Athens to *New Remedies*, says that these places are visited by persons affected with chronic rheumatism, anchylosis, and chronic synovitis of the knee joint, for the purpose of taking a sand bath. The patients (who are generally of the poorer classes) bury themselves in the sand or cause others to cover them with it, so that only the head, which is covered with a night cap or straw hat, remains free. It is a ludicrous sight to see twenty or thirty such odd looking heads sticking out of the sand. In consequence of the weight and the saline character of the sand, the skin of the patients becomes so red that when they emerge from their sandy bed (which they occupy as long as possible) they look like boiled lobsters. Wooden huts, or tents improvised with oleander and plantain branches, are used as bathing houses, and a piece of bread, some grapes, and a glass of wine, generally constitute the meal of a patient. Direct inquiry of the patients has elicited the fact that the effects of this sand treatment are decidedly beneficial.

Another variety of bath is likewise not uncommon, the so-called "mud bath." In the canals and ditches into which the sea water is allowed to flow, in order to obtain common salt by spontaneous evaporation, a mother water containing chiefly magnesium bromide remains behind, after the crystallized salt has been removed. At the same time, an aluminous mud collects at the bottom. This mother water, together with the mud, is used by patients affected with chronic splenitis caused by the frequent malarial fevers prevailing among the workmen in these localities, and with intestinal infarctions. The method consists in smearing the whole body with the saline mud, and in exposing themselves afterwards to the rays of the sun until the coating has become dry, when it is washed off with the saline mother water. Sometimes both the sand and the mud bath are used locally on a special portion of the body only, as, for instance, the legs or feet.

THE NATIONAL ACADEMY.

The first paper of the last day of the meeting of the National Academy was by Professor Joseph Le Conte, on the glycogenic function of the liver. It was read by Dr. George T. Barker, and was a continuation of the paper read at the previous meeting of the Academy. Dr. Le Conte contended that the chief function of the liver is in preparing sugar to be oxidized in the capillaries, whither it is carried by the blood. He regarded the liver also as a sort of storehouse for fuel; the carbon received one day may be held until the next day, when it is oxidized in the capillaries in contact with the tissues, with the evolution of heat. The paper provoked a lively discussion.

Dr. Barker followed with a brief paper detailing the results of certain variations of Arago's experiment to prove that a wire through which an electric current is passed becomes for the time a magnet. This view was overthrown by the tests applied by Professor Franklin Bache, some fifteen years ago.

Professor Bache placed a piece of cardboard against the wire in such a way as to cut the "magnetic field" containing the filings into halves. Immediately all the filings dropped. The inference was that the wire was not a magnet. The filings, it was believed, had been held in position before the interference of the cardboard in one of two ways: either by their magnetic adhesion to each other, or by the direct support of the currents circulating in the magnetic field. Dr. Barker has made some experiments to disprove these inferences. He employed a powerful magneto electric machine of the Wallace pattern at Ansonia, Conn. The energy it developed was so enormous that at a distance of seven feet an iron bar five feet long held opposite it would be instantly so charged with electricity as to hold up an ordinary nail. This current of electricity would heat to cherry redness in a minute a quarter inch gas pipe three feet long. Dr. Barker performed the "experiment of Arago" with this machine, using a copper wire. Copper, being diamagnetic, seemed not so likely to become a magnet as iron. A five inch iron spike was held below and close to this wire during the passage of the current. The spike was attracted, but not sufficiently to lift it clear. When the spike was touched to the wire, it immediately stuck fast at right angles to the wire. But when the spike was removed from the wire only the thousandth part of an inch, it fell to the floor. This showed that the great energy of the magnetism was in the wire, and not in the surrounding field. Then Dr. Barker had a glass plate prepared with a hole through its center; the wire was passed through the hole and iron filings sprinkled on the surface of the plate. When the current was passed through the wire, the filings arranged themselves in concentric circles around it. Further experiment showed, by reversing the wire current, that in this magnetic field the currents were traveling in circles around the wire. Finally, when the iron spike was held by the head parallel to the copper wire and near it, the spike deflected itself out of the perpendicular in the direction in which these currents were passing around the wire. Dr. Barker considers that his experiments yield conclusive proof that the old view was correct—that the wire through which a current is passing does become for the time a magnet.

