THE CELESTIAL WORLD.

A PARTIAL SOLAR ECLIPSE.

The second of the five eclipses of 1888 occurs on February 11. The sun is then partially eclipsed. The phenomenon is invisible in this country, but visible in the extreme southern part of South America, in the South Pacific Ocean, and at the South Pole. There is little interest attached to this eclipse, except that it forms one of the five eclipses of the present year. These five eclipses are the return of the five eclipses of 1870. A cycle of eclipses has been completed since that time. The ancient astronomers knew that after the lapse of a certain period the sun and moon returned to nearly the same position in regard to each other, and learned to compute eclipses from data thus obtained. The period was called the Saros, and takes, on the average, 18 y. 11 d. 7 or 8 h. for its completion, when a new cycle of eclipses occurs under nearly the same conditions.

The time, place of visibility, and the magnitude of the eclipse vary, but the general law is invariable. The eclipses of 1870 are repeated in 1888.

I. The total eclipse of the moon of January 28 was the same eclipse that occurred January 17, 1870, the interval being 18 y. 11 d. 8 h. 33 m.

II. The partial eclipse of the sun, February 11, repeats the eclipse of January 31, 1870, the interval being 18 y. 11 d. 8 h. 12 m.

III. The partial eclipse of the sun of July 8 and 9 repeats the eclipse of June 28, 1870, the interval being 18 y. 11 d. 6 h. 44 m.

IV. The total eclipse of the moon of July 22 and 23 repeats the eclipse of June 28, 1870, the interval being 18 y. 11 d. 7 h. 10 m.

V. The partial eclipse of the sun of August 7 repeats the eclipse of July 28, 1870, the interval being 18 y. 11 d. 7 h. 4 m.

COMETS OF 1887.

The first comet of the year, Comet *a*, was discovered on January 18 by Dr. Thome, of the Cordoba Observatory, Argentine Republic. It was a beautiful and conspicuous object in the southern hemisphere, with its tail 40° long, but refused to gladden the eyes of northern observers. The second comet, known on the records as Comet *b*, was picked up by Prof. Brooks, of Phelps, N. Y., on January 22, but was too small to be of much account. The third new comer in the cometic family was Comet *c*, detected by Prof. Barnard, of Nashville, Tenn. The same diligent observer found the fourth comet of the year, or Comet *d*, on February 16, and the fifth comet, or Comet *e*, on May 10. They were all telescopic comets, of little special interest or importance.

Prof. Brooks had the good fortune to detect the cometic prize of the year in the sixth comet, or Comet *f*. It proved to be the much wished for comet of 1815, or Olbers comet, on its first predicted return, after an absence of 72 years. It is also known as the Olbers-Brooks comet.

THE NEW ASTEROIDS OF 1887.

The family of asteroids was increased by the addition of seven members during the year 1887, so that it numbered at the close of the year 271 of these minor planets, the supply thus far seeming to have no end. No. 265, named Anna, was detected on February 25, by the indefatigable asteroid hunter Palisa, of Vienna. No. 266, rejoicing in the name of Aline, was found by Palisa on May 17. No. 267, Tirza, was picked up by Charlois, of Nice, on May 27. No. 268, still nameless, was discovered by Borelly, of Marseilles, on June 9. No. 269, nameless, was the third celestial prize won by Palisa, on September 21. No. 270, Anahita, was found by Peters, of Clinton, on October 8. No. 271, nameless, was discovered by Knorre, of Berlin, on October 16.

THE SATELLITE OF VENUS.

Observers, more than a hundred years ago, saw a small star in the neighborhood of Venus that bore many marks of being a satellite. If it had remained visible all the time, it would have been a satellite without doubt. The facts, however, that it was only seen at intervals, separated sometimes by twenty or fifty years, that the observations made were consistent with no possible orbit, and that it had not been seen for more than a hundred years, prove conclusively that it was not a real satellite. Many theories have been broached to account for the observations, but none of them has hitherto been tenable, and the enigmatical satellite of Venus has been considered one of the unsolved problems of astronomy.

A nearly satisfactory solution of the vexed question seems now to have been reached. M. Stroobant has found the key to the puzzle. He has sent a paper to the Belgian Academy of Sciences proving that in many instances the supposed satellite was actually a star. He was led to this conclusion by a thorough examination of all the appearances of the supposed satellite. He has embodied the result of his labor in a chart, extending from 1645 to 1768, including thirty-three dates, divided into eleven series, adding, in the form of an appendix, the requisite particulars referring to Venus, presenting an abstract of the theories invented to account for the satellite, reprinting the original observations and illustrating his own work by a series of star maps.

