which we call velocity, as a distinction of condition, the ſame impoſſibility of conception or the ſame abſurdity oc­curs. Nor can it be avoided in any other way than by laying, that this change of A’s motion is brought about by inſenſible gradations ; that is, that A and B influence each other preciſely as they would do if a ſlender ſpring were interpoſed. The reader is delired to look at what we have ſaid in the article Physics, § 82.

The two magnets there ſpoken of are good repreſentatives of two atoms endowed with mutual powers of repulſion ; and the communication of motion is accompliſhed in both caſes in preciſely the ſame manner.

If, therefore, we ſhall ever be ſo fortunate as to diſcover the law of variation of that force which connects one atom of matter with another atom, and which is therefore characteriſtic of matter, and the ultimate ſource of all its ſenſible qualities, the curve whoſe ordinates repreſent the kind and the intenſity of this atomical force will be ſomething like that ſketched in fig. 2. The firſt branch *a n* B will have AK (perpendicular to the axis AH) for its aſſymptote, and the laſt branch l m *o* will be to all ſenſe a hyperbola, having A O for its aſſymptote ; and the ordinates *l* L, *m* M, &c. will be proportional to 1/AL2, 1/AM2, &c. expressing the univerſal gravitation of matter. It will have many branches B *b* C, D *d* E, FfG, &c. expreſſing attractions, and alternate repulſive branches C *c* D, E *e* F, G g H, &c. All theſe will be contained within a diſtance A H, which does not exceed a very minute fraction of an inch.

The ſimpleſt particle which can be a conſtituent of a body having length, breadth, and thickneſs, muſt conſiſt of four ſuch atoms, all of which combine their influence on each atom of another ſuch particle. It is evident that the curve which expreſſes the forces that connect two ſuch particles muſt be totally different from this original curve, this hylarchic principle. Suppoſing the laſt known, our mathematical knowledge is quite able to diſcover the firſt ; but when we proceed to compoſe a body of particles, each of which conſiſts of four ſuch particles, we may venture to ſay, that the compound force which connects them is almoſt beyond our ſearch, and that the diſcovery of the pri­mary force from an *accurate* knowledge of the corpuſcular forces of *this* particular matter is abſolutely out of our power.

All that we can learn is, the poſſibility, nay the certain­ty, of an innumerable variety of external ſenſible forms and qualities, by which different kinds of matter will be diſtinguiſhed, ariſing from the number, the order of compoſition, and the arrangement of the ſubordinate particles of which a particle of this or that kind of matter is compoſed. All theſe varieties will take place at thoſe ſmall and inſenſible diſtances which are between A and H, and may produce all that variety which we obſerve in the tangible or mecha­nical forms of bodies, ſuch as elaſticity, ductility, hardneſs, ſoftneſs, fluidity, vapour, and all thoſe unſeen motions or actions which we obſerve in fuſion and congelation, eva­poration and condenſation, ſolution and precipitation, crystallization, vegetable and animal aſſimilation and ſecretion, &c. &c. &c. while all bodies muſt be, in a certain de­gree, elaſtic, all muſt gravitate, and all muſt be imcompenetrable.

This general and ſatisfactory reſemblance between the appearances of tangible matter and the legitimate conſequence of this general hypothetical property of an atom of matter, affords a conſiderable probability that ſuch is the origin of all the phenomena. We earneſtly recommend to our readers a *careful* peruſal of Boſcovich’s celebrated treatiſe. A careful peruſal is neceſſary for ſeeing its value ; and nothing will be got by a haſty look at it. The reader will be particularly pleaſed with the facility and evidence with which the ingenious author has deduced all the ordinary principles of mechanics, and with the explanation which he has given of fluidity, and his deduction from thence of the laws of hydroſtatics. No part of the treatiſe is more valuable than the doctrine of the propagation of preſſure through ſolid bodies. This, however, is but just touched on in the course of the inveſtigation of the principles of mechanics. We ſhall borrow as much as will ſuffice for our preſent inquiry into the ſtrength of materials ; and we truſt that our readers are not diſpleaſed with this general ſketch of the doctrine (if it may be ſo called) of the coheſion of bodies. It is curious and important in itſelf, and is the foundation of all the knowledge we can acquire of the preſent article. We are ſorry to ſay that it is as yet a new ſubject of ſtudy ; but it is a very promiſing one, and we by no means deſpair of ſeeing the whole of chemiſtry brought by its means within the pale of mechanical ſcience. The great and diſtinguiſhing agent in chemiſtry is heat, or fire the cauſe of heat ; and one of its most sin­gular effects is the converſion of bodies into elaſtic vapour. We have the cleareſt evidence that this is brought about by mechanical forces : for it can be oppoſed or prevented by external pressure, a very familiar mechanical force. We may perhaps find another mechanical force which will pre­vent fuſion.

Having now made our readers familiar with the mode of action in which coheſion operates in giving ſtrength to ſolid bodies, we proceed to conſider the ſtrains to which this ſtrength is oppoſed.

A piece of ſolid matter is expoſed to four kinds of ſtrain, pretty different in the manner of their operation.

**1.** It may be torn aſunder, as in the cafe of ropes, ſtretchers, king-posts, tye-beams, &c.

**2.** It may be cruſhed, as in the cafe of pillars, poſts, and truſs-beams.

3. It may be broken acroſs, as happens to a joiſt or lever of any kind.

4. It may be wrenched or twisted, as in the caſe of the axle of a wheel, the nail of a preſs, &c.

I. It may be pulled asunder.

This is the ſimpleſt of all ſtrains, and the others are in­deed modifications of it. To this the force of coheſion is *directly* oppoſed, with very little modification of its action by any particular circumſtances.

When a long cylindrical or priſmatic body, ſuch as a rod of wood or metal, or a rope, is drawn by one end, it muſt be refilled at the other, in order to bring its coheſion into action. When it is faſtened at one end, we cannot conceive it any other way than as equally ſtretched in all its parts ; for all our obſervations and experiments on natural bodies concur in ſhowing us that the forces which connect their particles, in any way whatever, are equal and oppoſite. This is called the *third law of motion ;* and we admit its univerſality, while we affirm that it is purely experimental (see Physics). Yet we have met with dissertations by perſons of eminent knowledge, where propoſitions are maintained inconſiſtent with this. During the diſpute about the com­munication of motion, ſome of the ableſt writers have ſaid, that a ſpring compreſſed or ſtretched at the two ends was gradually leſs and leſs compreſſed or ſtretched from the ex­tremities towards the middle : but the ſame writers acknow­ledged the univerſal equality of action and reaction, which is quite incompatible with this ſtate of the ſpring. No ſuch inequality of compreſſion or dilatation has ever been obſer-