In the afternoon, Professor J. S. Newberry, of Columbia College, delivered an essay on the vegetation of the Atlantic coast of North America in the cretaceous era, and illustrated his remarks by an exhibition of fossil leaves from the greensands of New Jersey. No angiospermic leaves appear in the Trias or Jurassic formations, but in the pottery clays of the lower cretaceous they occur in abundance. One trayful of specimens contained only leaves belonging to the salix family—willow leaves, much resembling those of the present day, but in greater variety. The other tray contained the leaves of conifers, many of them beautiful specimens; twigs showing the skin or bark; cones, etc. Some of the leaves were imbricated.

The question to which these fossils give rise is a difficult

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one. They evidently are the product of a temperate, not a tropical climate. Now other fossils of the cretaceous era, such as animal remains, indicate a tropical climate for that period. These leaves are from the dawn of the cretaceous, its lower strata, and are very rich and varied. At the present day it would be difficult to find in a large space such a great number of different species of trees as are supplied in cretaceous fossils. There can now be no doubt about the position of these remains, though when the cretaceous flora of this country was first announced it was bitterly disputed. We may suppose that in the dawn of the cretaceous we had a temperate climate here; that our plants went westward and occupied Europe before the tertiary times, certainly before the miocene and the raising of the Alps. After that came the glacial epoch and destroyed that vegetation, though its traces were left in the rocks of Greenland and Iceland. After that, Asiatic flora came to Europe and replaced its vegetation.

Professor Marsh was deeply interested in Professor Newberry's paper He regarded this flora as much older than the lowest cretaceous marl of New Jersey. In that marl we have abundant crocodiles and other remains that render certain the tropical character of the cretaceous era. With regard to the fossil leaves, there had been a similar question once about certain Dakota fossils, including numerous dinosaurs, some of which were 30 feet high, and some no larger than a cat. It was now known that these Dakota fossils were Jurassic. Up to date we know of no cretaceous mammal. This is the most serious break in our palæontological record. Let us hope that in looking for these leaves we may find some mammal, large or small. Several geologists joined in the discussion at this point. Professor Marsh mentioned that he had himself picked up angiospermic leaves in Europe from undoubted cretaceous formation; these were then regarded as a great curiosity. He suggested that perhaps these leaves grew on forests near the tops of mountains, where they would have temperate climate, while it was torrid in the valleys below; and that these fossil leaves had been washed down the mountain sides and sunk in cretaceous swamps at the bottom.

A second paper by Professor Newberry gave descriptions of certain gold and silver deposits in Utah and Colorado. In the limited area which he explored of the Horn Silver Mine, in Utah, there was not less than $20,000,000 of ore in sight. Specimens of sulphate of baryta with ruby silver were exhibited. The sandstones are full of the impressions of plants; the plants themselves have been removed and the vacancies filled with horn silver. It is said that there is no parallel instance of such impregnation, but he has seen similar cases with copper ores in New Jersey.

Mines in the neighborhood of the Horn Silver Mine were almost equally rich in argentiferous galena, worth $50 to $60 per ton. Recently a similar deposit, the Silver Cliff Mine, has been found in Colorado. The district is also of archendrite rock and trachyte. A man named Bassick, a sailor, who had wandered around the world, was reduced to his last cent in this region, and was living on "tick." He picked up a mass of the rusty conglomerate rubbish, and got somebody to assay it. The yield was $50 to the ton. The chemical history of these balls of trachyte is that they were boiled and softened, when silver ore floated into their crevices or coated their surfaces. There is found silicified wood at a depth of 150 feet. Bassick proceeded to work his mine, and eventually sold out for a round $1,000,000. Silver Cliff is a hill of ore about six miles away from the Bassick mine. From another locality arsenic ores were exhibited, and it was stated that there—"the Lucky Boy's Mine"—orpiment and realgar were found in veins. The arsenic ore in some assays yielded $150 to the ton.

In his closing address Prof. Rogers dwelt upon the need of measures calculated to make the meetings of the academy more popular in character. It is not only the province of the academy to aid in research and to facilitate the progress of science, he said; it is also its duty to make its work more generally and popularly known. It is a part of the beneficence of science to extend as widely as possible the knowledge of great truths and of the advances that are made in the discovery of underlying facts and principles.

It is proper to add that in preparing our review of the proceedings of the academy we have been largely aided by the ample reports furnished by the New York *Times*.

ROADMASTERS' DIFFICULTIES.

At the first annual convention of the International Roadmasters' Association, at Niagara Falls, last September, the difficulties experienced in maintaining railway tracks were discussed by the members at great length. The proceedings are reported in full in the *Railroad Gazette*, October 10 and 17.

