Ulverston in Lancashire; specular iron at Tavistock in Devonshire and in Cumberland. *Martite* seems to be the same substance in pseudomorphs after magnetite; it occurs in octahedra in Bute, Framont (Vosges), New York, and Brazil.

83. Ilmenite, $(Fe,Ti)_2O_3$.

Rhombohedral; R 86°. Crystals rhombohedral and tabular, also in twins. Cl. basal; fracture conchoidal. H. = 5 to 6; G. = 4·66 to 5. Opaque, semimetallic, iron-black to dark brown; streak black or reddish brown. Sometimes slightly magnetic. B.B. infusible, but with microcosmic salt forms a red glass. Slowly sol. in s. acid when powdered. C.c.: peroxide of iron, with from 8 to 53 per cent. oxide of titanium. Occurs in metamorphic rocks. Common in chloritic gneiss in Scotland; Menaccan (Cornwall), Ilmen Mountains, Salzburg, Egersund (Norway), Arendal, Dauphiné (*Crichtonite*), Massachusetts (*Washingtonite*).

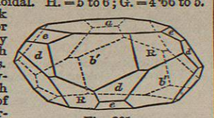

Fig. 281.

84. Iserine.

Cubic; in octahedra. Strongly magnetic; in other respects similar to ilmenite, but occurs in igneous rocks. Common as black iron-sand in Scotland; Iserweise in Bohemia, Auvergne, Canada, New Zealand.

3. Compounds of Sesquioxides with Protoxides (Spinels).

85. Magnetite, FeO, Fe_2O_3.

Cubic (figs. 35, 30, 33, 29, 34, 37, with 40, 41, 36). Hemitropes common on octahedral face (fig. 169). Twins (fig. 261). Faces of ∞0 striated in long diagonal. Often compact and granular. Cl. octahedral; fracture conchoidal or uneven; brittle. H. = 5·5 to 6·5; G. = 4·9 to 5·2 Opaque; lustre metallic. Iron-black to brown; streak black. Highly magnetic; often polar, forming natural magnets. B.B. becomes brown and non-magnetic, fusing with difficulty. Powder sol. in h. acid. C.c.: 31 protoxide and 69 peroxide of iron; or 72·4 iron, 27·6 oxygen; sometimes with titanic acid. In crystals in Shetland and Sutherland; also Cornwall and Antrim, Traversella (Piedmont), Tyrol, Styria. Massive at Dannemora and Taberg (Sweden), Norway, Urals, Harz, Saxony, Elba. This is the most important ore in Norway, Sweden and Russia, and affords the finest iron.

86. Magnesio-Ferrite, MgO, Fe_2O_3.

Cubic (fig. 30). H. = 6 to 6·5; G. = 4·57 to 4·66. Other characters same as magnetite. C.c.: magnesia 20, peroxide of iron 87. Fumaroles of Vesuvius.

87. Jacobsite, $(MnO, MgO), (Fe_2O_3, Mn_2O_3)$.

Cubic; O. Black; vitreous; streak red. Nordmark in Sweden.

88. Franklinite, $(FeO, ZnO, MnO), (Fe_2O_3, Mn_2O_3)$.

Cubic (figs. 34, 64); also granular. Cl. octahedral; fracture conchoidal; brittle. H. = 5·5 to 6·5; G. = 5·07. Metallic lustre. Iron-black; streak reddish brown. Opaque; slightly magnetic. B.B. infusible, but shines and throws out sparks. On charcoal with soda a deposit of oxide of zinc. Sol. in h. acid with evolution of chlorine. C.c.: about 67 iron oxide, 17 manganese peroxide, 16 zinc oxide. Franklin and Sterling (New Jersey).

89. Chromite, FeO, Cr_2O_3.

Cubic; in octahedra, generally granular-massive. H. = 5·5; G. = 4·4 to 4·5. Opaque; semimetallic to resinous. Iron-black to dark brown; streak reddish brown. Fracture uneven; sometimes magnetic. B.B. unchanged; in red. flame becomes magnetic; with borax forms an emerald-green bead. Not soluble in acids. C.c.: 19 to 37 protoxide of iron, 0 to 15 magnesia, 36 to 64 peroxide of chromium, 9 to 21 alumina. Unst (Shetland), Towanrieff (Aberdeenshire), Silesia, Bohemia, Styria, Urals, Turkey, Baltimore, Massachusetts, and Hoboken. The ore of chromium; used for dyes. *Iridite* is chromite mixed with iridosmium.

