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Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 246,

For the Week ending September 18, 1880.

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ADULTERATIONS AND SUBSTITUTIONS.

People who like to mix chiccory with their coffee should undoubtedly be allowed to do so, although, for one who knowingly uses coffee so adulterated, probably there are a dozen who do it without knowing. So, too, in regard to those who use oleomargarine instead of dairy butter, taking the former knowingly on account of its lower price, or because a good article of butter may not be obtainable. There are many other deteriorations, adulterations, and substitutions which are also allowable, if not even entirely harmless, provided, as between manufacturer, dealer, and consumer, there be a correct understanding as to the article dealt in, and no attempt at deception is practiced. The difficulty is that deception in some form, or at some stage, seems to be an invariable accompaniment of this kind of business. The manufacturer may not deceive the large dealer, who is supposed, equally with himself, to be an expert; from the large dealer to the retailer, and from the latter to the consumer, however, the opportunities for deception, without the commission of any fraud in the eye of the law, are wonderfully increased.

Perhaps one of the most successful of the comparatively new adulterations is that of the use of glucose, made from corn, for the adulteration of sugar and sirup supposed to be made from the sugar cane. Considerable prominence has been given to this matter on account of a trial which took place in Buffalo in July, the suit growing out of a difference as to the ownership of stock in a company which had made immense profits out of the business. Glucose, or starch sugar, is not necessarily harmful, but it has very little sweetening power. Mr. R. C. Kedzie, the president of the Michigan State Board of Health, in a recent report, gives a list of seventeen table sirups he had examined, of which only two were less than half glucose, while most of them were more than three-quarters, and four were *all* glucose. One gallon of sirup from cane sugar is estimated to have the sweetening power of 4·17 gallons of glucose sirup. The writer concludes, however, that there is comparatively little glucose in "granulated" and "crushed" sugars, of which he had examined many samples, although he found it easily in many samples of light brown sugars. He says: "The existence of clean, well-defined, non-coherent crystals, free from floury dust, is good evidence of the absence of glucose from commercial sugars," and adds: "In the common candies, where the crystalline form is purposely avoided as far as possible, glucose is often used in large quantities."

The case assumes a much graver aspect, however, when we come to the sophistication of drugs, and all that class of articles known to our *materia medica*, where a single instance of adulteration or substitution may put health or life in jeopardy. The National Board of Health has, therefore, done well, in the absence of any yellow fever damage this year, to devote some attention to this subject, and they have accordingly issued a pamphlet in relation thereto, embodying a report furnished by Mr. C. Lewis Diehl, on "Deteriorations, Adulterations, and Substitutions of Drugs." The writer, after mentioning the practical difficulties attending the collection of specific information in regard to particular drugs, to determine how general may be the adulteration, proceeds to set forth mainly such facts as are recorded in the current literature of the last twenty-five or thirty years, most of it coming within the published proceedings of the American Pharmaceutical Association. Previous to 1848 large importations of adulterated and inferior drugs were thrown on our market, but in that year Congress passed a law to regulate such importations, and designed to exclude inferior and adulterated drugs. Under this law the "special examiner" for the port of New York, at which most of the importations had been made, had occasion, during the first ten months, "to reject about 90,000 pounds of drugs, such as rhubarb, opium, jalap, gamboge, senna, yellow bark, iodine, croton oil, sarsaparilla, etc., while from 1848 to 1857 the same examiner rejected over 900,000 pounds of unsafe, adulterated, and improper drugs and medicines." It was at once demonstrated that the law had been of great benefit, for the quantity of drugs rejected within a short time after the appointment of the examiner was much larger than a brief period later, and continued to diminish for several years. The record of drugs rejected is not now kept, but the same law is in force, although it is complained that it is not as effective as it should be, because the examiners are not always appointed solely with reference to their fitness for the office.

The National Board of Health have no remedy to recommend for the present state of things, but from the printing of their report, and the diffusion of such information as is here presented, much good may ultimately result. The National Government can exercise more care, or make more stringent regulations if that be necessary, to prevent importations of inferior or adulterated drugs, but what seems even more necessary than this is uniform action by the various State Legislatures to more effectually control the manufacture and the dealings in a class of goods where the detection of inferiority or deleterious adulterations are generally so difficult, and where any fraud is likely to have a direct effect on the health of the community.

THE PHOTOPHONE.

