FIG. 6.

"With the spark," says M. Planté, "the distribution of negative electricity presents a curious crab-shaped appearance (Fig. 6.) With the aigrette, the electric movement around this same negative pole gives us the no less bizarre form of a polypus whose tentacles extend towards the positive pole, but do not reach it." (Fig. 5.)

From these results and other experiments quoted by M. Planté, he concludes that a blending of the two electricities may exist at each pole. This would infer that with electric currents of sufficient tension to obtain a continued series of discharges of static electricity, we could have a complete decomposition of the water at each pole and consequently a mixture of hydrogen and oxygen.

Pushing the study of these sparks still further, we find that the movement proceeding from the positive pole, externally, envelopes the negative electric movement like a bundle of curved sky-rockets. However, we often see at the same time an inward flux of positive electricity around the line of the spark between the positive current enveloping the exterior, and between both, the negative electric current which appears as though inhaled by the positive pole. This led M. Planté to suppose that the negative electricity, or else the ponderable matter which it carries with it, moves in an annular space furnished by the electrified matter proceeding from the positive pole. According to him, it would follow that the aspiratory or ascendant effects of the water obtained by electric currents of high tension might explain the ascension of water in a cloudy form as seen in water-spouts.

In a forthcoming article we will study other phenomena no less remarkable, which have been revealed by M. Planté's rheostatic machine. Among these are colored sparks and vibrations determined in a platinum wire traversed by a current of interrupted quantity, a phenomenon which can account for the effects produced in telephones by a simple wire crossed by a current.

TH. DU MARCEL.

To be continued.

ON A PROCESS FOR UTILIZING WASTE PRODUCTS AND ECONOMIZING FUEL IN THE EXTRACTION OF COPPER.*

BY J. DIXON (ADELAIDE, SOUTH AUSTRALIA.)

This paper contains an account of a process for extracting copper from sulphurous ores, in which the heat generated by the combination of the oxygen of the air with the sulphur of the ore is utilized for the smelting of the ore. This process is based upon experiments, which, although the author regards as incomplete, show (1) that the charge grows visibly hotter by simply blowing air through it; (2) that the melting of the raw ore or regulus and its reduction can be carried on in the same furnace; (3) that if the ore is in lumps, and fed at the top whilst the air is admitted by the side, a practically clean slagg can be obtained; but if added in a coarse powder, as it is generally found in the market, it either blows out again or chokes the furnace; (4) that a rough copper of about 96 per cent pure metal can be obtained by the successful working of this process.

*British Association, 1881.

ON THE CHEMICAL ACTION BETWEEN SOLIDS.*

BY PROF. THORPE, PH. D., F.R.S.

The author drew attention to the extremely rare instances of such action hitherto observed, showing how many of these might be explained on the supposition that combination actually occurred between the bodies either in solution or in a state of gas. For example, the formation of cement steel, by the combination of carbon with iron, which had long been adduced as an example of such combination between solids, was now explained by the fact that iron at a high temperature was permeable to gases, and that in the actual process of cementation oxides of carbon were formed, which were in reality conveyors of carbon to the metal. He then illustrated by experiments the formation of several compounds by bringing together the components in solid form, choosing as examples such as would manifest their formation by characteristic coloring. Thus, as instances, potassium iodide and mercuric chloride, potassium iodide and lead nitrate, and silver nitrate and potassium chromate, were powdered together in a mortar, and in each case evidence of an action was exhibited by the production of characteristic colors of the product of the reaction of these compounds. The author referred to the memoir of the Belgian phycisist, Prof. Spring, on the same subject, some of whose experiments he had repeated and in the main confirmed. One of the most remarkable results obtained by the Belgian professor was the formation of coal from peat by subjecting the latter material to a high pressure. Peat from Holland and Belgium, when exposed to a pressure of about 6,000 atmospheres, was, according to Spring, changed into a mass which in all physical characters resembled ordinary coal. Experiments of the same nature made by Dr. Thorpe with various samples of British peat yielded, however, a very dissimilar result. These experiments were made with pressures which were considerably less and more than those employed by Spring. Although solid, compact masses, hard and very much changed in structure, were attained, in no case was any product obtained which could be confounded with bituminous coal. He said it was highly improbable, on purely chemical grounds, that mere pressure had been little more than an important factor in the transformation of woody matter into coal.

A NEW DEMONSTRATION OF THE CARBONIC ACID OF THE BREATH.

BY C. F. CROSS.

Some time since I made the observation that the carbonic acid of the breath determines the liberation of iodine from a mixture of potassium iodide and iodate, and that the presence of starch renders the decomposition a very effective lecture-experiment, in demonstration of the presence of an active acid body in respired air. A friend to whom I lately communicated this result, threw doubt upon my interpretation, and while admitting the occurrence of the decomposition under the condition of respiring vigorously into the solution, preferred to attribute it to the action of the air or of acid vapors accidentally present. I therefore repeated the experiments

*British Association, 1881.

with special precautions, viz., washing the respired gases, and performing parallel experiments, in which, for the breath I substituted a rapid current of air, and lastly raising the latter to a temperature of 40° C. The result was to prove conclusively my original statement that the decomposition is brought about by a constituent of the respired air, and therefore by its carbonic acid. In performing this experiment it is only necessary to secure the neutrality of the solution; this being done, the development of a full purple color occupies from two to three minutes.

It is evident that this demonstration of the presence of *some* acid body precedes the lime-water test in the logical development of the complete proof of the presence of *carbonic* acid.—*Chemical News.*

THE BEST METHOD OF MOUNTING WHOLE CHICK EMBRYO.*

By Dr. Charles S. Minot.

