

the energies due to heat, vibrations, etc., and add these to the energy of the bodies considered as wholes, that the sum would be the total energy before impact. I do not think that any scientific man of the present day would controvert this.

It may be said that the more perfect the elasticity of a body is, the greater is its tendency to yield up the motion of its parts before contact ceases, and that if perfectly elastic, it would be perfectly at rest in its interior when contact ceased.

If a helical spring be suspended horizontally as a pendulum, and be allowed to fall endwise against a vertical wall, its coils will be noticed to be in a state of intense vibration after contact ceases, and I think no one would assert that it is possible to conceive it to be so elastic as not to vibrate. The assertion would even involve a contradiction of terms.

The fact is, that a perfectly elastic body would vibrate for ever, external resistances being supposed removed; and that this is not the case in imperfectly elastic bodies, is simply because their vibrations are gradually destroyed by internal friction being converted into heat, which is in turn communicated to surrounding bodies.

Again, take a number of balls placed very close together, and connected two and two by elastic strings of such tension that if the end ball be pulled away from the others, the motion is communicated through the system with the same velocity as it is when the end ball is struck towards the others; and imagine two such systems with a different number of balls in each to collide endwise in the line of their common axis. Calculate now the motion on the supposition of the conservation of relative motion as between each ball, and it will be found that the relative motion of the systems as wholes after impact is less than it was before impact, and that the motion of the parts will exactly account for the difference.

Thus we have an example of bodies made up of perfectly elastic parts in the sense in which the word has hitherto been used, which as wholes collide like imperfectly elastic bodies.

Now in all these cases, what is it that we see invariably to accompany the loss of relative motion. Is it not motion among the parts?

Do we not see that as the motion of the parts is diminished the relative motion becomes greater? Is not the loss of relative motion less when the bodies are harder, more able to retain their form, and