

whole momenta may always balance each other, yet the general motion is hobbling, and the points of support are strained. A great engine so constructed, commonly causes the building to tremble; but when uniform motion pervades the whole machine, the inertia of each part tends to preserve this uniformity, and all goes smoothly. It is also deserving of remark, that when the communications are so contrived that the uniform motion of one part produces uniform motion on the next, the pressures at the communicating points remain constant or invariable. Now the accomplishing of this is always within the reach of mechanics.

111. One of the most usual communications in machinery is by means of toothed wheels acting on each other. It is of importance to have the teeth so formed, that the pressure by which one of them *A* urges the other *B* round its axis, shall be constantly the same. It can easily be demonstrated, that when this is the case, the uniform angular motion of the one will produce a uniform angular motion of the other; or, if the motions are thus uniform, the pressures are invariable. This is accomplished on this principle, that the mutual actions of solid bodies on each other in the way of pressure, are perpendicular to the touching surfaces. Therefore, let the tooth *a* (Plate VIII. fig. 1.) press on the tooth *b* in the point *C*; and draw the line *FCDE* perpendicular to the touching surfaces in the point *C*. Draw *AF*, *BE* perpendicular to *FE*, and let *FE* cut the line *AB* in *D*. It is plain, from the common principles of mechanics, that if the line *FE*, drawn in the manner now described, always pass through the same point *D*, whatever may be the situation of the acting teeth, the mutual action of the wheels will always be the same. It will be the same as if the arm *AD* acted on the arm *BD*. In the treatises on the construction of mills, and other works of this kind, are many instructions for the formation of the teeth of wheels; and almost every noted millwright has his own nostrums. Most of them are egregiously faulty in respect of mechanical principle. In-