tion took place; the red crystals in fig. 4, were slowly dissolved, a property mentioned in the first part of this paper, the first act of solution commencing apparently by the disjunction of the crystals *a*, *b*, *c*, *f*, *g*, *h*, at the lines of marking, these lines being at first bright red, and gradually deepening in color when the act of solution commenced, and at last perfect separation taking place, so that the light could be seen between the compartments. At times the field would become dry from evaporation, and some of the yellow rhombic crystals which had not been dissolved, prior to the formation of the octahedra with the square base, were observed with scarlet lines on them similar to the first act of transition in the sublimed crystals, as shown at *g* 1 and 2, in fig. 2.

Fig. 4.

By polarized light the appearances now described were beautiful beyond all description, the yellow crystals presenting the most superb and brilliant colors, varying in hue with the varied thickness of the crystalline plate, and in the dark field having the appearance of the most splendid gems the imagination can conceive: the red crystals do not appear to be affected by polarized light, so far as the display of color is concerned.

The magnifying powers used in these investigations, were, for the experiments on the sublimed crystals, 200 times linear measurement, or diameters; in the precipitated compound, 620 diameters.

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On the Progress made in the Application of Electricity as a Motive Power. By W. R. GROVE, Esq.; read before the Royal Institution, February 9, 1844.

The subjects of Mr. Grove's communication were, first, a brief summary of the laws of the electro-magnetic force; second, a description of the chief modifications of the engines to which that force has hitherto been applied; third, the commercial statistics of its application; fourth, the purposes for which this power is available. In dealing with the first of these subjects, Mr. Grove exhibited, by many illustrative and successful experiments, the well known re-actions of iron and other metals on each other, when exposed to the influence of an electric current. The actual application of these familiar phenomena, was then shown in the working models of several machines, which were set in action by the nitric acid (or Grove's) battery, invented by Mr. Grove, and described by him four years ago at the Royal Institution. These machines may be divided into three classes, first, those acting by the immediate deflecting force, as shown in the

galvanometer, Barlow's wheel, &c.; secondly, those on what is called the suspension principle. In these, two powerful electro-magnets are fixed contiguous to the periphery of a wheel, and in the line of its diameter, plates of soft iron being fastened on this periphery at short and equal intervals. The electro-magnets are so arranged as to lose their attractive power as soon as they have drawn through a given space each plate of iron, necessarily presented to them by the revolution of the wheel, but are immediately afterwards re-invested with this power, in order to operate on the next plate. By these means the wheel is kept in constant rotation on its axis. The remaining class of electrically driven machines are applications of the principle of Ritchie's revolving magnet. In these, an electro-magnet, balanced on a pivot, so as to rotate in a horizontal plane, is arranged between the poles of a permanent magnet. Hence, the alternate attractions of the opposite magnetic poles, combined with its own momentum, cause the electro-magnet to continue rapidly revolving. Having noticed machines, on these various principles, by H. Fox Talbot, Esq., Mr. Hill, of Swansea, and Professor Wheatstone, Mr. Grove proceeded to his third subject, the commercial statistics of electro-magnetic power. It appears, by the experiments of Dr. Botto, that the consumption of 45 lbs. of zinc will produce an effect equivalent to a single horse power for twenty-four hours. The cost of the metal, at 3*d.* the pound, would amount to 11*s.* 3*d.* About 50½ lbs. of the nitric acid of commerce would be required to dissolve the metal in the most economical and effective manner. The charge of this, at 6*d.* the pound, would be 1*l.* 5*s.* 6*d.* The whole expense, therefore, of obtaining the effect of a one horse power by an electro-motive apparatus, would be 1*l.* 16*s.* 9*d.* In this calculation, the cost of the requisite sulphuric acid is assumed to be fully covered by the value of the salts of zinc produced in the operation. The same amount of power produced by a steam engine would not cost more than a few shillings. Mr. Grove explained that this comparative costliness of the electro-magnetic machines resulted from the sources of their force, zinc and acid being manufactured, and, consequently, costly articles; whereas, coal and water, the elements of the steam engine's force, were raw materials, supplied at once from the earth. Mr. Grove took this occasion to observe, that the experiments of Botto, just alluded to, were made with his (Grove's) battery; and that upon the cost of the constituents of this, the calculations were founded. At first sight, this battery would appear a dear form, from the expense of the nitric acid; but a little consideration proves the contrary of this. Compare it, for example, with a battery merely charged with dilute sulphuric acid, the cheapest possible electrolyte, to perform an equivalent of work, as the decomposition of a given quantity of water, a series of three cells of the ordinary battery is necessary; hence the consumption of three equivalents of zinc, and three of sulphuric acid. But the intensity of the Grove's battery is such, that the same resistance can be overcome by one cell, consuming only one equivalent of zinc, one of sulphuric acid, and one-third of nitric, there being in this acid three available equivalents of oxygen. Independently of this smaller consumption, Grove's

battery has the advantage of occupying only one-sixteenth of the space of the other constructions. In concluding his communication, Mr. Grove mentioned the two well known applications of electric power—the electric telegraph, and the electric clock. To neither of these can steam, or, indeed, any known force, be so applicable as that which travels with a greater velocity than light itself.

London Athenæum.

Description of an Instrument for Ascertaining the Specific Gravity of Fluids. By JOHN HAM, Esq., Civ. Eng.

I beg to forward, for insertion in your highly popular publication, the drawing of an apparatus for readily ascertaining the specific gravity of fluids, which I devised some months since, and find extremely useful in practice.

By having the scale minutely divided, or adapting to it a vernier, it is susceptible of a high degree of accuracy, and for all ordinary fluids, is infinitely superior to the gravity bottle and balance, and in many instances preferable to the common hydrometers, especially in commercial transactions, where rapidity and accuracy are essential points.

A and B, are two glass tubes, from $\frac{1}{4}$ to $\frac{3}{4}$ ths of an inch bore, and of any convenient length; about 2 feet will be found sufficient for usual purposes; C, a connecting brass tube and stop-cock; D and E, two glasses, one for distilled water, the other for the liquid whose specific gravity is required; F and G, two milled headed screws, carrying each a stand for one of the glasses; H, a bracket with two nuts for supporting the screws and stands, F G; I I, the scale, divided into 200, or 2000, equal parts, or degrees.

The mode of using it is simply this: Pour distilled water into one of the glasses, and the liquid to be tried, into the other, both at 60°, or any