The conclusion of the whole matter is that, in several instances, Stroobant has identified the pretended satellite with small stars in the neighborhood of Venus at the time. In the observation of Horrebow, in 1768, he found the star to be Theta Librae, while in this, as well as in other cases, the observed movement of the satellite is precisely the opposite to the proper movement of Venus in relation to the star.

Theories usually have some drawbacks, and Stroobant's theory is no exception to the general law. One series of observations made in 1764 are still unexplained. It is not impossible that one of the brightest asteroids was near enough to the planet to be seen in the same field. The objection that some of the stars examined are too small to have been visible near the planet has been refuted by M. Stroobant, who found that by using a telescope of six inches aperture, stars of the eighth or ninth magnitude can be seen near Venus when she is not in her brightest phase.

It looks, therefore, as if this long pending mystery concerning Venus and her supposed satellite was in a fair way of being cleared up. The theory commends itself for its naturalness and simplicity.

Military Notes.

The experiment, begun some time ago in the German infantry, of doing away with socks and keeping the foot soldiers' feet well greased, has proved thoroughly successful. To say nothing of the economy of the plan, the men march easier, and, generally speaking, show few blisters. So, too, lifting the foot high; the regulation step now is said to make the most awkward Pomeranian or Hanoverian peasant fairly sure footed, while before its adoption 25 per cent of such men would stumble in a charge over rough ground, and about 10 per cent fall.

The report sent hither as to the performance of the Nordenfelt submarine torpedo boat at the recent official trial, and the order given by the British government for a fleet of them, seems to be a mistake. The craft only repeated what she did six months ago at Kronstadt—sunk out of sight readily and maneuvered in the subcurrent. She was not, however, able to affix a torpedo to the hull of an anchored ship without giving the hostile crew ample warning of her intention and movements. This and the fact that she has no defense against machine guns proved, in the judgment of the Admiralty board, sufficient to preclude her adoption, at least until the type to which she belongs shall have been further developed.

"Kriegspiel" (the game of war) is becoming almost as popular among British troops as it is in Germany, where it was invented. There is scarcely a regimental headquarters that has not the maps and blocks and lead soldiers of which the game is composed, and now the company and troop commanders are taking to buying them, and not a few sergeants' messes have them. "Kriegspiel," it should be explained, is really a game of instruction; having most of the advantages of a sham fight in the field, without its wear and tear, its waste of ammunition, and the delays consequent upon maneuvering in a friendly country where gardens and cultivated fields must be spared, navigation of rivers left unobstructed, and crowds of sightseers are ever in the way. Topographical maps are made of the neighboring region, usually on a scale of six inches to the mile, heights of hills and their exact contours are shown by curves, equidistant the one from the other, woods and fresh water are recorded as they exist, the depths, widths, and shore line of streams, together with the character of their bottoms, for the information of the pontoniers, are carefully laid down. The game is said to be invaluable as a means of instructing the soldier in field work and of training officers to successfully operate their commands in a strange country. The officer has his map as the pilot of a ship has his chart of a strange harbor, and, if the map is correct, it should enable him to move with as much precision and guard against certain contingencies as surely as though he were on familiar ground.

It was left for French ingenuity to find a use for dogs in war, and yet, remembering the instincts of the dog and his sagacity and faithfulness, it is surprising that no attempt till now has been made to systematize their use in outpost duty. Sentries on the outer line, as well as near the main body of an army or small body of troops, are often unobservant and sometimes sleepy, but a good dog is ever alert. Taking advantage of this, the French have organized what might be translated as a "field pack," which has been "brigaded" with the 35th of the line, now stationed at Belfort. The pack is composed of large, fierce animals, which, from the description given, would seem to be a species of mastiff, though the mastiff is known for his sagacity, strength, courage, and good disposition rather than for his scent, which is much inferior to that of hunting dogs. Curiously enough, it was Belfort, where the experiment is on trial, which the Germans so successfully "masked," and it is perhaps because the French are determined not to be again outwitted at this point that they are taking this extraordinary precaution. The dogs are deployed on advanced posts, and, while held in the slips, are taught to attack dummies wearing the Prussian helmet and uniform.

