

VII. *Remarks upon a supposed Demonstration, that the moving Forces of the same Body are not as the Velocities, but as the Squares of the Velocities, By the same.*

THE Demonstration runs thus : “ Concipio cor-
 “ pus C *Fig. 7.* moveri obliquè in elastrum L, ve-
 “ locitate CL ut 2, angulo inclinationis CLP existente
 “ 30 gr. cujus nempe sinus CP est semitris radii CL.
 “ Suppono autem eam esse resistentiam in elastro, ut
 “ ad illud tendendum requiratur præcisè unus velocita-
 “ tis gradus in illo corpore, si perpendiculariter im-
 “ pingeret. Quid ergo jam fiet post incurtionem ob-
 “ liquam corporis C in elastrum L? Quoniam motus
 “ per CL componitur, ut notum est, ex duobus colla-
 “ teralibus per CP & PL, & cum CP, secundum
 “ quam corpus directè impingit in elastrum L, expri-
 “ mit dimidiam celeritatem corporis per CL, consume-
 “ tur hic motus per CP, tenso elastro (perinde enim ef-
 “ fet, ac si corpus C celeritate CP perpendiculariter
 “ incurreret in elastrum, quod per Hypothesin, eam
 “ celeritatem destruere posset) remanente corporis ce-
 “ leritate, & directione PL. Producta igitur PL in
 “ M, ita ut LM sit = PL = $\sqrt{3}$ (ponitur enim CL
 “ = 2) & applicato in M alio simili elastro faciente
 “ cum LM angulum LMQ, cujus sinus LQ = CP =
 “ 1, per eandem rationem manifestum est corpus C,
 “ post tensionem elastri L, tensurum esse elastrum M,
 “ amisso motu per LQ, & servato motu per QM.
 “ Prolongata itaque QM ad N, ut fiat MN = QM
 “ =

“ = $\sqrt{2}$ ibique substituto elastro simili tertio constitu-
 “ ente cum MN angulum MNR semirectum, quo
 “ scilicet MR iterum sit = CP=1; patet similiter
 “ motum per MR totum impendi in tensionem elastri
 “ N, corpore interim moveri pergente directione &
 “ celeritate RN=1. Denique si hac celeritate residua
 “ impingat perpendiculariter in elastrum O, huic ten-
 “ dendo totam suam vim reliquam dabit; ipsum ita-
 “ que corpus ad quietem redigetur. Hisce ita præ-
 “ missis, patet nunc potentiam corporis C tantam fu-
 “ isse, ut per se solum tendere possit præcisè quatuor e-
 “ lastra talia, ad quæ singula seorsim tendenda requi-
 “ ritur dimidia velocitas corporis æqualis ipsi C, ade-
 “ óque cum effectus illius quadruplo major sit quàm
 “ effectus hujus, evidens est quoque vim corporis velo-
 “ citate 2 grad. quadruplam esse vis corporis ejusdem,
 “ vel æqualis, velocitate 1 grad.

“ Haud ab simili modo demonstrarem corpus C ve-
 “ locitate 3 grad. tendere posse 9 elastra, ad quorum u-
 “ num tendendum unus velocitatis gradus in eo cor-
 “ pore requiritur, & tandem in genere numerum ela-
 “ strorum tensorum semper esse quadratum numeri
 “ graduum velocitatis. Unde igitur sequetur, vires
 “ corporum æqualium esse in duplicata ratione celeri-
 “ tatum. Q. E. D.

1. This Argument is founded entirely on the com-
 monly received Doctrine of the Composition and Re-
 solution of Forces, and not upon any decisive Expe-
 riments, that have been actually made upon this occa-
 sion.

