from the positive pole, is entirely employed in reducing the protoxide of iron, and the more violent the galvanic action, the more comminuted will be the metallic matter produced, and in this form, even at low temperatures, iron has the power of decomposing water.

When the substance to be decomposed is merely moistened with water, we still bring the reducing agency of hydrogen into play. Hydrate of potassa is a non-conductor, but when a new compound of it is formed with water, that compound is not only a conductor of electricity, but is more readily decomposed. The first point is to dissolve the surface of the hydrate in the smallest possible quantity of water, so as to give it a conducting power; the action produced by the apparatus melts the hydrate; an equivalent of oxygen is given off from the water, and the corresponding equivalent of hydrogen unites with the oxygen of the potash, the metal being revived. The case is exactly the same, when hydrate of potash is decomposed by iron in a gun barrel. At a white heat, the iron unites with the oxygen of the water of the hydrate, and the nascent hydrogen at these temperatures, separates the oxygen from the potassium, the water thus produced being simultaneously decomposed by the iron. The facility of this decomposition, is doubtless owing very much to the volatility of potassium, and the fixity of the oxide of iron, but we may be certain that hydrogen is the main cause of it, for oxide of potassium is decomposed in like manner at a white heat. Gay Lussac has shown, that the reason hydrogen will not decompose hydrate of potash, is owing to the water of the hydrate, which must be decomposed, before any action on the oxide can be produced.

At temperatures between 40° and 120° Fahr., no decomposition can be effected by the voltaic battery, if hydrogen gas is not present in a nascent state, and as at these same temperatures no compound substance is a conductor, which does not contain oxygen, water must always be present in all galvanic arrangements for decomposition, at those temperatures. But at upwards of 300° Fahr. we meet with many fluids of such conducting power, that without the presence either of hydrogen or oxygen, the mere power of the battery suffices for their complete decomposition, as is the case with liquid iodide of potassium, and chloride of sodium.

Every experiment of reduction, which is effected by the galvanic battery, at temperatures from 40° to 120° Fahr., may be likewise performed by chemical agency, when hydrogen gas is employed, and evolved under similar circumstances, provided the temperature be higher than a red heat.

In these remarks, I would be understood to speak only of common batteries, as, for instance, of forty or sixty pairs of three inch plates. In the case of larger batteries, there is a considerable difference.

Chemical analysis of the Native Chloride of Carbon, a singular mineral. By JOHN W. DRAPER, Christiansville, Mecklenburg county, Virginia.

The changes that take place in the living body, are so much con-

trolled by the operation of the vital principle, that it is very difficult to account for the production of many substances, which, from their uniformity of composition, are evidently the results of a continued disturbing action, upon the usual play of chemical affinity. It is only after death, that the uncontrolled action of the particles of different matter takes place, in a more simple form, and yet when we are even able to set aside the forces exerted by the vital principle, so prone are the elements which enter into the composition of vegetables and animals, to enter into unexpected modes of union, that we often find them assuming complex forms, when they ought, by following the usual laws of chemistry, to put on such as are more simple.

These remarks are very applicable to the substance, whose analysis forms the subject of this paper. I found, during an excursion to Sheerness, Kent, (England) in the summer of 1832, a white efflorescence on the surface of a septaria, on the beach of the Island of Shepey. The coast of this island looking towards the north, is very precipitous, but owing to land springs, and the nature of the soil, frequent slides take place. Whole acres slip down at once into the sea, and their debris extending a long way beyond low water mark, makes the beach shelve very gradually to seaward. These slides usually uncover large masses of septaria, which are used in the dock-yard as a cement. It was on the surface of one of these, that this efflorescence was found. The greater part of it is, at present, in the possession of Dr. Turner, Professor of Chemistry in the University of London.

At the time of collecting this substance, the weather was very fine, and the sky unclouded; there had been no rain for some time. At first, I mistook it for nitrate of potash, but on closer examination found it could not be that substance. It was of a pure white colour, and, like spermaceti, slightly agglutinated when a little of it was pressed between the fingers. It had a faint, disagreeable odour, like decaying fish, was of a light, feathery appearance, like snow. On examining it with more attention, I concluded that the form of the crystal must be a four sided prism, and from that circumstance, that it could not be nitrate of potash.

Not having an opportunity to examine the small sample I had gathered, until some weeks after, I found, that during the time it had been laid aside, it had contracted much in bulk; this might have arisen either from chemical changes, or from its mechanical property of agglutination; the fishy scent was gone, but the substance was still faintly odorous. My first object was to determine whether it was nitrate of potash, whose crystalline form was affected by the presence of extraneous substances; for this purpose, I exposed it to a test, which I commonly use to detect a very minute crystal of that salt, viz. by laying it on a small bit of paper, and setting fire to the end of the paper—as soon as the flame reaches the crystal, a slight deflagration ensues. I was much surprised to find that the substance itself caught fire, and whilst burning, evolved large quantities of carbon.