A new explosive for war purposes is described by the *MilitarWochenblatt* as composed of a carburet of hydrogen (aromatic) in solid form and concentrated nitric acid having a density of about 1·52. Separated, they are harmless; but mixed, as they are when discharged in a shell, a small glass tube of the second breaking while in flight and pouring over the carburet of hydrogen, the compound forms, it is said, a terrible explosive, which, however, must be fired by time fuse.

The Russians recently had a sham fight at Sebastopol in the Crimea. The ships anchored in the roads as were the allies in the Crimean war, sending a force ashore to assault the works. The landing was made under a heavy fire from the marine guns, and was replied to from the old Redan and the new works by what is described as a terrible crossfire concentrated, point by point, on the line of the advance from the sea. The *Wochenblatt* says that, while these guns remained in play, it is hard to see how such a maneuver as that of the Anglo-French armies could be repeated, even at night, for such is the disposition of the electric search lights that even the darkness of night would scarcely prove a sufficient cloak for such an adventure. It does not say, however, what might happen if those operating the lights were shelled out.

The *Souvenir de l'Azov* is the name of a new Russian cruiser (10,000 tons) said to be able to make 20 knots an hour readily and carry enough coal to steam 20,000 miles. She is partly armored, carries a heavy battery and two torpedo boats, and would seem, from what is said of her, to be a fine sea boat, stiff, easy, and buoyant.

The Time in which we Think.

One of the most beautiful applications of electricity which has of late been made is its use in the study of psychological phenomena. And why, indeed, is not the subtile power by which time and space are being annihilated, and human labor rendered less irksome, the most proper agent to assist man in the study of the facts of his own consciousness? In an elaborate article in the *Nineteenth Century*, Dr. J. McK. Cattell gives an account of the time measurements of thought made by means of the line drawn on a rapidly moving surface by a pen attached to the prong of a tuning fork vibrating at a constant rate, by means of electricity. By a delicate apparatus constructed on this principle, duration of time may be measured to the one ten-thousandth of a second. The writer above named has found that the process of thought varies in its degree of rapidity in different individuals, children and old persons thinking slower than people of middle age, ignorant persons thinking more slowly than educated persons. In this way he also found he could measure the time it takes to perceive, that is, the time which passes from the moment when the impression reaches consciousness until the moment at which we know what it is. In his own case he found that it took 1-20 second to see white light, 1-10 second to see a picture, 1-8 to see a letter, and 1-7 to see a word. It takes longer to see a rare word than a common word, or a word in a foreign language than in our native tongue. It even takes longer to see some letters than others. "Will time," or time taken up in choosing, can be measured. It takes 1-13 second to judge between blue and red. To recall the name of a printed word takes 1-9 second, to a letter 1-6 second, to a picture 1 4 second. It takes less time to remember the name of a familiar word than of a letter, though it takes less time to see the letter. The time of remembering can be measured. It takes 1-4 second to translate a word from one language to another when you are familiar with both. It takes 1-20 second longer to translate a word from a foreign language to your native tongue than it does in the other direction. We can think of the name of the next month in half the time we can think of the last month. It has been demonstrated that sensation does not travel through the nerves to the brain so fast as has been supposed. Its speed is not much greater than sixty miles an hour. —*Light and Heat.*

Bessemer Steel Rails.

According to the Bulletin of the American Iron and Steel Association, the production of steel rails by our Bessemer steel works in the first half of 1887 was 1,030,530 gross tons, and in the second half of 1887 it was 1,019,103 tons, or 2,049,638 gross tons in the whole year. The result was 487,228 tons greater than in 1886.

The new year, says the Bulletin, does not open auspiciously for our steel rail friends. Many large orders are still withheld, and the works which closed down in December are still idle.

Old Ants and Aged Spiders.

