lumn or ſtrutt to ſnap in an inſtant, as is well known to every experienced carpenter. The experiment by Muschenbroek, which Euler makes uſe of in order to obtain a meaſure of ſtrength in a particular inſtance, from which he might de­duce all others by his theorem, is an inconteſtable proof of this. The force which broke the column is not the twentieth part of what is neceſſary for breaking it by act­ing at E in the direction EF. Euler takes no notice of this immenſe diſcrepancy, becauſe it muſt have cauſed him to abandon the ſpeculation with which he was then amuſing himſelf.

The limits of this Work do not afford room to enter minutely upon the refutation of this theory ; but we can eaſily ſhow its uſeleſsneſs, by its total inconſiſtency with common obſervation. It reſults legitimately from this theory, that if CD have no magnitude, the weight A can have no momentum, and the column cannot be broken — True, it cannot be broken in this way, ſnapped by a tranſverſe fracture, if it do not bend ; but we know very well that it can be cruſhed or crippled, and we ſee this frequent­ly happen. This circumſtance or event does not enter into Euler’s inveſtigation, and therefore the theory is imperfect at leaſt and uſeleſs. Had this crippling been introduced in the form of a phyſicial affumption, every topic of reasoning employed in the proceſs muſt have been laid aſide, as the intelligent reader will eaſily ſee. But the theory is not only imperfect, but falſe. The ordinary reader will be con­vinced of this by another legitimate conſequence of it. Fig. *20.* n⁰ 2. is the ſame with fig. 106 of *Emerson's Mechanics,* where this ſubject is treated on Euler’s principles, and repreſents a crooked piece of matter resting on the ground at F, and loaded at A with a weight acting in the vertical direction AF. It reſults from Euler’s theory that the ſtrains at *b,* B, D, E, &c. are as *b c,* BC, DI, EK, &c. Therefore the ſtrains at G and H are nothing ; and this is asserted by Emerſon and Euler as a ſerious truth ; and the piece may be thinned *ad infnitum* in theſe two places, or even cut through, without any diminution of its ſtrength. The abſurdity of this aſſertion strikes at firſt hearing. Euler aſſerts the ſame thing with reſpect to a point of contrary flexure. Farther diſcuſſion is (we apprehend) needleſs.

This theory muſt therefore be given up. Yet theſe diſſertations of Euler in the Peterſburgh Commentaries deſerve a peruſal, both as very ingenious ſpecimens of analysis, and becauſe they contain maxims of practice which are impor­tant. Although they give an erroneous meaſure of the com­parative ſtrength of columns, they ſhow the immenſe im­portance of preventing all bendings, and point out with accuracy where the tendencies to bend are greateſt, and how this may be prevented by very ſmall forces, and what a pro­digious accession of force this gives the column. There is a valuable paper in the ſame volume by Fuſs *on the Strains on framed Carpentry,* which may alſo be read with advantage.

It will now be aſked, what ſhall be ſubſtituted in place of this erroneous theory ? what is the true proportion of the ſtrength of columns ? We acknowledge our inability to give a satisfactory anſwer. Such can be obtained only by a previous knowledge of the proportion between the exten­sions and compressions produced by equal forces, by the knowledge of the abſolute compreſſions producible by a given force, and by a knowledge of the degree of that de­rangement of parts which is termed crippling. Theſe circumſtances are but imperfectly known to us, and there lies before us a wide field of experimental inquiry. Fortunately the force requiſite for crippling a beam is prodigious, and a very ſmall lateral ſupport is sufficient to prevent that bend­ing which puts the beam in imminent danger. A judicious engineer will always employ tranſverſe bridles, as they are called, to stay the middle of long beams, which are employed as pillars, ſtrutta, or truſs beams, and are expoſed, by their poſition, to enormous preſſures in the di­rection of their lengths. Such ſtays may be obſerved, diſpoſed with great judgment and economy, in the centres em­ployed by Mr Perronet in the erection of his great ſtone arches. He was obliged to correct this omission made by his ingenious predecessor in the beautiful centres of the bridge of Orleans, which we have no heſitation in affirming to be the fineſt piece of carpentry in the world.

It only remains on this head to compare theſe theoretical deductions with experiment.

Experiments on the tranſverſe ſtrength of bodies are eaſily made, and accordingly are very numerous, eſpecially thoſe made on timber, which is the caſe moſt common and moſt intereſting. But in this great number of experiments there are very few from which we can draw much practical infor­mation. The experiments have in general been made on ſuch ſmall scantlings, that the unavoidable natural inequalities bear too great a proportion to the ſtrength of the whole piece. Accordingly, when we compare the experiments of different authors, we find them differ enormously, and even the experiments by the ſame author are very anomalous. The completeſt series that we have yet seen is that detailed by Belidor in his *Science des Ingenieurs.* They are contain­ed in the following table. The pieces were ſound, even-grained oak. The column *b* contains the breadths of the pieces in inches ; the column *d* contains their depths ; the column *l* contains their lengths ; column *p* contains the weights (in pounds) which broke them when hung on their middles ; and *m* is the column of averages or medi­ums.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| N⁰ | *b* | *d* | *l* | *p* | *m* |  |
| 1 | **1** | 18 |  | 400  415  405 | 406 | The ends lying loose. |
| 2 | **1** | 1 | 18 | 600  600  624 | 608 | The ends firmly fixed. |
| 3 | **2** | **1** | 18 | 810  795  812 | 805 | Looſe. |
| 4 | **1** | 2 | 18 | 1570  1580  1590 | 1580 | **Looſe.** |
| 5 | 1 | **1** | 36 | 185  195  I 80 | 187 | Looſe. |
| 6 | **1** | **1** | 36 | 285  280  285 | 283 | Fixed. |
| 7 | **2** | **2** | 36 | 1550  1620  1585 | 1585 | Looſe. |
| 8 | **1 2/3** | 2 1/3 | 36 | 1665  1675  1640 | 1660 | Looſe. |