

by contact and impulse : pressure, and force of all kinds, is exercised and transferred from one part to another, by means of a material connexion ; by rods, ropes, fluids, gases. In the machinery of the universe there is, so far as we know, no material connexion between the parts which act on each other. In the solar system no part touches or drives another : all the bodies affect each other *at a distance*, as the magnet affects the needle. The production and regulation of such effects, if attempted by our mechanics, would require great skill and nicety of adjustment ; but our artists have not executed any examples of this sort of machinery, by reference to which we can illustrate the arrangements of the solar system.

Perhaps the following comparison may serve to explain the kind of adjustments of which we shall have to speak. If there be a wide shallow round basin of smooth marble, and if we take a smooth ball, as a billiard ball or a marble pellet, and throw it along the surface of the inside of the basin, the ball will generally make many revolutions round the inside of the bowl, gradually tending to the bottom in its motion. The gradual diminution of the motion, and consequent tendency of the ball to the bottom of the bowl, arises from the friction ; and in order to make the motion correspond to that which takes place through the action of a central force, we must suppose this friction to be got rid of. In this case, the ball, once set a going, would run round the basin for ever, describing either a circle, or various kinds of ovals, according to the way in which it was originally thrown ; whether quick or slow, and whether more or less obliquely along the surface.

Such a motion would be capable of the same kind of variety, and the same sort of adjustments, as the motion of a body revolving about a larger one by means of a central force. Perhaps the reader may understand what kind of adjustments these are, by supposing such a bowl and ball to be used for a game