Dr. H. C. McCook, in an interesting paper lately read before the Philadelphia Academy of Sciences, and reported in the *Ledger*, gave an account of the life history of a fine specimen of the spider commonly known as the American tarantula. The animal was given to him in 1882 by Dr. Joseph Leidy. It was then apparently 18 months or 2 years old, and it lived in captivity until July, 1887. At the period of its death, therefore, it must have been at least 7 years old, and may have been 8, having thus attained the distinction of being the most aged spider known to science. How long this species and other spiders generally live in their natural habitat is not known, but human protection in the present instance probably aided to prolong life. It was kept first in a glass globe, and afterward in a wooden box, with glazed sides and a sliding glass door at the top. One end was filled with dry soil, which was slightly compacted and heaped up. The other end was sparsely covered with earth. It was at all times liberally supplied with water, and its food consisted of live flies, grasshoppers, and locusts. During confinement the tarantula shed its skin several times, a process apparently attended with some danger, as it was during such a change the creature died; and once before, on a similar occasion, it was found apparently dead, although it afterward revived. It is possible that it was too much exhausted by long previous fasting to endure the severe strain which evidently is laid upon the organism in the act of moulting. The spring of 1887 was a backward one, and some difficulty was experienced in procuring insects for food from the immediate neighborhood. The annual supply of grasshoppers and locusts was very late, and it may be that, had the spider been strengthened by a few weeks' generous feeding previous to its last moult, it might have been still alive.

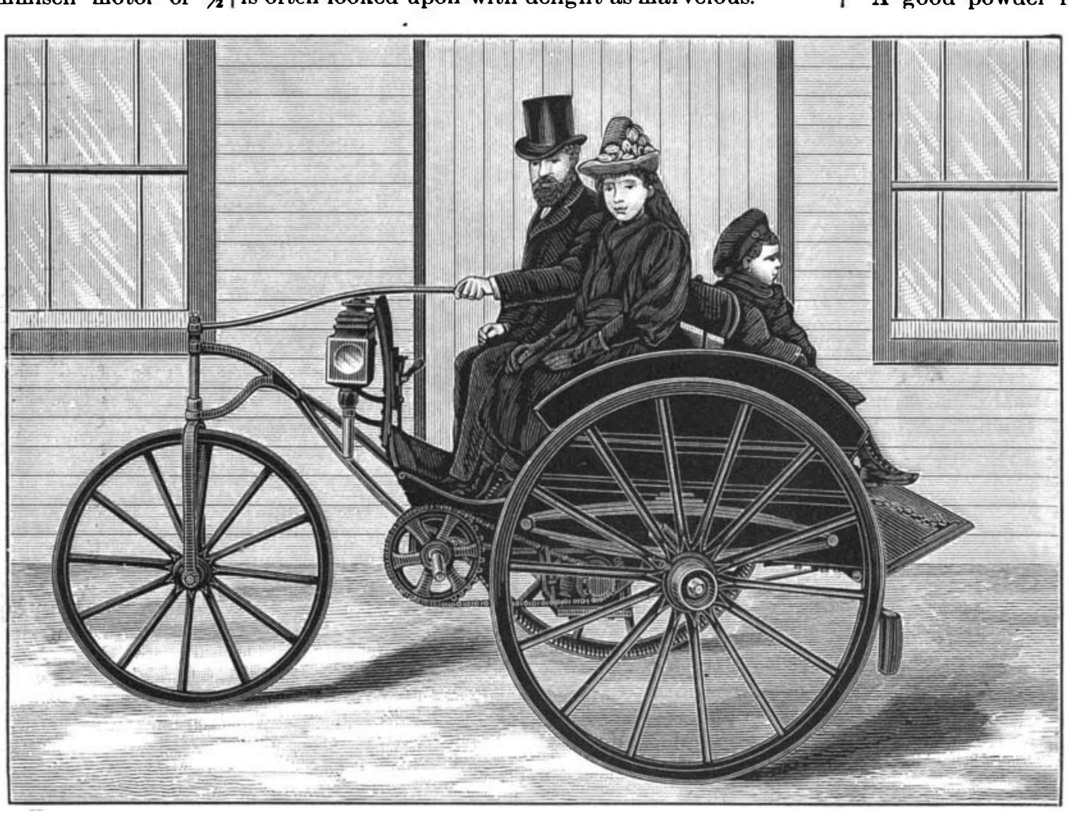
In connection with the general subject of the prolonged life of insects, Dr. McCook stated that during a recent visit to Sir John Lubbock at his house in London he inquired after a queen of the fuscous ant, which he had seen in an artificial formicary six years ago, it being then nearly 8 years old. He was told by his host that it had died the day before, having at the time reached the wonderful age of more than 13 years. She was still attended by her circle of courtiers. Some of these were licking the dead queen, or touching her with their antennæ, and making other demonstrations as though soliciting her attention, or desiring to wake her out of sleep. It was certainly a touching sight to witness these faithful attendants surrounding the dead body of one who had so long presided over the maternal destinies of the colony, and seeking by their caresses to evoke the attention which never again could respond to their solicitations.