90. Uraninite (*Pitch Blende*), UO, U_2O_3.

Cubic (fig. 30); usually massive and botryoidal. H. = 5 to 6; G. = 6·5 to 8. Lustre pitch-like to submetallic. Colour velvet-black, brownish black, and grey. B.B. infusible. Not sol. in h. acid, but easily in hot n. acid. C.c.: oxides of uranium 80, with a mixture of other oxides. Johann-Georgenstadt, Annaberg, Przibram, Redruth in Cornwall. The chief ore of uranium.

91. Gahnite, ZnO, Al_2O_3.

Cubic (figs. 166, 30, 33, and with 39, 40). Hemitropes like magnetite. Cl. O; brittle, with conchoidal fracture. H. = 7·5 to 8; G. = 4·3 to 4·9. Opaque; vitreous to resinous. Dark leek-green to blue; streak grey. B.B. unchanged. Unaffected by acids or alkalies. C.c.: 44 oxide of zinc, 56 alumina. Falun, Broddbo, Haddam in Connecticut, and Franklin in New Jersey. *Dysluite* contains 42 per cent. sesquioxide of iron; and *Kreittonite* contains 24 oxide of manganes

92. Hercynite, FeO, Al_2O_3.

Cubic; generally granular massive. H. = 7·5 to 8; G. = 3·9 to 3·95. B.B. infusible. C.c.: oxide of iron 41·1, alumina 58·9. Ronsberg in the Böhmerwald.

93. Spinel, MgO, Al_2O_3.

Cubic (figs. 30, 33, 40 with 26); hemitropes united by face of O. Cl. octahedral; fracture conchoidal. H. = 8; G. = 3·4 to 4·1. Transparent to opaque; vitreous. Black, red, blue, green; streak white. B.B. infusible and unchanged. C.c.: 28 magnesia, 72 alumina; some with a little iron, and the red varieties some chromium. Varieties are—*Spinel Ruby* when scarlet, *Balas Ruby* when rose-red; both often sold as the true ruby, but not nearly so valuable; when of 4 carats valued at half the price of a diamond the same size. These

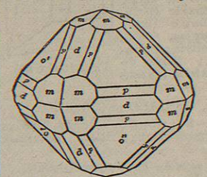

Fig. 282.

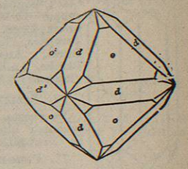

Fig. 283.

come from Pegu (native name Balachan) The violet-coloured is the *Alabandine ruby* from Alabandin in Caria, (Asia Minor). The orange red is the *Rubicella*. The above also occur at Ceylon, Ava, and Siam. *Sapphirine* is pale sapphire-blue to greenish or reddish blue; from Aker in Sweden, Greenland, and North America. *Pleonaste*, dark green or blue to black; from Candy in Ceylon. *Chlorospinel*, grass-green with a yellowish white streak; from Zlatoust. *Water-spinel* colourless; from Ceylon. *Picotite* is a dark blue chromiferous variety from serpentine.

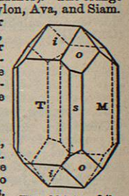

Fig. 284 (sp. 94).

94. Chrysoberyl, GlO, Al_2O_3.

Right prismatic (fig. 284). Twins common, united by a face of P∞ (fig. 285, also 156). Cl. brachydiagonal imperfect, macrodiagonal more so; fracture conchoidal. H. = 8·5; G. = 3·68 to 3·8. Transparent or translucent; vitreous. Greenish white, leek-green, and dark emerald-green. B.B. infusible. Not affected by acids. C.c.: glucina 20, alumina 80. Brazil, Ceylon, India, the Urals, Haddam in Connecticut. A very valuable gem. It sometimes possesses an opalescent band, which when the stone is cut *en cabochon* appears as a streak of floating light; whence it derives its name of *Cymophane*. It is then also called the chatoyant or Oriental chrysolite, and when fine is of extreme value. The emerald-green variety, or *Alexandrite*, is columbine-red by transmitted light.

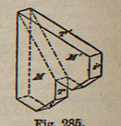

Fig. 285.

4. Deutoxides.

95. Rutile, TiO_2.

Pyramidal; prisms dominant. P 84 40′; P∞ 65° 35′ (figs. 286, 287). Hemitropes common, with axes of halves 114° 26′. Cl. ∞P and ∞P∞, perfect. H. = 6 to 6·5; G. = 4·2 to 4·3. Transparent to opaque; adamantine lustre. Brown-red, red, pale yellow, and black; streak yellowish brown. B.B. unchanged; with borax in the ox. flame forms a greenish, in the red. flame a violet glass. Not affected by acids. C.c.: titanic acid, with some peroxide of iron. Craigcailleach and Ben-y-Gloe (Perthshire), The Cobbler and Ben-Bheula (Argyllshire), Alps, Limoges, Norway, Brazil. Large crystals at Titanium Mount (Lincoln county, Georgia). Used in porcelain painting, and for tinting artificial teeth. When attenuated crystals are imbedded in rock-crystal they are called Venus' hair.

