MISCELLANEOUS.

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Lectures on Chemistry.---No. 3.

[An abstract of a Lecture on Chemical Affinity, delivered before the Mechanics' Institute, at Cincinnati, Ohio, by Prof. Chas. W. Wright.]

Chemical affinity is the attraction of the particles of different kinds of matter for each other, which is exhibited when the particles are in apparent contact only, and the manifestation of it is attended with the evolution of heat, electricity, and sometimes light, together with some one of the following changes, viz., of form, volume, color, density, or chemical properties.

Solution differs from chemical affinity in taking place between bodies possessing similar properties, whereas bodies are more disposed to combine chemically with each other the more unlike their properties. Thus, ether and alcohol dissolve the essential oils, as that of lavender, rosemary, &c., but acids and bases combine, forming a salt, which differ as much from their components, as they differ in chemical properties from each other.

Cohesion is exhibited when two pieces of iron are welded together—their properties are not changed in the least by the operation. The force that binds brick and mortar together, from its taking place between different kinds of matter, without changing the properties of the bodies concerned in the least, is termed "adhesion;" it is probably a modification of cohesion.

The Attraction of Gravitation is exerted at all distances, however great, and therein differs from chemical attraction, which is manifested only at insensible distances, or when the particles of matter are in apparent contact, and has no power in causing bodies to approach each other which are not in contact.

The circumstances which promote chemical action are, first, the fluid state:—in the fluid state the cohesive force is less, and there is a mobility of the particles of matter that allows of their juxtaposition. Thus, when carbonate of soda and tartaric acid are brought together in a dry state, there is no chemical decomposition, but the moment they are dissolved in water there is a brisk effervesence, from the escape of carbonic acid, and tartarate of soda is formed. An experiment of this kind is made in the preparation of extemporaneous soda water and in the making of soda biscuit. In fact, in almost all cases of chemical action, one or both of the bodies concerned must be in the fluid state. Of the three physical forms of matter, namely, the solid, the liquid, and the gaseous,—the liquid is the most favorable to the display of chemical affinity.

2nd. Certain allotropic states,—Chlorine, when prepared in the dark, and excluded from the action of the sun's rays, has little affinity for other bodies, and will not bleach; but, when exposed to the light for a certain time, it becomes one of the most active substances in chemistry. When one body is in the act of being liberated from another it is more active than when it has existed in a free state for a certain period. This is seen in the union of nitrogen and oxygen, in the formation of nitric acid. These bodies have no disposition to combine when mingled in the gaseous form, but when nitrogen is in the act of being liberated from decomposing organic matter, they readily enter into combination, and in this way all of the nitre that is found in nature is formed, with the exception of a small amount formed by the atmospheric electricity. The term "nascent" was formerly used to express this active state of nitrogen.

3rd. Heat—Heat favors chemical action by overcoming cohesion and promoting fluidity. Thus, when potash or soda is fused in contact with silicic acid, of which we have an example of the latter substance in common sand, which is really an insoluble acid, they unite and form glass. Heat, however, does not always bring about chemical action by overcoming cohesion, as when hydrogen and oxygen gases, in which there is no cohesion, are made to combine by it.

4th. Electricity—This is instanced when hydrogen and oxygen gases are exploded by the electric spark.

5th. Light—When chlorine and hydrogen gases are mingled and exposed to the direct rays of the sun, they unite with explosive violence, but they may be kept any length of time without combining, if excluded from the light.

6th. Catalysis—Thus, when a strip of platinum is introduced into a mixture of oxygen and hydrogen, its presence causes them to combine without undergoing the slightest change itself. There are many examples of this contact action in chemistry, they are, however, wholly inexplicable.

Circumstances which retard chemical action—These are, 1st. Cold—The absence of heat, by favoring cohesion, and converting liquids into solids, arrests chemical action. We have examples of this in the consolidation of the water which exists in organic matter, as that of flesh for instance, which, when frozen, never putrefies, and can be kept any length of time. The mastodon which was found some years ago, near the North Pole, is a notable example of the influence of cold in retarding chemical action. This animal, which belonged to a former period of the earth's history, remained for ages entombed in a huge mass of ice, and when first found the flesh was but little decayed, putrefactive decomposition having been prevented by the intense cold of the region in which it was found.

2nd. Dryness—By preventing the mobility of the particles of matter, dryness, or the absence of the fluid state, is opposed to chemical action. This fact is turned to practical account in the preservation of meats, fruit, &c., by depriving them of the greater portion of the water which they contain.