Subsequent experiments showed, that this substance burnt entirely away, with evolution of much carbon, leaving no residue. Litmus paper, held in the flame, was strongly reddened. To ascertain the nature of the acid evolved, a portion of the substance was burnt under a glass, whose sides were moistened with water. Nitrate of silver discovered the presence of muriatic acid, in the liquid. I now perceived, that the substance was a chloride of carbon, and therefore entered into a more detailed examination of its nature and properties.

This substance is of a whitish aspect, and feels much like spermaceti; it smells faintly, and is lighter than water; it sinks in ether, its specific gravity being about 950. It is insoluble in water, but soluble in four times its weight of ether at sixty degrees, Fahr. Boiling ether takes up a larger quantity, but deposits it again on cooling. It is a non-conductor of electricity—fuses at 235° Fahr., and may be distilled without change—at lower temperatures it slowly volatilizes, and may be sublimed from a water bath, in beautiful feathery crystals. It is soluble in alcohol, and hot volatile oils. It burns with a yellow flame, fringed at the upper part with red, and the lower with green.

Sulphuric acid has no effect in the cold, but with the aid of heat, the mixture becomes black, and much sulphurous gas is given out.

When sulphur or phosphorus is fused with this substance, chlorides of those bodies are formed, and carbon deposited, of a shining metallic aspect. Potassium takes fire when heated along with it, forming chloride of potassium, and carbon is deposited. In one instance, this action was so energetic, that the glass tube in which it was performed, burst, and was separated from the other apparatus, with a loud detonation.

I passed the vapour through a red hot tube, and found that muriatic acid gas was disengaged, and carbon deposited. From this I was at first inclined to infer the existence of hydrogen in the compound, and therefore attempted to gain more certain intelligence on that point. On fusing sulphur along with this substance, a moderate quantity of sulphuretted hydrogen was detected; and by the action of sodium, a still larger quantity of pure hydrogen was produced. But, on passing the vapour over peroxide of copper, chloride of that metal, and carbonic acid, were the sole products, from which I infer, that if hydrogen does exist in this substance, it is as an impurity.

Iron, tin, and zinc, at a red heat, decompose this substance; chlorides being formed, and carbon deposited. Peroxide of mercury is changed into calomel, carbonic acid given off, and carbon deposited. From these experiments, I suppose, that setting aside the existence of hydrogen in the compound, which is most likely extraneous, this substance is composed of:—

Carbon,	.	2 atoms,
Chlorine,	.	1 atom.

Of the non-existence of hydrogen, I would not, however, speak decisively, for the whole weight of the substance submitted to analysis, was much less than ten grains. The weight of what was collected at last, might be about 200 grains.

The production of this substance, to judge by its scent at first, and the locality in which it was found, seems to be referable to a marine animal. But through what singular changes must a dead fish pass, before its remains would leave a chloride of carbon, nearly pure.

On the present state of the Science of the Tides. By the Rev. W. WHEWELL, Fellow and Tutor of Trinity College, Cambridge.

(Continued from page 231.)

DIRECTIONS FOR TIDE OBSERVATIONS.

THE ESTABLISHMENT OF THE PLACE.

The interval at which high water follows the moon's meridian passage, or transit, at a given place, varies from day to day, (being affected by the semi-menstrual inequality.)

The *Vulgar Establishment* is the duration of this interval on the day of new or full moon.

The *Corrected Establishment* is the mean duration of this interval.

The "establishment" of any place is usually said to be the hour of high water on the day of new, or of full moon. The time of high water at London Bridge on September 28, (which was full moon,) was about two o'clock. It will be the same, or nearly the same, on every other day of new or full moon. Hence, two hours exactly, or nearly, is the establishment of London Bridge. In the same manner, at any other place, the time of high water falls very nearly at the same time on all the days when the moon is new, or full. At Portsmouth, this time is forty minutes past eleven; at Plymouth, thirty-three minutes past five; and thus, eleven hours and forty minutes is the establishment of Portsmouth, and five hours and thirty-three minutes the establishment of Plymouth.

This hour was called the *establishment* of the place, from an opinion that the differences of the tide hours at different places, depended solely upon the difference of the establishment; so that this hour being established, the whole course of the tides was settled also. This is not exactly true. If it were so, we could use tide tables of London to find the time of high water at Portsmouth, merely adding or subtracting the difference of the establishments of the two places; but in reality, this way of proceeding would lead us into error, as I have already stated.

It is not true, that the differences of tide times at different places, depend *solely* upon the differences of the establishments; they depend upon other differences also, as I shall endeavour to explain hereafter. The establishment may be considered as the starting point from which the tide hours set off every new or full moon; but these hours differ, not only in the point from which they start, but also in the pace at which they proceed; for this is, though in a smaller degree, different for different places.

The establishment is, however, much the most important of the circumstances which influence the tide hours at any place, and, therefore, deserves to be attended to in the first instance.