NOTES ON NEW DISCOVERIES AND NEW APPLICATIONS OF SCIENCE.

IS NITROGEN AN ELEMENT?

Chemistry and astronomy unquestionably stand out from among the sisterhood of the sciences as being the two which of late years have made by far the greatest progress, and are still advancing with the most rapid strides. Scarcely an hour has passed during the current century, and certainly not an hour passes now, without adding some new fact to the vast stores of knowledge which it is the province, on the one hand of the chemist, and on the other of the astronomer, to study and increase. And it is curious to note how the two sciences help each other. There exists, indeed—so, at least, it seems to us—such a perfect "correspondence," to use that word in the sense in which Swedenborg employs it, between the laws which govern the great orbs of which it is the object of the astronomer to learn all he can and those which rule the minute atoms into whose properties the chemist inquires, as must necessarily insure, when it shall be fully recognized, that any step forward taken by the student of the former shall be a step forward for the student of the latter also, and *vice versa*. We have not yet got to that point, but already it has begun to be not unfrequently the case that observations made from the astronomer's watchtower confirm and support those made in the chemist's laboratory. The latest instance of this has reference to the constitution of nitrogen, and is afforded by Mr. Huggins's observation of the spectra of some of the nebulæ, taken in connection with certain observations of the nitrogen spectrum which have recently been made in the laboratory of M. Waltenhofen. It consists simply in the fact that Mr. Huggins and M. Waltenhofen have both been lead to the suspicion that nitrogen is not an elementary substance, but a compound of more simple forms of matter—the former by observing in the spectra of some of the nebulæ some, but not all, of the lines of the nitrogen spectrum, just as though nitrogen were a compound body, and those nebulæ contained, among the materials of which they are composed, one of its constituents and not the other, and the latter by the discovery that in a highly rarified nitrogen atmosphere the violet rays disappear before the blue and green rays.

MECHANICAL POWER FROM SUNSHINE.

M. Babinet has communicated to the Academy of Sciences an account of some experiments by M. Mouchot, Professor of Mathematics at Alencon, on the mechanical effects produced by confined air heated by the rays of the sun. In these experiments M. Mouchot employed a cylindrical vessel of thin silver, blackened on the outside, and inclosed within two cyliuders of glass, placed one inside the other. The office of the glass cylinders, of course, was to prevent the heat which might pass through them to the blackened silver cylinder being radiated back again—glass, while affording a free passage to the direct rays of the sun, being practically opaque to radiant heat. The silver cylinder was half filled with water, and an airtight cover was then fitted on it; a tube, fitted with a stopcock, passing vertically through this cover to very nearly the bottom of the vessel. Thus arranged, the apparatus was placed in the sun, whereupon the air in the upper part of the vessel speedily became heated sufficiently to cause it to exert so much pressure on the water under it, that the latter, on the stopcock in the tube passing through the cover of the vessel being opened, escaped in a jet more than ten meters high. This very remarkable result lead M. Mouchot to construct an apparatus on the same plan which yielded a continuous jet of water as long as the sun was shining on it. M. Babinet is of the opinion that machines on this principle might be found useful for raising water on the great scale in tropical countries.

ALLOY FOR BEER TAPS.

M. Vigouroux, of Nimes, has devoted much attention to the production of a white alloy suitable for taps for wine and beer barrels, etc., and he has found that alloys of tin, antimony, and nickel answer the purpose best. For the body of the tap he prefers an alloy consisting, per thousand parts, of 785 parts tin, 195 antimony, and 20 nickel, and for the key an alloy of either 807 parts tin, 175 parts antimony, and 18 parts nickel, or of 715 parts tin, 215 parts antimony, and 70 parts nickel. These alloys are quite inoxidable under any ordinary circumstances, and, although containing antimony, are otherwise quite harmless, not being acted upon in the least by any of the elements of ordinary beverages.

ANOTHER METHOD OF OBTAINING ZIRCONIUM.

We mentioned some little time back that M. Troost had obtained zirconium in crystalline laminæ by heating, in a crucible made of gas-retort carbon, to the temperature at which wrought iron melts, one part of the double fluoride of zirconium and potassium with one and a half parts of metallic aluminum, and afterward separating the reduced zirconium from the excess of aluminum by dissolving the latter in dilute hydrochloric acid. Dr. T. L. Phipson has since obtained zirconium by reduction from its oxide, the earth zirconia, by means of metallic magnesium. Like carbon, boron, and silicon, zirconium is capable of existing in three distinct forms, the crystalline, the graphitic, and the amorphous, and by Dr. Phipson's method it is obtained in the amorphous state, as "a velvety black powder." The reduction takes place at the moment the magnesium begins to melt. The magnesia, which is formed by the combination of the oxygen of the zirconia with the magnesium, may be dissolved away by dilute hydrochloric acid, which has not the least action on the reduced zirconium. Dr. Phipson was led to try this method of obtaining zirconium by his having previously found that magnesium will reduce carbon, boron, and silicon from the acids which those bodies respectively form with oxygen. He concludes that carbon, boron, silicon, zirconium, and titanium all belong to the same group of elements. In most of their properties these five bodies certainly resemble each other very closely, but in their relations to hydrogen there is some difference between them. Carbon, silicon, and titanium form, very readily, gaseous compounds with hydrogen, and carbon forms also various liquid compounds therewith; but neither boron nor zirconium has yet been made to combine with hydrogen at all.—*Mechanics' Magazine.*

Discoveries in Boiler Explosions.

