

In fact, nothing but a continuous series of unyielding material particles, extending from an elevated body downward to the surface of the earth, can hold or sustain that body above the earth, by vertical and horizontal action alone, either separately or in combination.

III. Suppose a body, no matter how great or small, placed above the earth, with an unfathomable abyss, or an inaccessible space beneath it. Attach as many cords to it as you please, strain them much or little, (only horizontally,) the body will fall nevertheless. Thrust any number of rods, with whatever force you may, horizontally against it, still the body will fall. Moreover, the space beneath being inaccessible, there is no foundation or foothold on which to rest a post or stud, that may directly resist the action of gravity, and the lines of all other vertical forces or resistances pass by the body without affecting it. In the situation here supposed, the body can only be prevented from falling by oblique forces, that is, by forces whose lines of action are neither exactly horizontal, nor exactly vertical.

Attach two cords to the body, draw upon them obliquely upward and outward, in opposite directions, or from opposite sides of the abyss, with a certain stress, and the body will be sustained in its position. Apply two rods to it obliquely upward, of a proper degree of stiffness, in the same vertical plane, on opposite sides of the perpendicular, a certain thrust exerted on those rods will prevent the descent of the body.

IV. Here, then, we have the elementary idea, the grand fundamental principal in bridge-building. Whatever form of structure be adopted, the elementary object to be accomplished is, to sustain a given weight in a given position, by a system of oblique forces whose resultant shall pass through the centre of gravity of the body, in a vertically upward direction, in circumstances where the weight cannot be conveniently met by a simple force in the same line with, and opposite to, that of gravity.