the sensitive bath, I plunge it fairly into the bath, where it is left to soak for five or six minutes; then removing it wash it for about twenty minutes in a bath, or even two, of distilled water, to remove the excess of nitrate of silver, and then hang it up to dry (in lieu of drying it with blotting paper). Paper thus prepared possesses a greater degree of sensitiveness than waxed paper; and preserves its sensitiveness, not so long as waxed paper, but sufficiently long for all practical purposes, say thirty hours, and even more. The English manufactured paper is far superior for this purpose to the French. To develope these views, a few drops of the solution of nitrate of silver are required in the gallic acid bath. They are then finally fixed and waxed as usual.

These processes appear to me to be reduced to nearly as great a degree of simplicity as possible. I am never troubled with stains or spots, and there is a regularity and certainty in the results that are very satisfactory. You will have observed, too, how perfectly the aerial perspective and gradation of tints are preserved, as also how well the deepest shadows are penetrated and developed, speaking, in fact, as they do, to the eye itself in nature. In exposing for landscape, I throw aside all consideration of the bright lights, and limit the time with reference entirely to the dark and feebly-lighted parts of the view. With a 3¼-inch lens the time of exposure has thus varied from ten minutes to an hour and a half, and the action appears to me never to have ceased.

The influence of the air-pump in this appears to me very sensible, and deserving of further examination and extension. I purpose not only iodizing, but rendering the paper sensitive with the action of the air-pump, by perhaps suspending the sheet after immersion in the nitrate bath under the receiver of the air-pump for a few minutes before exposure in the camera, or by some other manœuvre having the same object in view.

I should add, that I have chiefly employed Canson's French paper in iodizing with the aid of the pump. Few of the English manufactured papers are sufficiently tenacious in their sizing to resist the action of the pump, but they may easily be made so; and were, in short, the English paper, so far superior in quality to the French, only better sized,—that is with glue less easily soluble, even though more *impure*, there is scarcely any limit to the beauty of the views that might be produced.

There are more minor details that might be given; but I fear repeating many a "twice-told tale," acquainted so little as I am with what is doing: the preceding, however, may have some interest, and whatever is of value is entirely due to our friend M. Regnault, ever so generously ready as well as able to aid and encourage one's efforts.

Ever yours, JOHN STEWART.

Chemistry and Physics.

1. *On the motion of Fluids from the Positive to the Negative Pole of the closed Galvanic Circuit.*—Wiedemann has communicated to the Prussian Academy of Sciences, a memoir on the mechanical action of the voltaic circuit which is of essential interest and importance. The apparatus employed consisted of a porous earthenware cell, closed at the bottom and terminated above by a glass bell firmly cemented to the upper edge of the cylinder. Into the tubulure of the bell a vertical glass tube was fitted, from which a horizontal tube proceeded so as to permit the fluid raised to flow over into an appropriately placed vessel. A wire serving as the negative pole of a battery passed down through the glass bell into the interior of the porous cylinder, where it terminated in a plate of platinum or copper. Outside the porous cylinder another plate of platinum was placed and connected with the positive pole of the battery. The whole stood in a large glass vessel, which, as well as the interior porous cylinder, was filled with water. The intensity of the current was measured by a galvanometer. As soon as the circuit was closed, the liquid rose in the porous cylinder and flowed out from the horizontal tube into a weighed vessel. The results obtained by means of this apparatus were as follows:—

(1.) The quantity of fluid which flows out in equal times is directly proportional to the intensity of the current.

(2.) Under otherwise equal conditions, the quantities of fluid flowing out are independent of the magnitude of the conducting porous surface.

To avoid any uncertainty arising from the laws of the flow of liquids through small orifices, Wiedemann measured the intensity of the mechanical action of the current by determining the height of a column of mercury which would hold the transferring force in equilibrium. For this purpose a graduated tube or manometer filled with mercury was attached to the extremity of the horizontal tube above mentioned: with different currents and porous surfaces of different extent, the mercury in the manometer rose to different heights. By the measurements of these heights the following results were obtained:—

(3.) The height to which a galvanic current causes a fluid to rise, is directly proportional to the intensity of the current and inversely proportional to the extent of the free porous surface.

The mechanical action of a galvanic current may also be referred to its simplest principles by the following proposition:—

(4.) The force with which an electric tension, present upon both sides of a section of any given fluid, urges the fluid from the positive to the negative side, is equivalent to a hydrostatic pressure which is directly proportional to that tension.