2. All that is proved from this Doctrine, is, that a
 Body moving with two Degrees of Velocity, may be
 made to bend 4; with 3 Degrees of Velocity it may
 be made to bend 9 similar Springs, each destroying one
 Degree

Degree of Velocity in a perpendicular Direction, before its force is entirely spent, provided you take care to alter the Directions of the Motion in every Stroke but the last, after a certain manner: That had the same Body moved but with one degree of Velocity in one Direction, and that in a perpendicular one, it would have lost all its force at once, and bent but one of those Springs: Which is far from proving the thing in Question.

3. To make the Reasoning on this Head conclusive, the two Bodies should not only be equal in Quantity of Matter, but alike in that material Circumstance the Direction of their Motions; so that if one of the Bodies move in a perpendicular Direction, the other should do so too; or if the one strikes in an oblique Direction, the other should do the same, and that in the same degree of Obliquity; and lastly, if one moves in several Directions, the other should do the same. But in the case before us one is supposed to move but in one Direction perpendicularly, and the other to move in three oblique Directions, and but one perpendicular.

4. Let therefore the same Body move always in the same Directions, and with a small Alteration, the Argument used in this Demonstration will be so far from proving that side only of the Question for which it was brought, that it will equally serve to prove the truth of the other, namely, that the Forces of the same Body moving with different Velocities are as those Velocities.

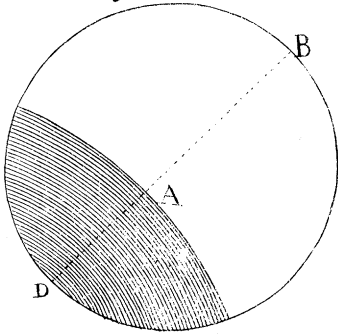
Let therefore the same Body, instead of moving with two Degrees of Velocity, move but with one, and in the same Directions as above; only let the Springs be capable of destroying but half a Degree of Velocity in a perpendicular Direction; then by the same steps
of

of reasoning it will follow, that this Body will now also bend 4 similar Springs, before its Force is spent ; so that the same Body moving with half the Velocities, and in the same Directions as before, bends the same number of Springs ; only now the Springs make but half the Resistance, that the Springs in the former case made ; therefore the Effect in this case, according to our way of estimating an Effect, is but half the former Effect ; consequently the Forces producing these Effects are as 2 to 1 ; But in this *Ratio* are the Velocities, with which the Body moved in the two Cases ; therefore the Forces are as the Velocities.

Let the Body move with 3 degrees of Velocity, and it will bend 9 similar Springs each destroying one Degree of Velocity in a perpendicular Direction, before the whole Force is consumed. So also by the same way of arguing, 'tis as certain, that if the same Body move with one degree of Velocity, it will bend 9 similar Springs, each destroying a third part of one Degree of Velocity in a perpendicular Direction, before its Force is extinguished : So that still the Effects, or Resistances overcome in the same Directions, are, according to our way of computing, as 3 to 1 ; and so also their Forces must be but in the same *Ratio* of 3 to 1, as were the Velocities ; consequently the Forces are as the Velocities.

5. Since therefore this Proof drawn from the Doctrine of Composition and Resolution of Forces equally proves both sides of the Question, it proves too much, or in reality nothing at all ; and is therefore far from deserving the Name of a Demonstration.

Fig. 1.



Philos. Trans. 396.

Fig. 2.



Fig. 3.



Fig. 5.

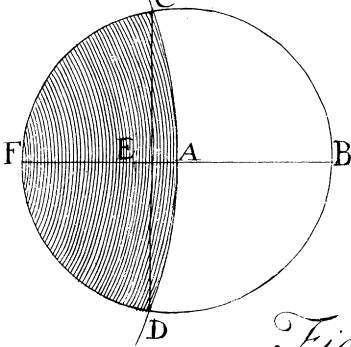


Fig. 4.



Fig. 6.

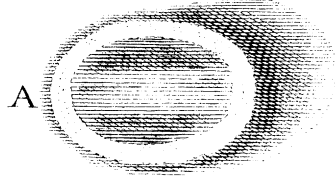


Fig. 7.

