'to cause the column or strut to snap in an instant, as is well known to every experienced carpenter. The experi­ment by Muschenbroeck, 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 at least im­perfect and useless. Had this crippling been introduced in the form of a physical assumption, 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. 18 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 *bc,* 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 infinitum* in these two places, or even cut through, without any dimi­nution of its strength. The absurdity of litis 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 Petersburg 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. This can only be obtained 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 arc called to stay the middle of long beams which are employed as pillars, struts, 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 completent series that we have yet seen is that detailed by Behdor 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 *in* is the column of averages or mediums.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No. | *b* | *d* | *l* | *P* | *m* |  |
| l | l | l | 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  180 | 187 | Loose. |
| 6 | 1 | 1 | 36 | 285  280  285 | 283 | Fixed. |
| 7 | 2 | 2 | 36 | 1550  1620  1585 | 1585 | Loose. |
| 8 | 21/3 | 21/3 | 36 | 1665  1675  1640 | 1660 | Loose. |