## 1.2.6 Boranes

Boranes are compounds with boron (B) and hydrogen (H). From 1912 to 1936, Alfred Stock and coworkers synthesized and studied many boranes, for example, $B_2H_6$ (diborane (6); b.p. in vacuum – 92.59°C; see Fig. 1.2.6), $B_4H_{10}$ (tetraborane (10); 18°C; Fig. 1.2.7A), $B_5H_9$ (pentaborane (9); 60°C; Fig. 1.2.7B), $B_5H_{11}$ (pentaborane(11); 65°C; Fig. 1.2.7C), $B_6H_{10}$ (hexaborane(10); 108°C; Fig. 1.2.7D), $B_{10}H_{14}$ (decaborane(14); 213°C; Fig. 1.2.7E), etc.

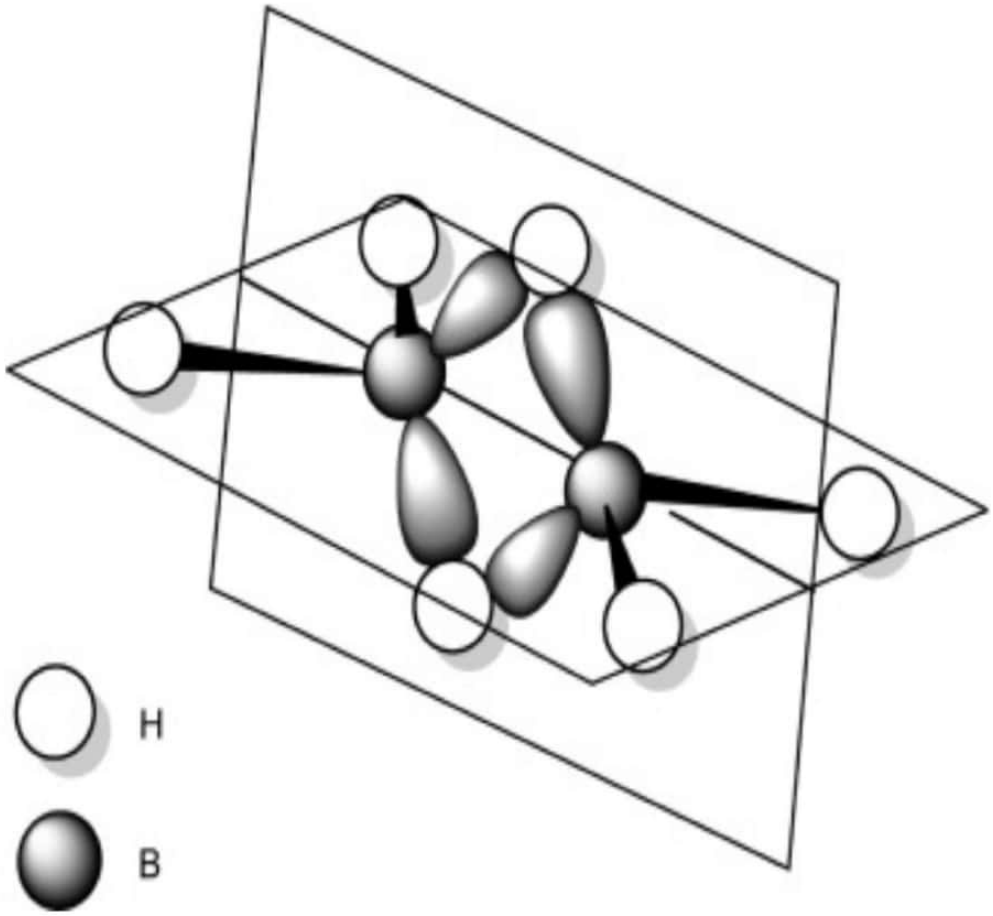




Fig. 1.2.6. Diborane (6) ($B_2H_6$).

