The electric arc, as shown in Fig. 1, may be produced by passing an electric current through two carbon rods which touch each other and then drawing them apart. The arc consists of a flame of vaporized carbon, extending from one carbon pole to the other. When an electric current meets with resistance, it is transformed into heat, and, as the carbonaceous vapour offers a considerable resistance to the electric current, a very high temperature is produced; high enough to melt or vaporize any known substance.

In the direct current arc the positive carbon, which is marked + in the figure, is hollowed out by the current, and becomes intensely white hot, presenting the dazzling bright light with which all are acquainted. The arc light is, in fact, a miniature electric furnace of the arc type; and produces a temperature not much inferior to that in any modern electric furnace. It has been supposed that the hollowing out of the positive carbon is due to an electrolytic conveyance of carbon from the positive to the negative electrode; but recent experiments show that any electrical transfer of carbon is in the other direction, being a stream of electrons from the negative electrode, like the kathode discharge in a vacuum tube. The bombardment of the positive carbon by this stream of electrons, generates so much heat that the electrode becomes white hot and rapidly evaporates, thus producing the characteristic crater-like form.

This explanation appears to fit in well with the appearance of an arc that has been drawn out to a little more than its normal length. The arc (which should only be observed through a dark-colored glass screen) will be noticed to stream freely from the tip of the negative electrode, and its starting-point on this electrode is unaffected by drafts or magnetic influences. The current passes with difficulty on to the positive electrode, and does not always select the point nearest to the negative electrode, but is blown about and wanders over a considerable area of the electrode. The temperature of the hottest part of the positive carbon in the electric arc has been measured, and is considered to be about 3,700°C. (6,700°F.), which is twice the temperature of melting platinum or melting quartz, and more than twice the temperature of the open-hearth steel furnace.

In the use of a direct current arc for lighting, it is usual to make the upper carbon the positive electrode, in order to throw the greatest illumination downwards. In Fig. 1 this arrangement has been reversed, and in this position the positive carbon serves