AN ELECTRIC CARRIAGE.

Mr. Magnus Volk, of the Brighton Electric Railway, has recently turned his attention to the application of electric traction to vehicles running upon ordinary roads. The dog cart represented in the adjoining engraving was built by Messrs. Pack, coach builders of Brighton, and is driven by an Immisch motor of $\frac{1}{2}$ horse power type. The current is supplied by 16 E. P. S. accumulators, which at the normal rate of discharge are good for a six hours' run. The cells are placed under the seats. The motor is supported by hangers under the body of the car, and drives on to a countershaft in front by a Renold's steel link chain. Upon the inner side of the rim of the right hand wheel, which is four feet in diameter, are a number of blocks fixed about one foot apart, and a second steel chain passes from the countershaft around these blocks. The arrangement is neat in appearance, and has the advantage of reducing the weight of the gear to a minimum.

The motor at present employed weighs 40 pounds, though it is scarcely large enough for the work it has to do. The experiments so far made have resulted in obtaining valuable data as to the tractive force required for vehicles on roads of various kinds. On asphalt the tractive force is less than on a grooved rail, and a speed of nine miles an hour can be obtained, whereas on a soft macadam road only four miles an hour is possible. With a load of two persons a grade of 1 in 30 can be surmounted.

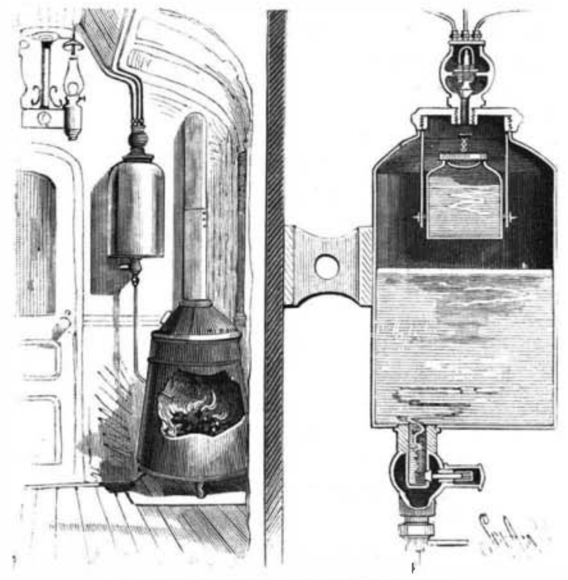
The vehicle is the object of much attention just now in Brighton, and taken altogether as a first experiment the results may be considered to be interesting and satisfactory.—*The Electrician.*



AN ELECTRIC CARRIAGE.

AN IMPROVED FIRE EXTINGUISHER.

A fire extinguisher especially designed for use in connection with car heaters and lamps, by which the fire in either or both will be put out when the car is upset or subjected to a particularly violent concussion, is illustrated herewith, and has been patented by Mr. William H. Durant, of Concord, N. H. It consists of a tank containing a solution of bicarbonate of soda dissolved in water, with a valve in its bottom and pipes leading therefrom to the interior of the car stove or heater,



DURANT'S FIRE EXTINGUISHER.

while in the top portion of the tank a small vessel is held suspended containing sulphuric acid, which, when emptied into the bicarbonate of soda, produces carbonic acid gas. The sulphuric acid vessel is supported on trunnions in such way as to be overturned by a severe concussion, by which its stopper will be withdrawn and the acid allowed to flow into the tank, where the pressure produced by the consequent production of carbonic acid gas will force open the valve at the bottom, connected with pipes leading to the car heater, and the fire-extinguishing gas is thus conducted to outlets in proximity to the grate bars. A small extinguisher of this kind may also be readily applied to lamps, the extinguisher for a four-bracket light being placed in the center, with tubes leading over the mouth of the smoke bells to the lamp chimneys.

Jewelry Repairing.

