American Association for the Advancement of Science.—No. 2.

Separation of Alcohol from Water by Gravitation.—Views of the Scientific American established.—Prof. Henry detailed an experiment which was made at the Smithsonian Institute, in consequence of the granting of a patent for the separation of alcohol from whiskey, by placing a considerable quantity in a vertical tube. The patentee stated that by the use of a tube 100 feet in hight, he had separated 100 gallons of alcohol in 12 hours. The experiment was made in one of the towers of the Smithsonian, with a gas pipe 260 feet long, into which stop-cocks were inserted at various lengths. A most careful examination of the whiskey at the various hights was made at the end of a few hours, and also at the expiration of some months, but no more variation could be discovered than in different samples of the same whiskey not subjected to the process. The patentee had, however, obtained his patent and sold several rights at a high price. A paper was read at the last meeting of the Association announcing this discovery. The gist of his remarks was that the Patent Office, the Association, and the country had been sublimely humbugged.

The patent referred to was that granted to B. F. Greenough, Dec. 20, 1853, and the paper read at the last meeting of the Association at Washington was by Dr. Gale, the substance of which was published on page 278, Scientific American; and at the end of which we stated that our opinions differed from those of its author, and that we would take occasion, at some future time to review the matter. We did so, on page 325, in an article of some length, showing that alcohol could not be separated from water—removing the alcohol from the water of whiskey—by placing it in a long tube;—this was on June 24, 1854. And now what do we hear, but our views confirmed in every particular by experiments made since then, to test the question fully, and by one who stands at the very head of practical science in our country. If the Patent Office, the Association for Advancing Science, and the country have been deluded respecting this alleged discovery, it was not for want of warning from us.

Frozen Wells—Prof. J. Brocklesby read a paper on certain frozen wells in Owego, Tioga Co., N. Y. These are two in number, and freeze in the latter part of winter, and remain frozen till July, while in September the water is represented to be too warm to drink. Mr. Macomber visited one of them in February: it has since fallen in. He found it 6 feet down to the water, which was frozen over so hard that they tried in vain to break the ice with a lead at the end of a line. The wall was covered with ice for some distance up. There seemed to be a current of air blowing laterally in the well, and a candle was extinguished before reaching the ice. The well was dry in the summer time, and at that time the ground was said to be so cold as to render it impossible to work long in it without being warmly clothed. A chain pump was put in one of them, but was soon removed as the ice rendered it useless.

Prof. Guyot alluded to the ice caves in the Jurassic formation in many parts of Europe. He instanced one of these caves about sixty feet deep, whose bottom was always covered with ice several feet in thickness, while stalactites of ice depended from the roof. The whole was a small glacier. The stalactites were formed by water percolating through the covering of the cave; these were situated 3,000 feet above the level of the sea.

Prof. Wm. B. Rodgers had to state similar occurrences in a range of mountains composed of a porous sand rock in Southern Virginia. But he could not see that any accumulation of snow at the bottom of a well should generate ice about its sides.

Prof. Olmstead supposed that there was a current of air circulating through the earth near its surface. In winter it would be below the freezing point, and in the summer it would not melt the ice, as the evaporation would produce a cooling effect.

Dr. Gould alluded to the ordinary method of freezing ice together by mere juxtaposition. It was his fortune to have a friend who was particularly fond on warm days of refreshing himself with a very highly iced beverage, in which the ice was present in small pieces, and sometimes eaten with a spoon. His experience was that pieces of ice frequently adhered to the spoon, and that, too, although the mixture was an alcoholic one.

Prof. Henry said that the fact presented by Dr. Gould was also referred to him by the same gentleman, who was also a friend of his. He repeated the experiment. To produce a perfect experiment it was necessary that all the conditions should be observed. He must therefore give them :—sugar and wine and water were mingled with ice, but instead of depending upon the taste he immersed a thermometer, and observed a reduction. With strong alcohol he obtained a still greater reduction, showing that alcohol has so great an affinity for water that it melts the ice—that this is a freezing mixture.

Prof. Agassiz explained the different kinds of ice. First was that produced by the freezing of the surface of the water and successive layers of water beneath it, a laminated schistose mass. Into this, bubbles from the bottom of the pond were frequently frozen, and when it was subjected to the action of the sun the bubbles became heated, melted the ice around them, and rendered it of no marketable value. It would therefore be worth while for ice gatherers to cover their ponds with cloths, or something which would prevent these bubbles from rising. Glacier ice was formed like pudding stone; compact masses being cemented together so that when you exposed a large lump of glacier ice to the heat of the sun it would crumble to pieces. It was like the decomposition of conglomerate; we had ice-sand. Icebergs could be determined to be derived from glaciers and not to be the frozen surface of the ocean by their conglomerate composition.—Pebbles in glaciers becoming heated, melted the ice beneath them, and quarried their way down to where the heat of the sun could not reach them. The pot holes formed in this way were soon covered with a thin film of ice, but it was only during the protracted cold of winter that they were frozen through.

