The Decomposition of Water.

Lord Rayleigh, delivering a lecture at the Royal Institution on the decomposition of water, recently, explained the latest methods of doing so by experiments. He said, in order to form water, it was necessary to take two volumes of oxygen to one of hydrogen. From that point of view the constitution of water was perfectly well known. But there was also the question of the relative weights of the two bodies, and how far the ratio of two to one really represented in the matter of volume the facts of the case. If the ratio in volumes were always the same, the question of weight would be the same as that of the relative densities of the two gases. In round numbers the weight of oxygen was sixteen times that of hydrogen. According to Prout's law, these ratios were always represented by some exact multiple. Thus, if hydrogen was taken as the unit, oxygen would be 16 and carbon 12. The question of atomic weights and relative densities was primarily experimental, but there was great danger of twisting *data* so as to meet the requirements of a preconceived idea. The investigations of chemists with respect to hydrogen and oxygen had varied, but not within great limits. In 1842, Dumas thought that the weight of oxygen was 15·96 times that of hydrogen, and Regnault, in 1845, came to the same conclusion. It was, of course, not improbable that this slight deflection from the exact number 16 arose from error of calculation. For a long time this question slumbered, and it was not for forty years that attention was again directed to it. He had himself, in 1888, arrived at the conclusion that the right proportion was 15·884 to one; and other chemists, both in Europe and America, had published the results of their inquiry, which all gave figures between 15·7 and 15·9. The real difficulty arose from the extraordinary lightness of hydrogen, which was only $\frac{1}{14}$ as heavy as the air. The glass in which the weighing was done might be 200 grammes, while the hydrogen contained therein was only $\frac{1}{10}$ of a gramme. Our brass and platinum weights were accurate enough to record infinitesimal weights; but that was not the crux. The atmospheric conditions might cause a greater disturbance than the weight of the hydrogen. To meet this difficulty Regnault had devised a method of weighing two glass vessels as similar to each other as possible against each other, so that each would be affected in like manner by any sudden change of external conditions. The effect of moisture or changes of barometric or thermometric conditions might be very different as between platinum weights and glass; but with two glass vessels constructed precisely alike the difficulty was eliminated. Lord Rayleigh then explained and illustrated the decomposition of water and the desiccation of the hydrogen so as to make it absolutely free both from oxygen and moisture, which was effected by means of passing it through phosphoric anhydride.

The Invention of the Submarine Armor.

In an article on the history of the mechanical arts published in *La Nature* of December 5, 1891 (reproduced in SCIENTIFIC AMERICAN SUPPLEMENT, No. 837, page 13368), one of the most striking figures, says Mr. Berthelot, of the Institute of France, is the one relative to the submarine armor, and which shows that this existed as far back as the beginning of the fifteenth century. "Having since found various new data upon this subject," says Mr. Berthelot, "it seems well to me to reproduce them briefly."

The idea of supplying air to divers submerged in water is very ancient. In the Problems attributed to Aristotle (section xxxii., § 5), we read the following passage:

"When an inverted vessel is let down to divers, it facilitates their respiration. The vessel does not fill with water, but retains the air. Moreover, it is only through force that it is made to descend in the water, for the vessel is kept perfectly upright, and, however slightly it be inclined, the water rushes into it."

Many attempts must have been made in the course of time to supply air to divers, although no trace of them has been pointed out up to the present. The apparatus figured in the memoir of Munich is the most ancient one known, but the tradition of the submarine armor starting from the fifteenth century is attested in an uninterrupted manner by authentic documents. In certain editions of Vegetius, such as those of 1532 and 1553 (both of Paris), we see, on pages 106-107, 176-177, and 180-181, figures of armored and ordinary divers, like those of the MSS. presently to be mentioned, and of which they appear to be the prototypes. In consequence of a singular error, some persons have attributed these figures to Vegetius himself, who says not a word about them. They are really the work of the editors of the sixteenth century, as the aspect alone of the persons shows at a glance. Mr. Berthelot has found similar figures in the French MS. No. 14,727 of the National Library, written in the first half of the seventeenth century, and which was the note book of a French engineer. On the recto of the fifth, last but one folio, we see a diver with his costume and his air tube alongside of a large reservoir designed to supply him with the air necessary for his respiration. On the verso there is another figure of a diver entirely analogous to that of the Munich MS.; and, alongside, a man provided with a sort of swimming belt. On the folio following, there is a naked man under water breathing the air contained in a bladder, or rather a leathern bottle. This represents a much more primitive type, and one analogous to that of the Problems of Aristotle. The armor of the diver was partly of leather and capable of being inflated, so as to perform the role of swimming belts, as appears from the figures found near the middle of MS. No. 14,727, and which are like those of the Munich MS., but accompanied with an explanatory legend: "Various kinds of leather belts, which are to be inflated with air in order to cross a river." Beneath, there is an inflated leather bottle designed to be affixed thereto.—*La Nature.*

CHARLES J. VAN DEPOELE.

This eminent electrician and inventor died at his home, Lynn, Mass., March 18. For the accompanying portrait, reproduced from the last photograph for which Mr. Van Depoele sat, and for the following details we are indebted to the *Electrical Review.*

The deceased was born in Lichtewelde, Belgium, April 27, 1846. When but a boy the first telegraph line was put through near his birthplace, and from watching the operations he became much interested. With what little money he could get by running errands and doing odd jobs for the neighbors he bought himself a couple of battery cells and some instruments, and from that time was constantly experimenting. At one time he had a battery of over 100 cells, which, owing to the opposition of his father, who looked upon electricity as nonsense, he was compelled to hide in a loft in the house in which he lived, and there, on his father moving to another place, they were left. He continued his experiments, spending every spare moment he had in that way, and every cent that he could get went to buy apparatus.

