

of the proper motion, he will be unable to conceive how the impulses can be directed and adjusted, except by an intelligence little short of miraculous.

It is inadmissible to regard the orbits as lying in parallel planes, since a certain amount of heat would be required to separate these planes which would destroy the constant relation between the increments of temperature and expansion.

There is another way of conceiving the motion of the particles, which might be preferred. Suppose the particles, perfectly elastic and united in pairs as before, attracted by a constant force. If the particles of a pair be separated to a certain distance and left to their mutual action, they will approach each other with gradually accelerated motion, strike and rebound, retrograding through exactly the same degrees of velocity, come to rest at the original distance of separation, then repeat the motion. Thus we have a vibrating element. We may suppose the impulses of the ethereal waves, or of the particles of the heating body, to be such as constantly to renew motion lost by resistance. When the impulses are increased by additional heat, they may be such as to increase the amplitude of the vibrations in the same proportion as the actual energy is increased. On this supposition the average dynamic energy will represent the temperature, and the average amplitude the distance due to potential energy. So far all seems well, but there is a fatal objection to this arrangement, viz., the vibrations, as the heat is increased or diminished, will not be isochronous, which they must be to agree with observation. They might perhaps be made isochronous by supposing peculiar alterations in the impulses of the ether, but then the increments of potential energy would not correspond with the increments of heat, as they should to account for proportionate expansion.

The only attractive force which will give isochronous vibrations is one varying with the distance, which is inadmissible for the above reason.

The above are the simplest arrangements which can be devised on the theory of action at a distance, and we see how they fail.

If we suppose more particles admitted into a system, or other laws of attraction, we only increase the difficulty of arranging vibrations of the ether, which are required to explain observed phenomena. There is another objection to this theory which seems fatal to it. If I remember aright, it was noticed by Faraday.