The blastoderm is removed and cleaned in the usual manner, and then floated out on a glass slide, where it remains permanently. It is carefully spread out and allowed to dry until the edges become glued to the slide. It is then treated with a 0.5 per cent osmic acid solution, until a slight browning occurs. Stain with picro-carmine. The next step is particularly important, because it prevents the further darkening by the osmium, which otherwise injures or ruins the specimen. Pour Müller's fluid, or 0.5 per cent chromic acid solution, on the slide, and leave it over night. The next morning the blastoderm is ready for dehydration by alcohol, and mounting in the usual manner in balsam or dammar lac. Embryos prepared in this manner make particulary beautiful specimens.

ON THE ALLEGED DECOMPOSITION OF THE ELEMENTS.†

By Prof. Dewar, M.A., F.R.S.

In his remarks Prof. Dewar dealt chiefly with the spectroscopic work from which Mr. Norman Lockyer had drawn conclusions very different from those of Professors Liveing and Dewar, especially concerning the value of evidence on the subject. Prof. Dewar argued that Mr. Lockyer's views regarding the existence of carbon vapor in the corona of the sun would not bear scientific investigation, and that his views regarding the modification of the spectrum of magnesium were equally illusory, and gave no proof of the decomposition of elementary substances. Finally he discussed Mr. Lockyer's theory of "basic lines," and addressed himself to a refutation of the same. The results recorded, he said, strongly confirmed Young's observations, and left little doubt that the few as yet unresolved coincidences either would yield to a higher dispersion, or were merely accidental. It would indeed be strange if amongst all the variety of chemical elements and the still greater variety of vibrations which some of them were capable of taking up, there were no two which could take up vibrations of the same period. They certainly should have supposed that substances like iron and titanium, with such a large number of lines, must each consist of more than one kind of molecule, and that not single lines, but several lines of each, would be found repeated with the spectra of some other chemical elements. The fact that hardly a single coincidence could be established was a strong argument that the materials of iron and titanium, even if they be not homogeneous, were still different from those of other chemical elements. The supposition that the different elements might be resolved into simple constituents and even into a single substance had long been a favorite speculation with chemists; but however probable that hypothesis might appear *a priori*, it must be acknowledged, according to Prof. Dewar, that the facts derived from the most powerful method of analytical investigation yet devised, gave it but scant support.

* Read before the A. A. A. S., Cincinnati, 1881.

† British Association, 1881.

ASTRONOMY.

Elements and Ephemeris of Comet (*d*), 1881.—Barnard.

Mr. S. C. Chandler, Jr., has computed the following elements and ephemeris of Comet (*d*), 1881—Barnard—which are published, by permission of Prof. E. C. Pickering, of Harvard College Observatory. The observations upon which the computation is based are the following: Washington Mean Time being given with the Nashville observation, which was obtained at Vanderbilt University, by Prof. O. H. Landreth, and Cambridge Mean Time with the two others:

		d.	*h.*	*m.*	*s.*		R. A. *h.*	R. A. *m.*	R. A. *s.*	Decl. °	Decl. ′	Decl. ″
1881.	Sept.	20	7	46		Nashville	13	28	2	+3	47	
		21	7	34	43	Harvard Obs.	13	30	20	4	54	
		25	7	17	52	Harvard Obs.	13	36	29.63	9	6	43.7

The observation of the 20th was received by telegraph, and that of the 21st depends on only two comparisons, taken when the comet was but one degree and a half above the horizon.

ELEMENTS.

T = 1881, September, 14.785. Washington Mean Time.

	°	′	
π =	271	22	Mean Eq., 1881. o.
Ω =	260	43	
i =	107	27	

$\log. q$ = 9.7053

EPHEMERIS.

Wash. midnight, 1881.	R. A. *h.*	R. A. *m.*	R. A. *s.*	Decl. °	Decl. ′	Log. *r.*	Log. Δ.	Light
Sept. 29	13	41	36	+13	4	9.7894	0.1350	1.00
Oct. 3	13	45	28	16	26	9.8270	0.1467	.80
7	13	48	40	19	29	9.8648	0.1569	.65
11	13	51	32	22	18	9.9014	0.1628	.52

The light of the comet on September 29 is taken as unity, and in this scale its light at discovery, on September 17, was 1.85. The orbit does not resemble that of any known comet.

The comet is circular, not over one minute of arc in diameter, with a very decided central condensation. Its collective brightness is not more than equivalent to that of an 8½ mag. star. The comet is rapidly decreasing in light, and the moon is advancing, so that observations of it at once are very desirable. So far as is known, positions have been obtained only at Nashville and Cambridge, the early setting of the comet, and clouds, having greatly interfered. Under the circumstances, the orbit cannot be other than a rough one, and considerable latitude for error had better be allowed in searching for it.

MICROSCOPY.

The following method of hardening the spinal cord for microscopic sections has been highly recommended by Dr. M. Debove:

Place the cord in a 4 per cent solution of bichromate of ammonia for three weeks, then in a solution of phenic gum for three days, and for three days more in alcohol. Sections may then be cut with great facility. They should be placed in water to prevent curling. They are then immersed in a saturated solution of picric acid for twenty-four hours, and colored with carmine for about twenty minutes, the picric acid acting as a mordant.—*Archives de Neurologie.*

An era of microtomes appears to be approaching, and numerous are such devices which are advertised by the opticians. Mr. Thomas Taylor of the Agricultural de-