3rd. Elasticity, or the Gaseous State—Elasticity, or the gaseous state, is not so favorable to chemical action as the fluid form, the particles of matter being too widely separared to act freely upon one another.

Chemical Affinity under Extremes of Temperature—Geology teaches us that the earth, at an early period, was in a state of igneous fusion, and that all the water surrounding it existed in the atmosphere as transparent vapor, consequently many substances that are now fonnd upon the surface of the earth had no existence then. All that class of salts called the nitrates, of which common nitre or saltpetre is an example, were not then formed, as they are all decomposed at a red heat. Of the classes of phosphates, the monobasic are the only ones that could have existed, as all of the others are decomposed by an elevated temperature, and the same remarks will apply to many other salts, and to all organic compounds. Even at the present temperature there are substances in certain parts of the earth, which do not exist in others. Thus it was observed by Prof. Horsford, that ozone was destroyed by a temperature of 140°, and as a temperature as high as that frequently exists in some parts of Australia, according to Gould, ozone in such localities must necessarily be destroyed. Epidemic diseases may thus have their origin in the developement of new compounds, from time to time, in the atmosphere. In the glacial ages of the world, almost all of the water upon the surface of the earth existed only in the solid state.

M. Petin's Balloon Ascension.

M. Petin, the French aeronaut, made an ascension from New Orleans on Saturday, Dec. 25th, 1852, with three companions. Mons. Petin says that he attained the great elevation of twenty thousand feet, at which height the pressure on the lungs was so great that it was with great difficulty that they could speak. During the ascent he encountered no less than six different currents of air, that from east to west being the strongest, but that at no time did he find any difficulty in directing the course of his frail bark at will. It was the intention of the navigator to have made a landing on the coast of Florida, but upon throwing over a bag of ballast for the purpose of lightening his car, the hook of the bag caught upon some of the rigging attached to the balloon, below and out of his reach, thus rendering the descent into the waters of Lake Borgne unavoidable. The point at which they struck the water was near a hundred miles from the city, which space had been traversed in less than one hour. Upon touching the water, the car, which was heavily ballasted, sank immediately, immersing the voyagers in the water, but with presence of mind they clung to the fastenings of the balloon, until the car having discharged itself of its contents, rose bottom upwards, when they seated themselves upon the bottom and there remained until rescued from their perilous position, after being twenty-five minutes in the water, by the steamboat Alabama.

Powder Mill Explosion.

A dreadful accident of the above description occurred on the 7th inst., at Acton, Mass., by which several workmen were blown to pieces. The locality is known as Pratt's Powder Mills, and the manufacture is carried on in several detached buildings situated at a small distance from each other.

Some workmen in the Kernel-house—the fifth building from the main road and from the dwelling house—were employed in work upon a cylinder, when, doubtless, (for no one is left to tell the tale), a spark from a chisel falling upon the combustible material, an awful explosion took place, instantly killing the men, whose names were Hudson, Balcombe, and Hanscom, two of whom were married and leave families. The Kernel-house is usually considered the most dangerous of the several houses, and it contained, at this time, as commonly, a considerable amount of powder. The occurrence of this tragedy was, of course, instantaneous, and its consequences quite inconceivable to those who have never witnessed a scene of this description.

Next the kernel-house was on the west side a mixing house, and this quite near; the explosive force forming a vacuum, the sides of the mixing house from the pressure of the air inside were instantly driven out, and the atmosphere, full of fire and cinders entering at an interval of some three seconds, as it is said, this house also exploded. The press-house (as it is called) is placed further off from the kernel-house than the last named, toward the east, and this distance doubtless saved the powder in it from exploding, though the boarding is mostly forced from its sides, and it is in fact a nearly complete wreck.

Of the kernel-house it may be said, it is swept absolutely clean off from the very foundation; the water dam, timbers, and all the machinery scattered to the four quarters of Heaven. The meadow adjoining has the appearance of being thickly sown over with fragments of boards and pieces of timber, while large portions of the roof lay in masses. On the top of the range of hills several large pieces of timber were carried, and countless smaller bits. The mixing house is not so utterly and entirely dispersed, but its timber and machinery (or what is left of it) lies a heap of smoking and blackened ruins. All the remains of these are as completely blackened over by the powder (not charred) as if the process had been effected by the brush of some diligent painter. Words cannot convey a faint impression of the scene of this fearful tragedy. In the workmen's dwellings near the mills the force of the concussion was very great. The window-glass was broken, the furniture shaken, and persons who were near thrown over. Some part of a chimney at the distance of half a mile was thrown off, and in fact at several miles distance the shock was very perceptible.

