ing to the calculations of Celoria, do not include the greater number of places within the belt of totality. It may be remembered that a calculation of the eclipse which occurred only two years later (1241 October), published by Hansen in the Transactions of the Saxon Society of Sciences, gave a total eclipse both at Erfurt and Stade near Bremen, where it is recorded to have been so observed, and hence his tables were considered satisfactory. Both eclipses may deserve further examination.

D'ARREST'S COMET.—This comet appears now to make a very close approach to the orbit of the planet Jupiter, from which circumstance it is possible that in some forty-five years from this time its elements may be entirely changed. Considerable perturbations from the attraction of this planet took place between the latter part of the year 1857 and the next period of the comet's visibility, so that by Leveau's calculations for that epoch the time of revolution had been increased sixty-eight days, the inclination diminished more than two degrees, with very material changes in the other elements. If we adopt the orbit found by Leveau for the last appearance, we have the following distances of the comet from the orbit of Jupiter at different points of heliocentric ecliptical longitude—equinox of 1872 :—

In	139°	1′	distance	0·411...Aphelion
	146	28	,,	0·292...Ascending Node
	150	0	,,	0·189
	152	0	,,	0·098
	153	0	,,	0·085

In longitude 153° 10′, which is about the point of nearest approach, the distance between the two orbits is only 0·0841. At this point the comet's radius-vector is 5·4254, with latitude 1° 52′ N., and it is passed 873 days or 2·39 years before the arrival at perihelion. Without very sensible perturbations in the mean time, the comet and planet would encounter each other at the latter end of the year 1920, when, as noted above, an entire change of orbit might take place.

THE MINOR PLANETS.—Inquiries are occasionally received for the fullest catalogue of elements of the minor planets. Such readers as have occasion to refer to a pretty complete list, will find the latest and most authentic summary in the "Berliner Astronomisches Jahrbuch" for 1877, where the orbits of upwards of 130 of these planets are given, and in many cases from new and complete discussion. Indeed, the preparation of elements and ephemerides of the minor planets forms a speciality of the "Berliner Jahrbuch" under the superintendence of Prof. Tietjen. The labour and practical difficulty attending this work have now become very great, so much so as to require almost exclusive devotion to it of a body of computers, if accurate results for the guidance of observers are expected. Prof. Tietjen to a considerable extent ensures this. The elements are collected by him in each successive volume, the latest being found as stated above in that for 1877, published within the last few months.

ON THE PLAGIOGRAPH aliter THE SKEW PANTIGRAPH

I HAVE been led by the study of linkages to the conception of a new instrument, or rather a simple modification of an old and familiar one, the Pantigraph, by means of which a figure in the act of being magnified or reduced may at the same time be slewed round the centre of similitude. Some of the readers of NATURE, such possibly as my able and most ingenious friends, Messrs. George Cayley and Francis Galton, may be able to pronounce with authority how far the invention is new and whether it is likely to be found in any way useful in practice as applied to the art of the designer or engine turner. Already my invention of the Isagoniostat, or equal angle setter, which I shall take some other opportunity to communicate to this journal, has been deemed available in practice for working automatically the train of prisms of a spectroscope.

In Fig. 1, A O B C Q represents an ordinary pantigraph. O is the fixed point, P is the tracer, and Q the corresponding follower ; then, as everybody knows, any curve traced out by P will be imitated by Q, and the two curves will be similarly situated in respect to O. The point of addition is the following :—

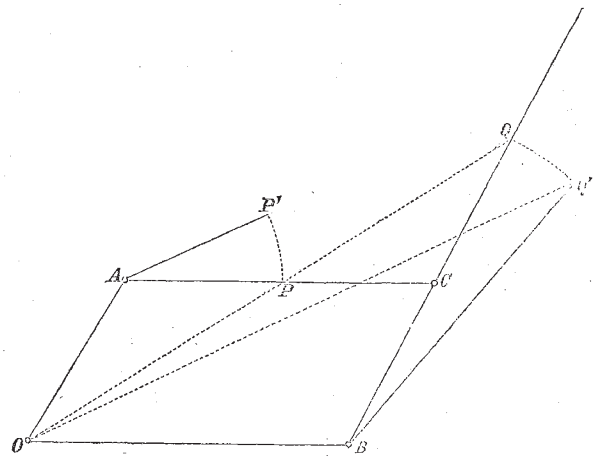

FIG. 1.

Let P be moved through any angle, P′ A P round A, and Q through *an equal angle* Q B Q′ in the *opposite* direction round B, and let P′ and Q′ be supposed to be in any manner rigidly connected with the bars A C, B C respectively. Then it admits of an easy proof that in whatever way the pointed parallelogram A O B C is deformed, O Q′ will bear to O P′ the constant ratio of A C to A P, and moreover the angle P′ O Q′ will always remain equal to the angles P′ A P, Q B Q.

It follows that whilst P′ is made to move upon any curve the follower Q′ will trace out a similar curve altered in magnitude, and at the same time turned round the first point O.

If, as in Fig. 2, we take A D equal to A C, B E equal to

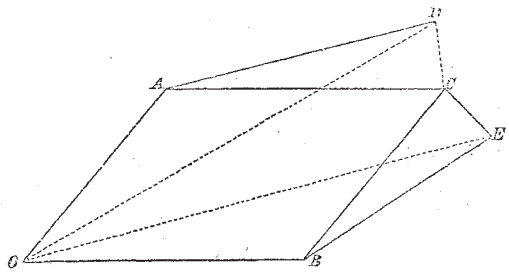

FIG. 2.

B C, and the angles C A D, C B E equal to each other, then the rays O D, O E will always remain equal and be inclined to each other at a constant angle. With this adjustment the instrument may be used to transfer a figure from one position in a sheet of drawing paper to any other position upon it, leaving its form and magnitude unaltered, but its position slewed round through any desired angle.

J. J. SYLVESTER

SCIENCE IN GERMANY

(From a German Correspondent.)

WHEN in 1819 Dulong and Petit measured the specific heats of some solid elements they found for each of the elements experimented upon, a very simple relation between its specific heat and its atomic weight : the product obtained by multiplying the specific heat