

undercharged state, to that of a Leyden jar, the coatings of which are in opposite conditions. If the jar be charged with electricity beyond a certain tension, there will be a spontaneous discharge, the restraining influence of the glass or the air being too small to overcome the expansive force of the electricity. This is the condition under which lightning is produced in the atmosphere. The attractive power exerted by two clouds charged positively and negatively must be active at a considerable distance, and this draws them towards each other with an accelerating force; but as soon as they have approached so near as to give the electricity an advantage over the constraining influence of the non-conducting medium, atmospheric air, a flash of lightning is produced. But this discharge is not sufficient to restore the electric equilibrium, and there will be successive discharges, proportioned to the distance of the clouds from each other, until this effect has been produced.

It sometimes happens that there is a passage of electricity from the earth to the clouds, and lightning is then produced, as in the discharge between two clouds. It is, however, quite impossible to determine whether the electricity moves from the earth to the cloud, or from the cloud to the earth; for so great is its velocity, that there is no perceptible period of time between the commencement and the completion of its circuit. This statement is beautifully illustrated by an experiment that has been made by Professor Wheatstone. When a spoked wheel is put into rapid rotation, the spokes will be absolutely invisible, on account of the velocity with which they are successively presented to the eye. But, if the wheel should at this time be illuminated by a flash of lightning, the spokes will for a moment be as distinct as though the wheel were at rest; for, however rapid may be its motion, it is not able to move through a perceptible space during the presence of the light, so instantaneous is the progress of electricity.

Many electricians imagine that the earth is always in the negative state, and that the electricity invariably passes to it from the clouds. Mr. Morgan, however, was of opinion, that the deficiency is never in the earth; but we can find no reason, either from the experiments that have been made, or from legitimate deductions, for either of these opinions. It is quite possible, from all that has been yet ascertained, that