Prof. Brocklesby could not see the analogy between an ice cave and a well ; he did not think the phenomenon had been explained.

Building Materials—Prof. Joseph Henry read a very useful and interesting paper on this subject. He was one of the Commissioners appointed by the Government to examine and test the qualities of marble offered for the Capitol extension at Washington. He gave a detailed account of those experiments. The committee subjected specimens to actual freezing, and after several experiments a good method was obtained. It was found that in ten thousand years one inch would be worn from the blocks by the action of frost. Blocks of 1 1-2 inch cube were subjected to pressure, and thin plates of lead were introduced to equalize any inequalities which might occur in the surfaces. But upon experiment it was found that while one of these cubes would sustain 60,000 lbs. without the lead plates, it would sustain only 30,000 with them. They had therefore to invent a machine to cut the sides of the block perfectly parallel, when it was found that the marble which was chosen for the Capitol, from a quarry in Lee, Massachusetts, would sustain about 25,000 lbs. to the square inch. The manner of its breaking was peculiar. With the lead plates interposed, the sides which were free, first gave way, leaving the pressure on two cones, whose bases joined the plates, and whose apexes met each other, and that they then yielded with comparative ease.

Further experiments were made, perhaps twenty, in order to arrive at definite conclusions. The result arrived at was, that the cube upon solid compression between steel plates of resisting surfaces, sustained fully twice the pressure that it was able to endure when compressed by lead, which possesses a comparatively unresisting tendency.

Locomotive Axles—According to the views he had presented, the difference in tenacity of steel and lead did not consist in the attractive cohesion of the atoms, but in their capability of slipping upon each other. From this view it followed that the form of the material ought to have some effect upon its tenacity, and also that the strength of the article depended in some degree upon the process to which it had been subjected. He had, for instance, found that softer substances, in which the outer atoms had freedom of motion, while the inner ones, by the pressure of those exterior, were more confined, broke unequally, the inner fibres, if he might so call the rows of atoms, gave way first and entirely separated, while the exterior fibers showed but little indications of a change of that kind. If a cylindrical rod of lead, three-fourths of an inch in diameter, were turned down a lathe in one part to about half an inch, and then gradually broken by a force exerted in the direction of its length, it would exhibit a cylindrical hollow along its axis of half an inch in length, and at least a tenth of an inch in diameter. With substances of greater rigidity this effect was less apparent. It existed, however, even in iron, and the interior fibers of a rod of this metal might be entirely separated, while the outer surface presented no appearance of change. From this it would appear that metals should never be elongated by mere stretching, but in all cases by the process of wire drawing or rolling. A wire or bar must always be weakened by a force which permanently increases its length without at the same time compressing it. Another effect of the lateral motion of the atoms of a soft heavy body when acted upon by a percussive force with a hammer of small dimensions, in comparison with the mass of metal, was, that the interior portion of the mass acted as an anvil upon which the exterior portion was expanded so as to make it separate from the middle portions. Prof. Henry exhibited a portion of bar originally four feet long, which had been hammered in that way so as to produce a perforation through the whole length of its axis, rendering it a tube. This fact appeared to him to be of great importance in a practical point of view, as it might be connected with many of the lamentable accidents which had occurred in the breaking of the axles of locomotive engines. These ought in all cases to be formed by rolling, and not with the hammer.

Camphor.

This substance is the produce of the *Laurus camphora* or camphor laurel, of Japan and China. The roots and wood of the tree are chopped up, and boiled with water in an iron vessel, to which an earthern head containing straw is adapted; and the camphor sublimes and condenses upon the straw. In China, the chopped branches are boiled in water till the camphor begins to adhere to the stirrer; the liquor is then strained, and the camphor concretes on standing; it is afterwards mixed with a finely powdered earth, and sublimed from one metallic vessel into another. Two kinds of unrefined or crude camphor are known in commerce, Dutch or Japan camphor, and China camphor. It is chiefly produced in the island of Formosa, and conveyed in junks to Canton, whence the foreign markets are supplied.

