APPLICATION OF RESULTS.

Although it would appear from the preceding statements, copied literally from the manuscript referred to, that the results given by this formula can be relied upon in practice, yet, notwithstanding the evidence furnished by the Monocacy aqueduct, we cannot think that the dimensions given by the formula are sufficient. When the stone is extremely hard, and the pressure upon it very small in proportion to its capability of resistance, the result may be sufficiently great, but in other cases it cannot be trusted. In fact, it is evident that the formula has been deduced upon the supposition that the pressures are thrown entirely upon the points $D$ and $C$, but, unless the strength of the material be almost infinite, these points could not sustain the pressure; the portions of the stone lying at these points would break off, and the points of contact $D$ and $C$, being thus brought nearer together, would render the line of direction of the pressure more nearly horizontal, increase both the horizontal force at $C$ and the leverage on $s$, or $LX$ at which it acts, and consequently require a greater thickness of abutment to resist its effects.

That which we believe to be the true method of determining the equation of equilibrium of an arch, can be deduced from a process of reasoning analogous to that employed in the case of a straight beam supported at the ends, or the chords of a straight bridge.

The lower fibres of a beam, and the lower chords of a straight bridge-truss are in a state of extension, and the upper ones of compression, and the neutral axis is, in general, in the middle of the depth; but in an arch of any material, resting upon fixed abutments, the resistance of the abutments exactly replaces that of the ties or lower chords in the former case, and the position of the neutral axis will remain unchanged.

Fig. 74.