Mr. Wiswell said that the most difficult thing he had to contend with was sliding clay banks in the spring of the year. He had thought it might be economical to use old sleepers for retaining walls; had heard of bank walls of old ties, on the Central Vermont, which had lasted twenty years and were still in good condition.

Mr Hardy complained of fire and water. The latter occasions all sorts of trouble; sometimes it comes and takes out a culvert or bank; sometimes it soaks into clay banks, and down comes the bank on the track; and sometimes it comes under the track. He thought the New England men would bear him out in saying that with fire on the bridges, and water in the wash-outs and slides, throwing the track in many cases, they could sum up the principal part of their anxiety and trouble.

He then asked the opinion of the members as to the relative merits of gravel, stone, and other forms of ballast. Mr. Collopy thought gravel ballast the best of any; better even than furnace cinders, which were liable to break in winter. Locomotive ashes make good ballast The trouble with them, however, is the difficulty and delay of unloading cinders. He had also used rolling mill clinkers—slag, iron, and limestone.

Mr. Sullivan had tried the latter. He objected to cinders because they cause the ties to rot very fast. In locomotive cinders the ties (burr oak and white oak) play out in three or four years. In mill cinders they last as long as with gravel ballast. Touching the life of ties on the Atlantic and Great Western road, Mr. Latimer said that on the first division, where there is nothing but gravel ballast, ten years is the average; including sidings on the second division, which is also gravel ballast, but very poorly ballasted, eight years and four months; on the third, hardly better ballast, nine and one-tenth years; on the fourth, a good deal better ballast, ten years and three months. On a portion of the road, not well ballasted, very poorly ballasted indeed—that is, the third division—seven years and eight months; and in the longest part, better ballasted, eight years and two months. In another portion, where the traffic is light, eight years and five months; and where it is still lighter, with good gravel ballast, eleven years—this with chestnut ties. Mr. Kennedy thought that the more rock was put under a chestnut tie the quicker it would give out.

Mr. Hardy gave the following experience: About three or four years ago there was a piece of track laid for a change, and upon one of those tracks, about three-fourths of a mile, was sawed ties, which wear like bridge ties. He did not think the cutting up of those ties amounted to 25 per cent of the rest of the road. The track is well laid; it is a silicious country, good quartz rock, and there is no heaving. He thought that with a proper rock ballast there must be a great saving in the wear of ties and rails. Mr. Latimer had no doubt that there is more wear upon the rail resting on rock ballast or cinder ballast than there is on gravel, engine cinders, ashes, or coal dust. The ties on hard ballast are more dug into by the rail than on elastic ballast. Mr. Collopy thought there was also more wear on the rolling stock, and more broken rails in winter.

Mr. Armstrong expressed the opinion that locomotive cinders are calculated to preserve the life of some kinds of timber, and are injurious to others. In 1864 he filled a track with locomotive cinders, and used white hemlock ties. Not one per cent of those ties have been removed. He filled another track with cinders, oak ties being used, and they rotted out in five years. He used nine inches of cinders over the ballast.

Mr. Collopy expressed the opinion that the life of a hemlock tie is about three years. Mr. Sullivan said that he put down 5,000 hemlock ties in Northern Michigan, and three years after took them out with shovels. They were too rotten to pull out.

Touching the cost of maintaining a road bed in good condition, Mr. Burnett thought the yearly expense with gravel was about 40 per cent less than with broken rock. The expense of keeping rock ballast free from grass and weeds is about one-half less than with gravel. In regard to keeping a good surface on the road, Mr. Sullivan claimed that rock ballast was better than gravel, the latter being liable to settle unevenly in spring time. His choice would be: first, rock ballast; next, furnace cinders, where they could be got. Mr. Latimer preferred rock with a covering of gravel.

With reference to the heaving of the track by frost and irregular thawing, Mr. Burnett said that under certain conditions the south side of the track may heave as much as the north side. With a clay embankment stone will heave nearly as much as gravel. Stone is more open than gravel, frost penetrates further, and when the clay freezes the track will heave.