Probably there is not anything upon which the reputation of a keeper of a jewelry store is more easily built up than the neat and substantial repairing of the jewelry of his patrons. The intrinsic value of a filled ring may be almost nothing, but to the owner it is surrounded by a halo of associations which give it priceless worth, and if broken by accident, its neat repairing is very highly appreciated. So, also, the cleaning of jewelry, which through discoloration has lost its beauty, is often looked upon with delight as marvelous.

Perhaps a few hints on this subject may be of use to some who have met with difficulty in making repairs to their satisfaction.

It is of the utmost importance that the use of soft solder be avoided as far as possible in repairing articles made of gold or silver, and even filled and plated jewelry may be repaired with hard solder.

To repair a ring, the shank of which requires soldering, bury the head in a crucible full of wet sand, place a small piece of charcoal against one side, coat the break, previously cleaned by filing or scraping, with borax, and charge with solder; blow a flame against the ring and charcoal until the solder runs in. For articles which require to be protected against discoloring in the process of soldering, coat them with a mixture of burnt yellow ocher and borax, adding a little dissolved gum tragacanth to make it lie all over, allow it to dry, then charge with borax and solder and heat sufficiently. Boil out in weak pickle made of nitric or sulphuric acid. One important point is to wash the piece well in hot water with a little ammonia in it before attempting any repairs. This removes all dirt and grease, which, if burned on, cannot be removed.

If the article be of colored gold, boil out in pickle made of muriatic acid, and never coat with any protecting mixture. The solder must vary in regard to fusibility according to the quality of the article. For repairing most filled work, very easily melted solder is required, which may be made of 1 ounce of fine silver, 10 pennyweights hard brass wire, adding 2 pennyweights zinc just before pouring; or, to make it more fusible, use bar tin instead of zinc; or, for stronger silver solder, use only the silver and brass. For repairing most bright gold work, use gold coin, 3 pennyweights; fine silver, 3 pennyweights; fine copper, 2 pennyweights. For colored work, fine gold, 1 pennyweight; silver, 17 grains; copper, 12 grains; hard brass wire, 2 grains.

A good solder for repairing spectacles or other steel work is made by melting together equal parts of silver and copper. In soldering steel, plenty of borax should be used.

Very often the want of a rolling mill is a great obstacle to the making of solder, but it may be flattened very thin, although not with great regularity, by pouring on to a flat piece of wood, and putting on it the flat surface of a piece of iron while it is still in a melted condition; a piece of cigar box is good to pour it on, as the odor emitted is not very disagreeable, and the solder may be melted in the hollow of a piece of charcoal, by using gas and a blowpipe.

For cleaning colored gold, a mixture of one pound sal soda, one pound chloride of lime and one quart of water will be found useful. It should be placed outside the building after mixing, and when settled the water poured off and the sediment thrown away; with great care this may be used for cleaning gilt bronzes and cheap gold and plated jewelry, but caution is necessary, as it will corrode brass very rapidly.

To remove lead solder from badly repaired jewelry, place the piece in muriatic acid and leave till the lead is eaten away. It is best always to heat the piece gently and brush off the lead, while melted, before subjecting the piece to the action of the acid, as too long a steeping is not desirable.

Set pearls, which have become discolored by wear, may often be improved by placing in a covered vessel with a mixture of whiting, ammonia, and water, and permitting them to remain for a few hours.

A good powder for cleaning jewelry, silver watch cases, etc., is made by mixing about four parts of whiting with one of rouge, using with alcohol or water; this, it will be found, is easily brushed out of crevices, engravings, etc.

Many are not aware of the fact that gold and jet jewelry, which has been worn so much for years, can be hard-soldered with easy-running solder without removing the jets, but it is easily accomplished by coating the gold with ocher, and laying the piece with the jets up while soldering, care being taken not to smoke the jets. An alcohol lamp is perhaps preferable to gas for this purpose, but in most cases gas answers best for soldering.—*Jewelry News.*

A SUBSTITUTE for gum arabic, patented in Germany, is made as follows: Twenty parts of powdered sugar are boiled with 7 parts of fresh milk, and this is then mixed with 50 parts of a 36 per cent solution of silicate of sodium, the mixture being then cooled to 122° Fah. and poured into tin boxes, where granular masses will gradually separate out, which look very much like pieces of gum arabic. This artificial gum copiously and instantly reduces Fehling's solution, so that if mixed with powdered gum arabic as an adulterant, its presence could be easily detected. The presence of silicate of sodium in the ash would also confirm the presence of adulteration.