Crude camphor very much resembles moist sugar before it is cleaned. It is refined, and converted into the beautiful well-known article sold in the shops, by sublimation. This process is carried on in spheroidal vessels called *bomboloes*. They are made of thin flint glass, and weigh about 1 lb. each, and measure about 12 inches across. Each vessel has a short neck. When filled with crude camphor, they are imbedded in a sand bath, and heated to a temperature of from 250 deg. to 280 deg., which is afterwards raised to between 300 deg. and 400 deg. About 2 per cent. of quick-lime and 2 parts bone-black, in fine powder, are added to the melted camphor, and the heat raised, so as to boil the liquid. The vapor condenses in the upper part of the vessel. As the sublimation proceeds, the hight of the sand around the vessel is diminished. The process is completed in about 40 hours. This operation requires considerable attention and experience. Dr. Ure says :—"If the temperature be raised too slowly, the neck of the bottle might be filled with camphor before the heat had acquired the proper subliming pitch; and if too quickly, the whole contents might be exploded. If the operation be carried on languidly, and the heat of the upper part of the bottle be somewhat under the melting point of camphor, that is to say, a little under 350 deg., the condensed camphor would be snowy, and not sufficiently compact and transparent to be saleable. Occasionally, sudden alternations of temperature cause little jets to be thrown up out of the liquid camphor at the bottom upon the cake formed above, which soil it, and render its re-sublimation necessary."

The vessels being removed from the sand bath, the mouth is closed with tow, and in this hot state water is sprinkled over them and they crack. When quite cold, the cake of camphor, weighing about eleven pounds, is removed, and trimmed, by paring and scraping into the form of large hemispherical cakes, perforated in the middle. In this process the lime retains the impurities and a portion of the camphor; the latter is recovered by heating the mixture in an iron pot, with a head to it, and the product is refined by a second sublimation.

The factory where camphor is refined has its temperature maintained at about 150 deg., and the atmosphere is generally charged with camphor vapor. The sand baths are therefore heated in baths of fusible metal, kept at a proper temperature from a furnace outside. Each bambolo or flask is covered with a glass shade to prevent the escape of as much vapor as possible, and also to exclude the air, which would render the camphor opaque. There is also an essential oil contained in crude camphor which is driven off before sublimation.

Camphor is a hydrocarbon (C.10, H.8, O.) and as sold by druggists, is a white and semi-transparent solid, of a crystalline fracture, a peculiarly fragrant odor, and a warm, pungent, and somewhat bitterish taste, accompanied by a sense of coldness on the tongue. It is soft and tough, but can be readily pulverized if moistened with a few drops of spirits of wine. It evaporates in the air at ordinary temperatures, and gradually sublimes in close vessels, and attches itself to the surfaces most exposed to the light. If a vessel exhausted of air, and containing a piece of camphor, be exposed to the direct rays of the sun, these crystals will be formed speedily. When small pieces of perfectly clean camphor are allowed to fall upon the surface of pure water, they rotate and move about with great rapidity, sometimes for several hours together; but if, while the camphor is rotating, the surface of the water be touched with a greasy substance (a glass rod dipped in turpentine answers best,) all the floating particles quickly dart back, and are instantly deprived of all motion. The motions of the camphor are accelerated by placing the glass in vacuo. Camphor fuses at 347 deg., and boils at 400 deg., when it may be distilled without decomposition. The density of camphor vapor is 5·27. Camphor is sparingly soluble in water, 1 part of camphor requiring about 1,000 parts of water for solution. This aqueous solution is named camphor julep. It is very soluble in alcohol, ether, acetic acid, sulphuret of caabon, and some other substances. 100 parts of spirits of wine (specific gravity 0·806) dissolve 120 of camphor, forming the camphorated spirit of the Pharmacopœia. On adding water to this, nearly all the camphor is thrown down in a minutely divided state. Considerable use is made of camphor in medicine, both as an internal and an external remedy.

Lima Beans and Sunflowers.

Messrs. Editors—Every body who reads the Scientific American (and who does not?) understands very well that what you don't know is not worth looking after. In fact, your paper is with us a kind of scientific Bible, a perfect rule of action in all cases, one in which we can confide with the full assurance that we shall never be led astray. But the story in No. 48 of the Lima beans and the sunflowers rather puzzles us "Down Easters;" and we respectfully ask you to explain. What we want to know is, whether in case the bean had grown the fastest, the sunflower would not have been the victim, and been pulled up, or whether this method of poling beans belongs to that class of rules that works both ways? Don't think for a moment that we doubt the story—no, indeed! But do tell us how it is done, so that if we try the experiment, we can so manage the process that the bean and the sunflower shall harmonize, and we secure a crop of both.

J. R. M., and Others.

Bangor, Me., Aug. 11, 1855.

[We recommend our friends to sit on the sunflower by turns, during its growth. This will crowd down or check the too rapid elevation of its stalk, and undoubtedly enable them to harvest both crops with success.—Eds.