A New York letter to the Philadelphia *Inquirer* says:—

"A curious fact in connection with the explosion of the *St. John*, that has not yet been noted, is that all the boiler explosions that have occurred in this vicinity for some months past, and there has been quite a number, causing at least a hundred terrible deaths, have been of low-pressure engines. It had always been supposed that low-pressure engines and boilers were safer than those made for high pressure. It seems natural that it should be so, and yet when we come to look at the results, they are such as to entirely puzzle and confound even those most expert in such matters.

"I was talking yesterday with a gentleman who has a very high reputation here as an engineer and scientific man, and he assured me that the whole subject of boiler explosion is as yet comparatively little understood. [That is by the scientific 'gent.'] In fact, they form a subject worthy of much scientific research and investigation. It is supposed that steam, heated beyond a certain point, necessarily passed, even in low-pressure boilers, when coming in contact with an iron surface, generates a certain amount of electrical or galvanic action, that finally destroys the fibrous strength of the iron and renders it brittle and liable to fracture. Another theory is that long-continued pressure on the inner surface of an iron boiler gradually destroys the strength of the iron, so that although a boiler may stand the initial test of hydraulic pressure, that will form but little proof of its capabilities to withstand the long-continued elastic and varying pressure of steam.

"It is certainly true that in the use of steam it has yet been studied but very little apart from its mechanical effect. These explosions, for which the theory of superheated steam will not account, as the boilers were fixed to 'blow off' at a low pressure, will turn a large share of attention to this subject, and possibly we may soon find it necessary for every steam boiler to be arranged with an electrical machine or indicator, to show the amount of electrical action, and the approach of electrical or galvanic storms."

[Such pompous nonsense as the above matter consists of is beneath criticism were it not, unfortunately, the fact that hundreds of persons believe it. There are men of sound mind on all other subjects who are perfectly insane on the subject of boiler explosions, and they go about seeking whom they may buttonhole, endeavoring to make proselytes.

The whole subject of boiler explosions is not understood, because men are determined not to understand it, and juries not to do their duty. We attended an examination into one of these disasters recently, and two of the jury were personally known to us as practical boiler makers. These men sat at the examination, with stolid faces, like men of wood; they opened not their mouths, and we have not the slightest faith that they could repeat ten consecutive words of any of the witnesses.

When we find earnest inquiry and investigations directed to the palpable facts in the case—to the causes positively pointed out by experience, by precedent; when we find juries not content with swallowing such nonsense as is put forth in the letter above, we may hope for some reform—not before.—EDS.

Rosin in Lard.

In the Scientific Convention at New Haven, Prof. Olmstead stated that rosin added to lard gives it a degree of fluidity not before possessed by the lard, and also prevents the latter from forming those acids which corrode metals—copper and brass for example.

Several important practical applications result from this property. Its use for lubricating surfaces of brass or copper has already been alluded to. It is equally applicable to surfaces of sheet iron. I have found a very thin coating, applied with a brush, sufficient to preserve Russia iron stoves and grates from rusting during summer, even in damp situations.

I usually add to it a portion of black lead, and this preparation, when applied with a brush, in the thinnest possible film, will be found a complete protection to sheet-iron stoves and pipes. The same property renders the compound of lard and rosin a valuable ingredient in the composition of shaving soap. The quality of shaving soap is greatly improved by a larger proportion of oil than is usually employed, so as completely to saturate the alkali; but such soap easily becomes rancid when wet with water and allowed to remain damp—as it commonly is when in use.

If a certain proportion of this compound is added to common Windsor soap (say one-half of its weight) the tendency to grow rancid is prevented.

A very soft and agreeable shaving compound, or cream, may be made by steaming in a close cup a cake of any common shaving soap, so as to reduce it to a soft consistency, and then mixing intimately with it half its weight of our resinous preparation, adding a few drops of some odoriferous substance. The same compound forms an excellent water-proof for leather.

Curious Effects of an Earthquake.

The San Francisco *Bulletin* says:—One of the most astounding effects of the late earthquake is to be seen on the front of the new bank and insurance building lately erected on Montgomery street, between California and Sacramento streets. The gilt letters composing the signs that overspread the building have been thrown into such confusion that it is utterly impossible to tell what kind of business is carried on there. It looks as though half a dozen sets of the English alphabet had been fired out of a mortar and stuck promiscuously all over the front of the building. The passer by can distinguish here and there the words "Globe," "and," "Liverpool," "&," "Life," "London," "Fire," "412," "limited," "San Francisco," "414," etc.; but as for deciphering any connection between the words, it is out of the question. No attempt has yet been made to replace the letters in their proper position, and it is said that the occupants of the building have agreed to let them stand as they are, and surmount the building with a new sign labeled, "curiosities of earthquakes."

THE razor question has received all the attention at our hands that the subject merits. We thank those persons who have sent us letters which have not been published; their attention is not unappreciated, but we are quite unable to continue the discussion.