long, bow-shaped spurs, each of which secretes a drop of honey (Fig. 9). The carpels are also reduced to five, the regularity of number being itself a common mark of advance in organisation. Various columbines accordingly range from red to purple, and dark blue. Our English species, *A. vulgaris*, is blue or dull purple, though it readily reverts to white or red in cultivated varieties. Even the columbine, however, though so highly specialised, is not bilaterally but circularly symmetrical. This last and highest mode of adaptation to insect visits is found in larkspur (*Delphinium ajacis*), and still more developed in the curious monkshood (*Aconitum napellus*), Fig. 10. Now larkspur is usually blue, though white or red blossoms sometimes occur by reversion; while monkshood is one of the deepest blue flowers we possess. Both show very high marks of special adaptation; for besides their bilateral form, *Delphinium* has the number of carpels reduced to one, the calyx coloured and deeply spurred, and three of the petals abortive; while *Aconitum* has the carpels reduced to three and partially united into a compound ovary, the upper sepals altered into a curious coloured hood or helmet, and the petals considerbly modified. All these very complex arrangements are definitely correlated with the visits of insects, for the two highly abnormal petals under the helmet of the monkshood (Fig. 11) produce honey, as do also the two long petals within the spur of the larkspur. Both flowers are also specially adapted to the very highest class of insect visitors. *Aconitum* is chiefly fertilised by bees; and Sir John Lubbock observes that "*Anthophora pilipes* and *Bombus hortorum* are the only two North European insects which have a proboscis long enough to reach to the end of the spur of *Delphinium elatum*. *A. pilipes*, however, is a spring insect, and has already disappeared, before the *Delphinium* comes into flower, so that it appears to depend for its fertilisation entirely on *Bombus hortorum*."

GRANT ALLEN

(*To be continued.*)

FREDERIC KASTNER

FREDERIC KASTNER, who is known to the scientific world as the inventor of the *Pyrophone*, has recently died, as we announced at the time, at the early age of thirty years. He was the son of an Alsacian composer of some merit, Georges Kastner, and was himself an accomplished musician. Educated partly at Paris and partly at Strasburg, he imbibed a love of science, and at the early age of fourteen years was already assisting his teachers in the chemical laboratory. When seventeen years of age he invented and patented a novel form of electromotor, in which a series of electro-magnets were caused to act in succession upon a rotating arbor. After the war of 1870-71, in which he was driven from Strasburg, he devoted himself to studying the properties of musical flames. The discovery of Higgins in 1777, that a hydrogen flame burning within the lower end of an open glass tube could set up a musical note, had been the starting point of a number of hitherto barren attempts by Schaffgotsch and others. Without knowing anything of the experiments of Schaffgotsch, Barrett, or Tyndall, young Kastner set to work to experiment, with the determination to construct a musical instrument on this principle. For two years he worked at the subject, endeavouring to temper the harsh tones of the flames and to produce a purity and constancy in their notes. He tried tubes of different sizes and forms. He varied the form of the gas jet, and essayed to introduce two or more jets into one tube. At last, in 1871, he discovered that when he employed *two* flames he could control their note at will, being silent when both were close together, but producing sound when they were separated. This phenomenon, which Kastner called the interference of flames, was the real starting-point of Kastner's *Pyrophone* or *Flame-Organ*, which he patented in 1873. This organ had for its pipes glass tubes of different lengths, two hydrogen flames burning in each at the proper height. A very simple lever-arrangement served to separate the flames at will. In this form the instrument was presented to the Académie des Sciences at Paris, and publicly exhibited. Two subsequent improvements followed. A circle of small jets of common coal gas was found to answer quite as well as the two hydrogen jets, the circle being constructed so that by a simple mechanical contrivance it could be increased or diminished in size, thus separating or reuniting the flames at will. The second improvement was the application of electric currents and an electromagnetic apparatus enabling the flame-organ to be played at a distance. The first instrument of this kind constructed by Kastner was in the form of a singing-lustre hung from the chandelier in his mother's house. The pyrophone was shown at the Royal Institution in January, 1875, and at the Society of Arts in the succeeding month. It was also shown at the Loan Collection of Scientific apparatus at South Kensington in 1876, and at the Paris Exhibition in 1878. In 1876, moreover, an account of the instrument and of the researches which led to its construction was published by Kastner under the title of "Flammes Chantantes." The strange, weird tones produced by the instrument attracted the notice of musicians. Gounod sought to introduce the pyrophone into his opera of "Jeanne d'Arc," and Kœnemann at Baden Baden, in 1879, actually introduced the instrument on one occasion. A decline, however, seized the young inventor, whose strength for some years ebbed slowly away, and he died all too soon to see his invention fairly recognised by the public.

THE NEW AFRICAN EXPEDITION

IT is now understood to be quite settled that a new African exploring expedition will start next year. The Royal Geographical Society have, as might have been expected, taken the opportunity of Mr. Joseph Thomson's return from the completion of his engagement to the Sultan of Zanzibar to obtain his services as leader, and it is certain that no bettter selection could have been made.

Mr. Thomson will leave England in the Spring of 1883, and proceed to Zanzibar to organise the expedition. From Mombas, a port on the East African coast, to the north of Zanzibar, he will direct his course straight to Kilimandjaro, and do his best to explore the snowy ranges of this celebrated mountain, which but one European has as yet ever reached. Passing across the water-parting he will then descend through an entirely unknown country to the eastern shore of Lake Victoria Nyanza, and return to the coast by a more northern route, in the course of which it is hoped he may be able to visit Lake Baringo and Mount Kenia—another peak known to run far above the snow-level, but concerning which further details would be very desirable.

As a mere geographical expedition it will be thus seen that the proposed route will be one of great interest, embracing, as it does, the transit through much utterly unknown country, and the exploration of two mysterious snow-crowned mountains, which, according to the usual view of the conformation of the African Continent, appear to be quite out of place in the districts in which they are situated. But still more interesting problems will be solved, if steps are taken to investigate the unknown fauna and flora of Kilimandjaro and Kenia. The animal and vegetable life of these mountains must be entirely different from that of the plains by which they are surrounded. They will prove to have been derived either by modification from the adjacent lower districts, or by immigration from the north—in any case, presenting phenomena of first-rate importance to the student of geographical distribution.