them with any degree of firmness. In some contests it was formerly the custom for the combatants to rub their bodies with oil, that the adversary might not be able to keep his grasp. If the pole of the boatman, the rope of the sailor, were thus smooth and lubricated, how weak would be the thrust and the pull! Yet this would only be the removal of friction.

Our buildings are no less dependent on this force for their stability. Some edifices are erected without the aid of cement; and if the stones be large and well squared, such structures may be highly substantial and durable; even when rude and slight, houses so built answer the purposes of life. These are entirely upheld by friction, and without that agent they would be thrown down by the Zephyr, far more easily than if all the stones were lumps of ice with a thawing surface. But even in cases where cement *binds* the masonry, it does not take the duty of *holding* it together. In consequence of the existence of friction, there is no constant tendency of the stones to separate; they are in a state of repose. If this were not so, if every shock and every breeze required to be counteracted by the cement, no composition exists which would long sustain such a wear and tear. The cement excludes the corroding elements, and helps to resist extraordinary violence; but it is friction which gives the habitual state of rest.

We are not to consider friction as a *small* force, slightly modifying the effects of other agencies. On the contrary its amount is in most cases very great. When a body lies loose on the ground, the friction is equal to one-third or one-half, or in some cases the whole of its weight. But in cases of bodies supported by oblique pressure, the amount is far more enormous. In the arch of a bridge, the friction which is called into play between two of the vaulting stones, may be equal to the whole weight of the bridge. In such cases this conservative force is so great, that the common theory, which neglects it, does not help