Mr. Shanks said that when eighteen or twenty inches of ballast was used there would be little freezing. But if the clay froze to any depth it was absurd to expect it not to heave. Gravel tends to keep the frost out to a certain extent. Mr. Preston suggested that imperfect drainage might be the cause of heaving. Mr. Burnett instanced a cut 250 feet long, the water running eight inches to the bottom of the ties, and there is no heaving. Mr. Wiswell spoke of a rock cut with water right up to the end of the ties, in some places the gravel would be heaved up through the track, but the ties never were out of place. Mr. Hardy's company had a rock cut with much water in it, in which 1,000 feet of new steel rails had been laid. The water gave a great deal of trouble. Mr. Burnett said he would lay 3 inch sewer pipe close to the ends of the ties and fill in with gravel He knew from experience that the method would prevent a great deal of heaving where water came from the top and had no chance to escape from the bottom. Mr. Hardy thought the pipe would not stand the temperature. They had made it a matter of much study, for they had lost a great deal of steel rail there. This on account of the rigidness of the road bed. Owing to the excessive wear in the four months of frost the life of the rails was diminished about forty per cent.

Mr. Adamson's experience was that rock is the cheapest ballast in cuts. The ties last longer, and there is less tendency to heave in winter. Another advantage was the absence of weeds and grass to attract stock. In Indiana good gravel is hard to get. He would prefer gravel if he could get it. It costs less to put in and take out ties in gravel than in rock ballast. The most perfect bed would probably be pure gravel on stone.

THE "CONCH PEARL."

Many of the readers of the SCIENTIFIC AMERICAN have doubtless frequently seen and admired the delicately tinted, pink-faced shells which are extensively used in the United States for bordering garden walks and other ornamental purposes, but few probably are aware that in the conch which forms and inhabits this shell is occasionally found a very lovely gem, known to lapidaries as the conch pearl. When perfect the pearl is either round or egg-shaped and somewhat larger than a pea, of a beautiful rose color, and watered, that is, presenting, when held to the light, the sheeny, wavy appearance of watered silk. It is, however, a very rare circumstance to find a pearl which possesses all the requirements that constitute a perfect gem, and when such does happen, it proves an exceedingly valuable prize to its fortunate finder. A good pearl is very valuable indeed, some having been sold in Nassau for no less a sum than four hundred dollars. Although many of these pearls are annually obtained by the fishermen in the Bahamas, not more than one in twenty proves to be a really good gem, and hence probably their high price.

Pink is the most common and only desirable color, although white, yellow, and brown pearls are occasionally found. Even among the pink ones there is usually some defect which mars their beauty and materially injures them; some are very irregular in shape and covered apparently with knobs or protuberances; others are too small, while many lack the watering, which gives them their great value and chief beauty.

The conch abounds in the waters of the Bahamas, and thousands of them are annually obtained and destroyed for their shells, which form quite an article of commerce, but in not one conch in a thousand is a pearl found. When this is taken into account, and the other fact, that not more than one in twenty of pearls found turns out to be perfect, it will at once be seen that a good conch pearl will always be a rare and costly gem. In fact, their value within the last few years has almost doubled, and the demand for them is steadily increasing.

Most of the conch pearls found in the Bahamas are exported to London, where they are readily sold. A few have been sent to New York, having been purchased in Nassau by an agent of Messrs. Tiffany & Co., the well known jewelers.

Like everything else that is valuable, the conch pearl has been imitated, and some of the imitations have been sold as the genuine article. Many years ago an ingenious American visited Nassau and conceived the idea of making conch pearls. He succeeded admirably in cutting out of the pink portion of the shell some very creditable imitations. To make success doubly sure, he procured a number of the live shell fish, carefully inserted his spurious pearls in the position in which the genuine pearl is usually found, and placed the fish in an inclosed place in the water. At the expiration of a month or more, the fish were again removed, and, of course, pearls found in them, several of which were sold to inexperienced persons before the fraud was detected. It was detected, however, and the perpetrator received prompt and deserved punishment. SAUNDERS.

Importance of Illustrating Inventions.

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Patentees, and those who wish to have their inventions or machines which they manufacture illustrated in this journal, will receive full information by addressing this office.

James Clerk Maxwell.

The well known Professor of Experimental Physics at Cambridge, England, James Clerk Maxwell, M.D., LL.D., F.R.S., died November 5. Professor Maxwell was an accomplished mathematician and successful investigator in physics. His "Treatise on Electricity and Magnetism," and "Theory of Heat," are his best known works.

A Great Ship enters South Pass.

The British steamship City of Bristol, Inman Line, went through the jetties October 31, drawing 24 feet 7 inches of water. The tide was four inches below the average. There was no detention whatever at the jetties or at the head of the pass. Since that date it has been announced that the largest cargo of cotton ever floated at New Orleans has safely passed outward. Now for the sanitary improvements of the Mississippi Valley, which shall permanently avert the danger of yellow fever blockades.

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