fourth method stridulate during flight, the others while at rest. To the first group belong the crickets; to the second the Locustarians; to the third and fourth certain kinds of Acridians. With few exceptions the males alone stridulate. In general terms one may say:

Crickets shrill and creak.

Locustarians scratch and scrape.

Acridians shuffle, rustle and crackle.

In the following pages we propose to pass in review what is known of our American species in this particular, beginning with the crickets and treating the species in systematic order. In doing this we shall have occasion to make our statements perhaps a little clearer by the introduction of a few illustrations, in which a peculiar system of musical notation is employed. It should first of all be explained that this is done only to express the time limits of the song and the rapidity of the successive notes. As the notes are always at one pitch (which, when specified, has been determined by the aid of a piccolo flute), there is, properly speaking, no *song* at all; but it is to the insect what song is to the bird, and so this tropical use of the word may here be allowed. Each bar represents a second of time, and is occupied by the equivalent of a semibreve; consequently a quarter note , or a quarter rest , represents a quarter of a second; a sixteenth note  , or a sixteenth rest  , a sixteenth of a second and so on. For convenience's sake I have introduced a new form of rest ( or), which indicates silence through the remainder of a measure.

Gryllidae.

Gryllotalpa borealis Burm. This insect, our common mole cricket (Fig. 35, page 61) usually begins its daily chirp at about four o'clock in the afternoon, but stridulates most actively at about dusk. On a cloudy day, however, it may be heard as early as two or three o'clock; this recognition of the weather is rather remarkable in a burrowing insect, and the more so as it does not appear to come to the surface to stridulate, but remains in its burrow, usually an inch below the surface of the ground. The European mole cricket (*Gryllotalpa vulgaris*), is said to chirp both within its burrow and at its mouth (*plerumque sub terrâ*, Fischer says), and it may be that our species sometimes seeks the air in chanting; but the chirp, as far as I have heard it, always has a uniformly subdued tone, as if produced in some hidden recess. Fischer says that the European species which is twice as large as ours, cannot be heard more than from one hundred and fifty to two hundred feet (*ultra spatium 20-30 passuum*). Ours, when certainly beneath the surface, is easily distinguished at a distance of five rods; and one would presume that it could be heard, if above ground, nearly twice as far away. Its chirp is a guttural sort of sound, like grü or grēēu, repeated in a trill indefinitely, but seldom for more than two or

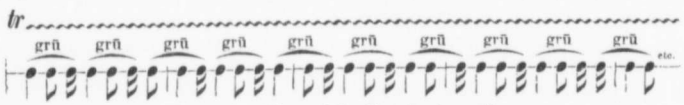

Figure 36—Note of Gryllotalpa borealis.

three minutes, and often for less time. It is pitched at two octaves above middle C, and the notes are usually repeated at the rate of about 130 or 135 per minute, sometimes, when many are singing, even as rapidly as 150 per minute. Often, when it first begins to chirp it gives a single prolonged trill of more slowly repeated notes, when the composite character of the chirp is much more readily detected, and afterward is quiet for a long time. When most actively chirping, however, the beginning of a strain is less vigorous than its full swell, and the notes are then repeated at the rate of about 120 per minute; it steadily gains its normal velocity. Zetterstedt compares the chirp of the European species