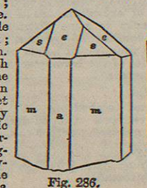

Fig. 286.

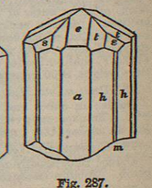

Fig. 287.

96. Anatase, TiO_2.

Pyramidal; pyramids dominant. P 136° 36′ (fig. 288). Cl. basal, and ∞P, both perfect; brittle. H. = 5·5 to 6; G. = 3·8 to 3·93. Transparent to opaque; lustre adamantine to metallic. Indigo-blue, yellow, brown, rarely colourless; streak white. B.B. infusible. Sol. in hot s. acid. C.c.: titanic acid, with a little iron and rarely tin. Cornwall and Devonshire, the Alps, Dauphiné, Valais, the Urals, Minas Geraes (Brazil).

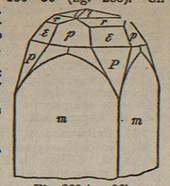

Fig. 288 (sp. 96).

97. Brookite, TiO_2.

Right prismatic; with polar edges 135° 37′ and 101° 3′ (fig. 289). Cl. macrodiagonal. H. = 5·5 to 6; G. = 3·86 to 4·2. Transparent to opaque; lustre metallic adamantine. Yellowish, reddish, and hair-brown; streak yellowish white to white. B.B. infusible; with microcosmic salt, a brownish yellow glass. C.c.: titanic acid, with 1 to 4·5 per cent. peroxide of iron. Snowdon and Tremadoc (Wales), Chamouni, Bourg d'Oisans, Miask. *Arkansite* is iron-black, and submetallic, in thick crystals from Arkansas, U.S.

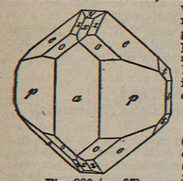

Fig. 289 (sp. 97).

98. Cassiterite, SnO_2.

Pyramidal. P 87° 7′; P∞ 67° 50′ (figs. 290 to 292). Crystals ∞P, P; or ∞P (*g*), P (*s*), ∞P∞ (*l*); or with P∞ (*P*), (fig. 290); and also ∞P2 (*r*), and $3P\frac{3}{2}$ (*z*), (fig. 291). Hemitropes very common, combined by a face of P∞ with the chief axes 112° 10′ (figs. 293, 171, 172, 178); also fibrous (*Wood Tin*), or in rounded fragments and grains (*Stream Tin*). Cl. prismatic along ∞P, and ∞P∞, imperfect· brittle H. = 6 to 7; G. = 6·8 to 7. Translucent or opaque; adamantine or resinous. White, but usually grey, yellow, red, brown, and black; streak white, light grey, or brown. B.B. in the forceps infusible; on

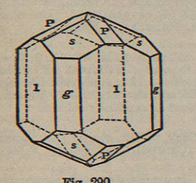

Fig. 290.

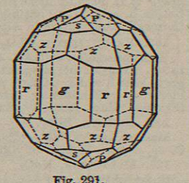

Fig. 291.

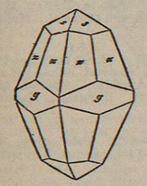

Fig. 292.

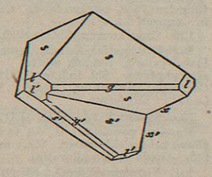

Fig. 293.

charcoal, in the inner flame, reduced to tin. Not affected by acids. C.c.: 78·6 tin and 21·4 oxygen, but often mixed with peroxide of iron, or manganese, or tantalic acid. Cornwall, Bohemia, Saxony, also Silesia, Haute-Vienne in France, Greenland, Russia, North and South America, Malacca, Banca, and Queensland. Almost the only ore of tin.

99. Hausmannite, $2MnO, MnO_2$.

Pyramidal. P 116° 59′; P∞ 98° 32′ (fig. 110). Twins common, and rosettes of twins (figs. 174, 175). Cl. basal, perfect, less so P and P∞; fracture uneven. H. = 5·5; G. = 4·7 to 4·8. Opaque; metallic lustre. Iron-black; streak brown. B.B. infusible, but becomes brown. Sol. in h. acid, with evolution of chlorine. Powder colours s. acid red. C.c.: 31 protoxide and 69 peroxide of manganese. Ihlefeld and Ilmenau in the Harz, and Sweden.

100. Braunite, MnO, MnO_2.

Tetragonal. P 108° 39′. Cl. P; brittle. H. = 6 to 6·5; G. = 4·7 to 4·9. Metallic lustre. Colour and streak dark brownish black. C.c.: 70 manganese and 30 oxygen, generally with about 8 per cent. of silica. Ihlefeld and St Marcel. *Marceline* has violet tarnish.

