XVII. Propositions respecting the mechanical power of the wedge

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dence shall be put into practice, those, and many more than I can think of at present, will of themselves occur ; so that I do not in the least doubt, but that with a little practice, all things may be made so convenient, that the same character may be seen at Paris within a minute after it hath been exposed at London ; and that the characters may be exposed so quick after one another, that a composer shall not much exceed the exposer in swiftness ; and this not only at the distance of one station, but of a hundred ; for, supposing all things ready at all those several stations for observing and exposing, as fast as the second observer doth read the characters of the first exposer, the second exposer will display them to the observer of the third station, whose exposer will likewise display them for the fourth observer, as fast as his observer doth name them to him, or write them down.

“ There may be many objections brought against this way of communication, because it has not yet been put in practice ; but hardly any that may not be easily answered and obviated.” Dr. Hook illustrates his invention thus :

“ Let A B C (Plate X. fig. 4.) represent three very long masts or poles erected ; E, the top-piece, that joins them all together ; D, a screen, behind which all the deal-board characters hang upon certain rods or lines, and may, by the help of small lines connected with each of them, be exposed at F, or drawn back again behind D, as occasion shall require.”

XVII. *Propositions respecting the Mechanical Power of the Wedge*, by Mr. PETER NICHOLSON of Newman-street.
Communicated by the Author.

WRITERS on mechanics, in treating of the wedge, have frequently drawn false conclusions respecting the proportion which exists between the impelling power applied to the head, and the resisting powers opposed to the sides ; and
those

those conclusions have resulted from false opinions concerning the directions of the resisting powers.

It is evident, that when wood or other substance is split by a wedge which does not fill the cleft, that is, when the angle of the cleft is more acute than that of the wedge, the power or action of each side of the wedge, equal and opposite to the resistance of the cleft, must be resolved into two ; the one in the direction of the side of the cleft, which tends to thrust it forward ; and the other perpendicular to that direction, which tends to tear it asunder. It is by not attending to the above resolution that writers on this subject have been led into mistakes ; for, instead of considering the powers which act in those two directions, they have imagined a single power only as acting obliquely on each side. But if the sides of the wedge are perfectly polished, as we must here consider them, no single permanent power can be applied to impel any one of them, unless its direction be perpendicular to the plane of the side to which it is applied : therefore two oblique powers, applied on opposite sides of the same point, are at least necessary to sustain each other and the action of the plane ; and in the case of the wedge above mentioned, the directions of those two oblique powers will always be perpendicular to each other, as will appear obvious from the two following propositions :

PROP. I. Let ABC (Fig. 3, Plate X.) be a vertical section passing through the centre and at right angles to the head and sides of any isosceles wedge ; also in the plane of this section, and at right angles to its sides AC , BC , and CA , let three powers be applied, such, that their directions may all mutually intersect in the axis, and their efforts sustain the wedge in equilibrio ; I say, that these three powers are as AB , BC , and CA respectively.

Let LM , KI , ED be the directions of these three powers, which produced, intersect each other and the axis in O . Since, by hypothesis, these three powers directed to the same point are in equilibrio, and the three sides of the triangle ABC are at right angles to their directions ; therefore, by a well

well known statical principle, the intensities of these powers are as AB , BC , and CA respectively.

PROP. II. When an impelling power applied to the head of an isosceles wedge is in equilibrio with the resisting power of a cleft, the angle of which is more acute than that of the wedge inserted, then universally,

The impelling power applied to the head,
The action of the wedge on either side of the cleft,
The part thereof which tends to thrust it forward,
And the remaining part, which tends to tear it asunder,

Are

As twice the sine of half the vertical angle of the wedge,
The radius,

The sine of the angle contained by the sides of the wedge and cleft,

And the co-sine of that angle respectively, the same radius being common.

Let Fig. 2, Plate X. represent a vertical section of the wedge and cleft, similar in position to that described in Proposition 1; also let the two sides of the cleft DH , DH be equal, and in contact with the sides of the wedge AC , AC at equal distances DC , DC from the vertex C , in which case the sides of the wedge make equal angles with those of the cleft. Through either point D , draw DF at right angles, and equal to AC ; also through D , draw DE , at right angles to DH , and complete the parallelogram $DEFG$. Then by Proposition 1, the line AA represents in quantity the impelling power applied to the head, and the line DF represents in quantity and direction the whole action of the side of the wedge on that of the cleft, which by hypothesis is balanced by its resistance; but the power DF is resolved into two, represented in quantity and direction by DG , DE respectively: the one, being in the direction of the cleft, tends to thrust it forward; and the other, being at right angles thereto, tends to tear it asunder.

Therefore the powers mentioned in the Proposition are as AA , DF , DG and DE respectively; but $AC = DF$ being radius, these lines are respectively equal to

Twice

Twice the sine of half the vertical angle of the wedge,
 The radius,
 The sine of the angle contained by the sides of the wedge
 and cleft,
 And the co-sine of that angle. Hence the proposition is
 manifest.

XVIII. *Report of the Commissioners appointed by the National Institute to repeat the Experiments which have been made on Galvanism: read in the Name of the Commission by Cit. HALLE. From the Bulletin des Sciences, par la Société Philomathique, Thermidor, An VI.*

THE commission was not satisfied with repeating a great part of the experiments already made: they classed them, and rendered them complete by the addition of others which were wanting.

I. The phenomenon of Galvanism, taken in general, is as follows: A communication is established between two points of a series of nervous or muscular organs by means of certain determined substances. At the moment when this communication is made, there take place in the state of the organs changes, the nature of which is still unknown; but which are manifested by sensations more or less lively, or contractions more or less violent. These muscular contractions take place even in separated parts of the body, and with as much force as when produced by the most effectual means of irritation. The series of muscular or nervous organs is called the *animal arc*; the other substances form the *exciting arc*. The composition of both may be varied many different ways.

II. Among the effects resulting from the different compositions of the animal arc, the following are the most remarkable: A ligature made on a nerve does not intercept Galvanism, unless it be made in the part surrounded with flesh. If the
 nerve