The Chemistry of Confectionery.

An interesting lecture was recently delivered before the Society of Arts in London by Mr. William Jago upon "Chemistry of Confectionery." In flour confections or cakes—not sugar confections or sweets proper —the principal substances used are flour, milk, eggs, and sugar. For confectionery the weaker and softer flours, containing much starch and little gluten, are preferable. Milk is used as a moistener instead of water, because of its richness, average pure new milk containing 4.0 per cent of fat, 3.6 per cent proteids, 4.5 per cent sugar, 0.7 per cent ash, 8.8 per cent non-fatty solids, and 78.4 per cent of water. It is not only the fat in the milk that is of service to the confectioner, but also its proteids, which, though like the white of eggs have no very pronounced taste, yet confer a fullness of flavor which a simple solution of lactose in water would not possess. In baked goods the proteids of milk produce a moistness and mellowness of character, and new milk therefore gives to confectionery richness through its fat, sweetness through its sugar, and mellowness through its proteid.

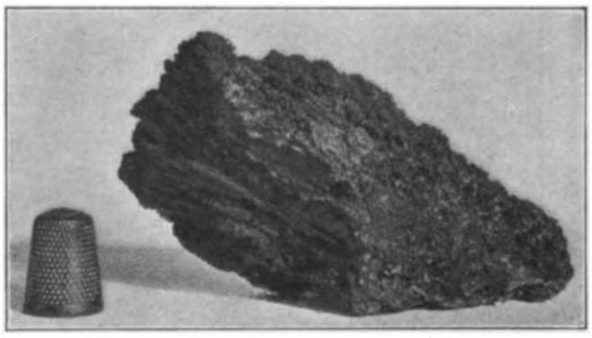
Next to milk, eggs are one of the most important moistening agents to the confectioner. In composition the white of eggs consists of proteids dissolved in water, while the yolk contains in addition to the proteid, fat and coloring matter. The white of eggs may be viewed as a solution of one part albumen in seven parts of water, while in the whole egg about two-fifths of the solids consist of fat and three-fifths of proteid, while the water of the whole egg amounts roughly to three-quarters of its weight. Another moistening agent used by confectioners is glycerin. If exposed to the air glycerin increases in volume through absorption of moisture. Chemically glycerin is a compound of carbon, hydrogen, and oxygen, belonging to the alcohol type. When used in small quantities in cakes the result is that drying is much retarded and the cake remains fresh and moist for a considerable time longer than would otherwise be the case.

Many aerating agents are used by confectioners, the chief of them being ammonium-carbonate, usually called "ammonia," or volatile sodium bicarbonate, tartaric acid, and cream of tartar. The chemical action of these on the confectioner's paste is to change the sugar present by fermentation into alcohol and carbon-dioxide gas, which has the mechanical effect of distending and lightening the dough. If, for instance, ammonium carbonate be mixed with other constituents of a dough, there is very little change perceptible until the dough is placed in the oven. With a rising temperature the liberated carbon dioxide and ammonia gases distend the mass and so produce the desired lightness. Like ammonium carbonate, sodium bicarbonate only commences to evolve gas when subjected to the heat of the oven, and even then it only evolves half its gas. When, however, it is treated with an acid the whole of the carbon dioxide gas is evolved, and of all acids the most convenient for this purpose is tartaric acid. When tartaric acid and sodium bicarbonate are mixed with flour in equivalent quantities, the result by moistening with water is that the acid attacks the carbonate, liberating all its carbon dioxide and forming normal sodium tartrate. The latter salt is comparatively tasteless, and the presence of the quantity produced as a residue from the amount of acid and soda necessary for the aeration of an average dough is not sufficient to injuriously affect the flavor of the resultant goods.

The British Admiralty has been carrying out a series of important armor-plate tests at the Whale Island butts, Portsmouth, for the first time with the 2-inch armor plates used in protective decks, and intended to form the splinter screens behind the guns in the central battery of the new 16,500-ton battleships. Plates from all the armor works were tested. The manufacturers were not on this occasion called upon to submit special sample plates. The Admiralty used those plates which they had already bought for the splinter screens. The results were highly satisfactory.

LONDON SMOKE DEPOSITS.

Of late years a great deal of attention has been drawn to the question of London smoke, and during the recent great fogs in that city, a number of experiments were conducted by Sir William Thistleton-Dyer, which showed that solid matter, consisting of soot and tarry hydrocarbons, was deposited during the worst fogs at the rate of so many tons to the square mile every week.