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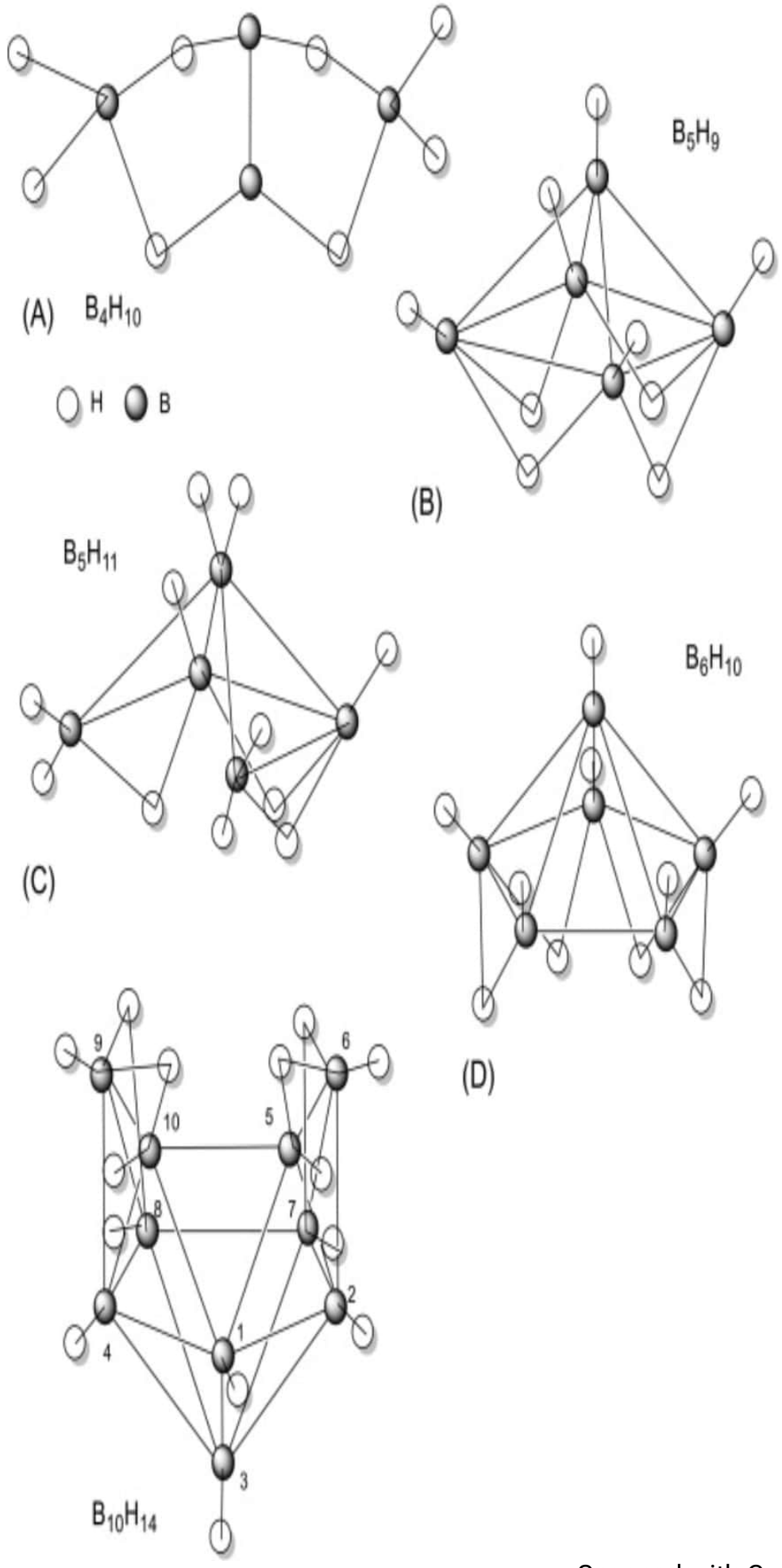

The number in parentheses after the borane indicates the number of hydrogen atoms in one molecule. Diborane(6) ($B_2H_6$) is flammable gas in air. Thus, in order to deal with these boranes, Stock developed vacuum experimental techniques. In addition, boranes have interesting chemical properties as well as remarkably interesting structures. For example, the structure of diborane (6) is shown in Fig. 1.2.6. Along a B-B line, there are two perpendicular planes. On one plane there are four usual $sp^3$ B-H bondings; however, on the other perpendicular plane, two prototypal three-center two-electron (3c-2e) hydrogen bridge bondings are formed. One hydrogen atom is bonded to two boron atoms, each of which donate one electron, so that two boron atoms give two electrons to two hydrogen atoms to form two B-H, 3c-2e bondings.