Georgia Central Railroad.

The Central Railroad of Georgia has been very prosperous during the past year, the aggregate earnings having been $945,508 28—leaving, after all expenses paid, a net profit of $507,625 78; the increase of gross receipts over those of the previous year, are $197,300 42. Out of the above a dividend of $139,858 has been declared for the past year. The locomotives belonging to the company amount to 46, of which number nine are new, twenty-eight are in good order, and in constant service, four are in the shop for alterations and repairs, and five are condemned. It is recommended that, for the ensuing year, fourteen additional engines be purchased, and that six passenger and one hundred burthen cars be constructed. Some damage was done by the late freshet, but not to such an extent as was apprehended. The light T rail now laid down it is proposed to supersede by a heavier article of the same kind.

Patent Matters in Congress.

Russia Sheet Iron—A memorial has been presented to the Senate, by B. F. Gould, of Conn., alleging that he has discovered the means of manufacturing American fine sheet-iron, fully equal to the best Russia sheet-iron, and praying for the patronage and protection of the Government; which was referred to the Committee of Finance.

Ether Controversy.—A memorial has been presented to the Senate, by the heirs and friends of Dr. Horace Wells, of Hartford, Ct., for compensation, arising from the discovery of anæsthetic agents in Surgery, by Dr. H. Wells. On the presentation of this petition it elicited a debate of considerable length, wherein it came out that, at the last session of Congress, the matter was referred to a select committee of the House. The majority made a report in favor of Dr. Morton's claims, and the minority against them. No testimony was taken in favor of Dr. Wells' claims. The reports were not presented, but somehow the favorable one was obtained by Dr. Morton, who got it published, The whole case will now undergo a thorough investigation. We hope that every item of testimony on behalf of all the claimants,—viz., Dr. Jackson, Mr. Morton, and Dr. Wells' heirs, will be presented, and weighed with the strictest impartiality.

Silk Worms.

The breeding of silk-worms is becoming an important branch of industry in Germany; and is so in the northern as well as the southern parts, though the general impression is that silk worms cannot thrive in a northern temperature. The first attempts to establish this branch of industry in the north were made by French Protestant refugees in the District of Wurtzburg, in 1594, and they were encouraged by the Prussian Sovereigns. In the middle of the seventh century, the ramparts of Petz and the environs of Frankfort on the Oder, were planted with mulberry trees, and in the following century Frederick the Great caused plantations to be made at Cœpnik, Potsdam, and in the immediate vicinity of Berlin. Since 1821 the production of silk has become considerable, not only in Prussia, but in the other States of the Zollverein; the annual production is at present several thousand pounds. In quality it is remarkably white, and finer then that in the southern countries; and Berlin manufacturers say that if enough of it could be obtained, they would not apply to the producers of Lombardy.

From Berlin and Potsdam the cultivation of mulberry trees gradually extended to Silesia and Hanover. It is schoolmasters who chiefly occupy themselves with it—one of their body having in the eighteenth century commenced it as a means of adding to his income; and some of these persons now gain from 20 to 80 thalers annually. Several of the German Governments encourage the productions of silk by granting premiums, and causing societies of patronage to be formed. A short time ago, the Minister of Commerce recommended that the sides of all the railways should be planted with mulberry trees. The King of Wurtemberg has caused the French translation of the Chinese treatise on the breeding of silkworms to be translated into German, and to be extensively circulated at Dresden.

In the Grand Duchy of Baden the roads and the sides of the railways have been planted with mulberry trees, and in the village of Ilgen, near Heidelberg, the breeding of worms has been carried on, during the last twelve years, on an extensive scale. Austria, on its part, is sparing no pains to increase its production, which already amounts to about 100,000,000f. annually—one half coming from Lombardy alone. On the military frontier of Turkey a garden of mulberry trees has been established in every village, and the military colonists are encouraged to extend the cultivation. At Prague the fosses of the fortifications have been planted with mulberry trees, and orders have been given that such trees shall also be planted by the side of all the railways in the monarchy.

The average price of gas in England is $1,20 per thousand cubic feet; this is less by $2,60 than it is in New York City. All the working people there burn it.