

the several pieces of which its dorsal portion is composed, are loosely connected together by ligaments.*

The shape of the wings is more or less triangular. They are moved by numerous muscles, which occupy a large space in the interior of the trunk, and consist of various kinds, of flexors, extensors, retractors, levators, and depressors; the whole forming a very complicated assemblage of moving powers. The largest, and consequently most powerful of these muscles, are those which depress, or bring down the wings. They form a large mass, marked *a*, in Fig. 144. All these muscles exert great force in their contractions, which are capable of being renewed in very rapid succession; for, indeed, unless they had this power, even so light a body as that of an insect could not have been sustained for a moment in so rare a medium as the atmosphere, far less raised to any height by its resistance.

The simple ascent and descent of the wings would be sufficient, without any other movement being imparted to them, to carry forwards the body of the insect in the air. The action in which the muscles exert the greatest force is in striking the air during the descent of the wing; an impulse in the opposite direction being the result of the reaction of the air. The axis of motion of the wings is a line inclined at a small angle to the axis of the body, and directed, from before, backwards, outwards, and downwards; and they move in a plane which is not vertical, but inclined forwards. The angle which the plane of the wing forms with the horizon varies continually in the different positions of the wing; but the general resultant of all these successive impulses is a force directed forwards and upwards; the first part of this force produces the horizontal progression of the insect, while the second operates in counteracting the force of gravity; and, during the advance of the insect, either maintains it at the same height, or enables it to ascend.

When the insect wishes to turn, or to pursue an oblique

* See Chabrier's "Essai sur le Vol des Insectes," Mémoires du Muséum d'Histoire Naturelle; vi. 410, vii. 297, and viii. 47 and 349. See, also, Zoological Journal, i. 391.