CHARLES J. VAN DEPOELE.

When about 15 or 16 years of age his father apprenticed him to a church furniture and fancy wood carver in Paris, where he soon became master of the trade, devoting his evenings and oftentimes sitting up until daylight experimenting. He continued in this business until, in 1871, he came to this country and settled in Detroit, Mich., where he started a shop of his own, being at the head of 200 hands at one time.

His father, who had followed him here, and his many friends objected to his persistent experimenting and wasting of money, as they were pleased to call it, and met to have him sign papers agreeing to give up his experiments altogether. The meeting had just an opposite effect, and young Van Depoele swore that from that time on he would devote the whole of his time and money to the study of electricity. Accordingly, he placed his father at the head of his shop and, building a little place of his own near his residence, worked altogether at developing his ideas. Becoming interested in the electric light about that time, he constructed a dynamo, and in 1880, after moving to Chicago, formed the Van Depoele Electric Light Company, with A. K. Stiles at its head. The following summer he lighted some of the streets in Chicago gratis, and soon the company made and carried out numerous contracts.

As soon as this company was fairly started he began advocating the idea of running railways by electricity, contrary to Mr. Stiles' wishes, who thought nothing would come of it. Van Depoele was undaunted, and in 1883 he obtained Mr. Stiles' consent to put up a short exhibition railway in Chicago. Seeing the success of this, Mr. Stiles became enthusiastic, and from that time on offered no opposition.

In 1884 he constructed a conduit road at the Toronto (Ont.) Exposition, followed in 1885 by the overhead system in the same place.

During the next three years he was busy developing the electric railway, taking out many patents and building several railways in Toronto, Ont., South Bend, Ind., Minneapolis, Minn., and other places. In 1888 the Thomson-Houston Company, of Lynn, observing the success of his railway, bought out all of his railway patents, and in March of that year he came on to Lynn and was connected with the company ever since as electrician and inventor.

It was also by his untiring efforts that the electric percussion drill was brought to its present state of perfection, he having begun his experiments in that field as far back as 1882. Thinking that electricity could be used in the exploitation of mines, he talked with Mr. Stiles about the matter. Mr. Stiles immediately offered him money to carry on experiments, and he soon evolved a drill. Two were manufactured by the Thorn Wire Hedge Company, of Chicago, and experimented with in the company's shops. They were powerful enough to knock to pieces some very large stones on which they were used. Much encouraged, he continued his work, taking out numbers of patents and developing and improving the machines, until now the result of his exertions is seen in the mining drills, pumps, hoists, etc., of the Thomson-Van Depoele Electric Mining Company, whose patents were lately bought out by the Thomson-Houston Electric Company. Though much interested in all branches of electricity, it is the electric railway and electrical reciprocating devices that owe most to him. At the time of his death he was developing and improving his apparatus in the latter field.

Impeding Patent Office Business.

The many ways in which the business of the Patent Office is being constantly retarded by the insufficient appropriations of the government for the proper maintenance of the work of this bureau has been a matter of frequent comment for several years. With the growth of the business of the office there has been no adequate preparation for its natural expansion, and the Commissioner has just been obliged to issue a brief official notice to the effect that "in consequence of want of room for the proper storage and arrangement of printed copies of patents, it will be impossible to fill orders in current issues until additional room is provided by the proper authorities."

Those who are now obtaining patents from week to week are likely, therefore, to have some trouble in obtaining duplicate copies of any patents issued after March 8, and may in some instances be subjected to annoying delays, although copies of issues of an earlier date are obtainable as usual. Congress has failed from year to year to provide room for this rapidly growing, money earning institution. Its examiners and clerks are packed into rooms so small they can hardly breathe, and its immense mass of valuable records are stacked up on triple rows of pine shelves in the corridors, where moth and dust may easily corrupt and where a fire may break out if thieves do not break in. Now even this space is exhausted, and copies of patents now being issued cannot be stored, so that copies can only be obtained with difficulty and delay. It is certainly high time that some measure of effective relief was provided.

To Make Wax Sheets.

I have used the following plan for the last fifteen years: After the wax is properly cleaned, get four pieces of glass cut the width you want to have your sheets and about ten inches long. Any deep vessel, such as a dinner pail or an old oyster can, will serve to melt the wax. Put the pieces of glass in a pail of cold water; when the wax is melted, take two pieces of the glass, one in each hand, and dip alternately, one cooling while you dip the other (about three or four dips is sufficient), then drop into the cold water. Let these two remain till you dip the other two in the same manner. By trimming the edges off the glass with a knife, the sheets will drop off themselves. If the wax is kept too hot, the sheets will be too thin; if too cold, they will be lumpy and thick. Near the setting or cooling point is the proper temperature. A tablespoonful of Venice turpentine to three or four pounds of wax will toughen it. This should be evaporated to dryness like resin. It can sometimes be obtained in drug stores in this form. It will answer the purpose even if used thin, but the thicker it is the tougher will be the wax sheets.—*Dr. Beacock, Dom. Dent. Jour.*

Double Carbon Lamps.

On March 1 the Brush Electric Light Company scored an important victory in court. In its suit against the United States Electric Lighting Company, asking for an injunction restraining the latter company from using the double carbon lamp, which was patented by Charles Brush, September 2, 1879, the court granted a perpetual injunction, and ordered that testimony be taken of the amount due the Brush Company for infringement of the patent.