In this manner therefore we obtain a simple measure of electric tension and its mechanical action in terms of atmospheric pressure and consequently of gravity.

The above laws hold good only for fluids of the same nature. When different fluids are subjected to the action of the currents, the mechanical action is greatest upon those which oppose the greatest resistance to its passage. The requisite data are still wanting to determine the precise connection between the mechanical action and the resistance, but observations made with solutions of sulphate of copper of different degrees of concentration, appear to show that the quantities of fluid transferred in equal times by currents of equal intensity, are nearly proportional to the squares of the resistances.—*Monatsbericht der K P. Akademie der Wissenschaften, March*, 1852, 151.

Spots on the Sun.—The number of spots seen in 1826 was 118; from this there was an increase to 161 in 1827 and 225 in 1828, and then a decrease to 33 in 1833. The number again increased, and was 333 in 1837, 282 in 1838, and 34 in 1843. Again it increased and after five years in 1848, it was 330, since which there has again been a decrease. Moreover at the time of minimum the spots are much smaller than at the maximum. In 1841 the largest was hardly 4′ broad. While in 1848 three groups were 8½′ across, and one spot appeared for seven or eight consecutive rotations.

M. Gautier observes that he has remarked a singular connection between this decennial period in the spots, and a decennial period in the variations of the magnetic needle recently pointed out by Dr. Lamont of Munich. According to this astronomer, since August, 1840, the mean annual amplitude of the diurnal variation of magnetic declination between 8 A. M. and 1 P. M. augments regularly for *five* years and then diminishes for five years. The epoch of the *minimum* of this amplitude corresponds to the middle of the year 1843, and that of the *maximum* to the middle of 1848. He has also found, from the Gottingen observations a *maximum* in 1837, corresponding with the above observations on the spots.

The results of Dr. Lamont have been confirmed by M. Reslhuber at the Observatory of Kremsmunster in Austria. Thus in 1843, the annual mean diurnal variations of declination and intensity have been respectively 6′ 28″·6 and + 0·00088; and in 1844 they were 6′ 14″·9 and + 0·00138. In 1848, they were 10′ 55″·4 and + 0·00273; in 1849, 10′ 39″·5 and and 0·00230.

M. Schwabe has deduced from eight observations with regard to the period of rotation of the sun, 25·07 days as the shortest, 25,75 as the longest: the mean of his results gives 25·507. He remarks that some of the spots have a brownish red colour; one was examined with glasses of different colours, to avoid any source of error, its north side was reddish-brown, more red than brown. The next day it had much changed and the border had the usual gray colour.

M. Rodolphe Wolf, of Berne, has been registering the spots since 1847; and he concludes that the number through a year so varies, that if a curve be drawn to express the variation, this curve has undulations, the more regular of which correspond each to a period of about 27½ days, or the period of the sun's rotation with relation to the earth. As bearing on this subject, the author states that M. Buijs Ballot of Utrecht, has concluded from thermometric observations at Harlem, Zwanenbourg and Dantzig, (see Pogg. Ann., 1851, Dec.,) that during a number of years, at each period of 27·7 days there is at these places a small elevation of temperature and at the intermediate period a diminution.

On the Freezing of Vegetables.—In connection with an abstract of Prof. J. LeConte's paper On the Freezing of Vegetables, (Silliman's Journal, vol. xiii., 84,) published in the Bibliothèque Universelle for June, 1852, the following note is inserted by M. A. de Candolle, showing that the action of freezing on vegetation for some years has not been altogether misunderstood by botanists. "In 1838, I published in the Bulletin de la Classe d'Agriculture de Genève (No. 121, p. 171,) in an article on the intense cold of January, 1838, the following remarks—after first alluding to the observations of Pictet and Maurice who found the temperature of the centre of a chesnut tree below zero, and also the experiments of M. Ch. Coindet, who after a prolonged cold had extracted from the middle of a large tree, small crystals of ice:—'These trees are however not dead. I have myself, after a cold but little intense, seen crystals of ice in the interior of the buds of several trees which have not suffered from it. Young branches, the buds of many trees, and the leaves of the plants of our country are in winter often penetrated beyond doubt with a cold several degrees below zero (centigrade); and although the viscous liquids of the slender tubes congeal with difficulty, it must frequently happen that congelation