fluid must be sustained as if it were a single column reaching to the top of the tree. The division into minute parts and distribution through small vessels does not at all diminish the total force requisite to raise it. If, for instance, the tree be thirty-three feet high, the pressure must be fifteen pounds upon every square inch in the section of the vessels of the bottom in order merely to support the sap. And it is not only supported, but propelled upwards with great force, so as to supply the constant evaporation of the leaves. The pumping power of the tree must, therefore, be very considerable.

That this power is great, has been confirmed by various curious experiments, especially by those of Hales. He measured the force with which the stems and branches of trees draw the fluid from below, and push it upwards. He found, for instance, that a vine in the *bleeding* season could push up its sap in a glass tube to the height of twenty-one feet above the stump of an amputated branch.

The force which produces this effect is part of the economy of the vegetable world; and it is clear that the due operation of the force depends upon its being rightly proportioned to the force of gravity. The weight of the fluid must be counterbalanced, and an excess of force must exist to produce the motion upwards. In the common course of vegetable life, the rate of ascent of the sap is regulated, on the one hand, by the upward pressure of the vegetable power, and on the other, by the amount of the gravity of the fluid, along with the other resistances, which are to be overcome. If, therefore, we suppose gravity to increase, the rapidity of this vegetable circulation will diminish, and the rate at which this function proceeds, will not correspond either to the course of the seasons, or the other physiological processes with which this has to co-operate. We might easily conceive such an increase of gravity as would stop the vital movements of the plant in a very short time. In like manner, a diminution of the