In May, 1878, Mr. Alexander Graham Bell, well known in connection with the telephone, announced before a scientific society in London his belief that it would be possible to hear a shadow by interrupting the action of light upon selenium. At the recent meeting of the American Science Association in Boston, Mr. Bell read a paper describing at length his experiments in the production and reproduction of sound by light, and the invention by Mr. Sumner Tainter and himself of an instrument for the purpose.

The influence of light upon the electric conducting power of selenium is well known. Mr. Bell found the electric resistance of same selenium cells of peculiar construction only one-fifteenth as much in the light as in the dark. It occurred to him that all the audible effects obtained in the telephone by variation of the electric current by sound waves, could also be produced by variations of light acting upon selenium; and that with suitable transmitting and receiving apparatus voices might be conveyed without a wire along a line of light.

The fundamental idea on which rests the possibility of producing speech by the action of light is the conception of what Mr. Bell terms an undulatory beam of light in contradistinction to an interrupted beam; meaning by the former a beam that shines continuously, but is subject to rapid changes of intensity.

The apparatus used to give the required undulatory character to light consists of a flexible mirror of silvered mica or thin glass. The speaker's voice is directed against the back of this mirror, as against the diaphragm of a telephone, and the light reflected from it is thereby thrown into corresponding undulations. In his experiments, chiefly with sunlight, Mr. Bell concentrates upon the diaphragm mirror a beam of light, which, after reflection, is again rendered parallel by means of another lens.

The beam proceeding from the transmitter is received at a distant station upon a parabolic reflector, in the center of which is a sensitive selenium cell connected in a local circuit with a battery and telephone. In a recent experiment, Mr. Bell's associate operated the transmitting instrument, which was placed on the top of the Franklin school house, in Washington, about eight hundred feet distant from the receiver, placed in a window of Mr. Bell's laboratory. Through this distance messages were distinctly conveyed by means of light. In his laboratory experiments Mr. Bell finds that articulate speech can be transmitted and reproduced by the light of an oxyhydrogen lamp, and even by the light of a kerosene lamp.

The rapid interruption of the beam of light by a perforated disk gives rise to musical tones, siren fashion. With this apparatus silent motion produces sound, loud musical tones being emitted from the receiver when no sound is made at the transmitter.

The importance of these investigations it is impossible now to estimate. That the photophone can practically take the place of the telephone is not likely, though it is likely to work radical changes in military and other signaling operations. The heliograph, which has proved so useful in recent campaigns in the Afghan country and elsewhere, can now be made to talk orally yet silently over the heads of an enemy or across impassable streams or other low barriers. For rapid communication between distant exploring or surveying stations, the photophone also promises to be serviceable.

Another result of Mr. Bell's researches in this connection is the discovery that many other substances are sensitive to light. He has found this property in gold, silver, platinum, iron, steel, brass, copper, zinc, lead, antimony, German silver, Jenkins' metal, Babbitt's metal, ivory, celluloid, gutta percha, hard rubber, soft vulcanized rubber, paper, parchment, wood, mica, and silvered glass. The only substances found insensible to light are carbon and thin microscopic glass.

AN ASTRONOMICAL DISCOVERY.

Professor E. C. Pickering, director of the Harvard Observatory, lately made a discovery which is regarded as one of the most important of the century in stellar physics. In the ordinary telescope a star appears as a point of light, brighter, but not larger than when looked at with the naked eye. Prof. Pickering finds that, on placing a prism between the object glass and the eyepiece of his telescope, the light of a star is drawn out into a continuous band. When, however, the telescope with the prism is directed to a planetary nebula, the light is collected into a star-like point without any band, enabling the astronomer to distinguish instantly between a star and a planetary nebula. This principle has already enabled Prof. Pickering to discover several planetary nebulæ. On Thursday evening, August 26, an object was observed which presented the appearance of two star-like points within the band in the modified telescope. It is different from anything heretofore observed in the telescope, and is regarded as an important object for investigation.

HOW ARE THE OIL TANKS SET ON FIRE BY THE LIGHTNING?

Again we have to record the destructive effects of lightning in the Bradford, Pa., oil regions. On the 28th of August, at 8:30 P.M., one of the 25,000 barrel oil tanks of the United Pipe Line Company, near State Line and Tarport, was set on fire by electricity and burned; also four smaller tanks on the West Branch near Bradford. At one time there was danger of a gigantic conflagration, as there were some twenty large tanks not far from the burning tank of the Pipe Company. By firing cannon shot into the tank its contents were run out and the adjacent property saved.