The size of the mass is shown by comparison with the thimble.

SMOKE DEPOSIT FROM ST. PAUL'S CATHEDRAL.

The fogs of the Thames Valley can, of course, never be avoided; but that particular quality of fog which takes its distinctive name from the great city itself could be prevented if its citizens were willing to use smokeless coal in place of the highly bituminous coal which they favor at the present time. There is a society in London known as the Coal-Smoke Abatement Society that has strenuously grappled since 1898 with the problem, and with the very best results. At a recent meeting of the Society, Prof. A. H. Church exhibited a specimen of a remarkable atmospheric deposit, which had been taken from the cornice below the dome of St. Paul's Cathedral. It is believed that this specimen, which is herewith illustrated, had taken about two hundred years to form. According to the Illustrated London News, to which we are indebted for our illustration, the mass contains one grain of carbon per 100 grains, and about half a grain of tarry matter in the same weight of deposit. The chief constituent is gypsum or crystallized sulphate of lime, produced by the action of the sulphuric acid of the city atmosphere on the carbonate of lime of the stone of which St. Paul's is built. This sulphate of lime is first dissolved by, and then deposited from the rain water. During the formation of the coral-like mass, the tarry particles of soot are inclosed within it. In order to give an idea of the size of the piece, an ordinary thimble is shown beside it in the illustration.

NOVEL USES FOR THE TROLLEY CURRENT.

BY DAY ALLEN WILLEY.

In making repairs and building extensions to its system the Union Traction Company, of Philadelphia, has in service an interesting variety of apparatus, most of which is operated by the current from the trolley wire. The company makes use of welded track joints, and for making the joints they use a portable welder, which is mounted upon a truck especially built for the purpose. The cupola has a capacity of about 1,800 pounds of iron. The blower mechanism is operated by a five horse power motor, carried on the center of the truck, which also has space for fuel, tools, etc. Two men only are required to operate it. To avoid the danger of melting the overhead construction by the heat from the cupola, a screen of asbestos, mounted on framework, is placed below the trolley wire.

For breaking joints and pigs of iron for the cupola a drop hammer has been designed, which is also mounted on a special truck, but is hauled by another car. The hammer proper weighs 1,500 pounds and has a fall of 16 feet, giving it sufficient force to break the heaviest joint in service. The winch is operated by an ordinary railway motor, and the mechanism, as will be noted, can be readily operated by one man. For supplying illumination for repair work, Mr. H. B. Nicholls, the maintenance-of-way engineer, has devised among other appliances some portable street lamps, which are connected with the overhead wiring by what is known as the fishpole circuit. The poles sustaining the wiring are merely hung to the trolley wire, so that they can be lifted off instantly to allow a car to pass, then replaced without delay. The lamps, which are of the incandescent type, are arranged in series of ten each, and furnish ample illumination for the most intricate repair work.

STREET ROLLER READY FOR TRANSPORTATION.

PORTABLE WELDING MACHINE, WITH ASBESTOS SCREEN FOR PROTECTING OVERHEAD WORK.

Another appliance which is of much practical value is the rail grinder, which is utilized for smoothing the welded joints. It consists of an emery wheel, driven by a two horse power motor which is placed on a barrow. It is carried on a motor car to the locality where it is to be operated, when a workman merely trundles the barrow to the joint. The motor is first connected to the trolley wire, then by a flexible shaft with the emery wheel, which polishes the joint in a few minutes. The current is then disconnected and the motor wheel backed to the car and taken wherever its services may be needed.

The charter of the company requires it to keep a certain portion of the pavement of the streets traversed by its lines in good repair. For surfacing the macadam and asphalt it employs a 15-ton road roller, which is transported by electric motor power on a flat car especially built for the purpose. On arriving at the street where the work is to be done, a detachable inclined platform is fastened to the end of the roller car, and the roller easily transferred to the surface. It can be loaded again by its own power. It is about the only special application in which steam is used in repair or other work by the company. Even in the system employed of greasing the curves, a large number of men have been dispensed with by the use of what the engineer poetically terms "grease chariots." These consist merely of small carts drawn by one horse, the greaser standing on a low rear platform. Each chariot is equipped with a broom, a crowbar for removing stones and other obstacles from the switches, a pail of grease, and swabs.

Another valuable addition to the company's equipment is a portable sand-blast apparatus. This is also hauled by horse power, and consists of an air compressor driven by an electric motor which takes current from the trolley wire. The work of cleaning the