101. Pyrolusite. MnO_2.

Right prismatic; ∞P 93° 40′; generally radiating fibrous, or compact earthy. Cl. ∞P; friable. H. = 2 to 2·5; G. = 4·7 to 5. Opaque; lustre silky to semi-metallic. Dark steel-grey to black; streak black. Soils. B.B. infusible, loses oxygen and becomes brown. Sol. in h. acid, with evolution of chlorine. C.c.: manganese 63, oxygen 37. Arndilly (Banffshire), Cornwall and Devon, Ilmenau, Ihlefeld, France, Hungary, Brazil. Used for removing the green iron tint from glass; hence its name and that of *Savon de verrier*. Also for obtaining oxygen and chlorine. *Varvicite* is a variety with 5 per cent. of water, from Warwickshire.

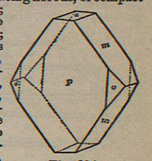

Fig. 294.

102. Credenerite, $3CuO, 2(MnO, MnO_2)$.

Oblique. H. = 4·5; G = 5. Metallic. Black; streak brown. Thuringia.

103. Plattnerite, PbO_2.

Hexagonal. ∞P 120°. Cl. indistinct; brittle. G. = 9·4. Opaque; metallic. Iron-black; streak brown. C.c.: lead 86·2, oxygen 13·8. Leadhills.

104. Minium, $2PbO, PbO_2$.

Pulverulent. H. = 2 to 3; G. = 4·6. Dull. Colour bright red; streak orange-yellow. B.B. fuses easily and reduced. Sol. in h. acid. C.c.: lead 90·7, oxygen 9·3. Leadhills, Wedrdale in Yorkshire, Anglesea, Badenweiler, Siberia.

5. Hydrous Oxides.

105. Sassoline, B_2O_3, H_2O.

Anorthic. 0P : ∞P∞ 75° 30′. Scaly six-sided plates. Cl. basal. Flexible and sectile. H. = 1; G. = 1·4 to 1·5. Transiucent; pearly; white; taste bitter; greasy. Sol. in hot water. C.c.: boracic acid 56·45, water 43·55. Hot springs of Sasso, near Siena, Tuscany; and with sulphur in the crater of Volcano, Lipari Islands.

106. Turgite, $2Fe_2O_3 + H_2O$.

Massive and fibrous, also earthy. H. = 5 to 6; G. = 3·5 to 4·68. Lustre satin-like, also dull. Colour reddish black to bright red. Botryoidal surfaces lustrous like limonite. Opaque. C.c.: iron sesquioxide 94·7, water 5·3. B.B. decrepitates violently and yields water. Kerrera (Hebrides), Bogoslovsk (Urals), and many limonite localities. Frequently taken for limonite.

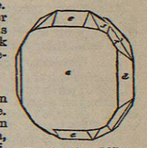

Fig. 295 (sp. 107)

107. Diasport, Al_2O_3, H_2O.

Right prismatic; ∞P 129° 47′; usually thin foliated. Cl. brachydiagonal, perfect; brittle. H. = 6; G. = 3·3 to 3·4. Vitreous; pearly on cleavage-planes. Colourless to yellowish, greenish, or violet. B.B. infusible, decrepitates. Insoluble. C.c.: alumina 85, water 15. Schemnitz, Broddbo, Switzerland. Naxos, Chester, Massachusetts. Fig. 295.

108. Göthite, Fe_2O_3, H_2O.

Right prismatic; ∞P 94° 53′; also columnar, fibrous, or scaly. Cl. brachydiagonal, perfect; brittle. H. = 5 to 5·5; G. = 3·8 to 4·4. Opaque; or fine crystals transparent, and hyacinth-red; lustre adamantine or silky. Colour yellow, red, or dark brown; streak brownish yellow. B.B. becomes magnetic, difficultly fusible. Sol. in h. acid. C.c.: peroxide of iron 90, water 10. Hoy (Orkney), Achavarasdale (Caithness), Salisbury Crags (Edinburgh), Lostwithiel, Clifton, Bristol, Przibram, Siegen, Saxony, Urals, North America.

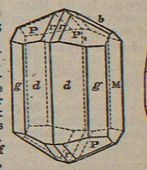

Fig. 296.

Fig. 297.

109. **Manganite**, Mn_2O_3, H_2O.

Right prismatic, sometimes hemihedric; ∞P (*M*) 99·40. Crystals prismatic (figs. 298 to 300); vertically striated; also columnar or fibrous. Hemitropes common. Cl. brachydiagonal, perfect; brittle. H.=3·5 to 4; G.=4·3 to 4·4. Opaque; metallic lustre. Steel-grey to iron-black; streak brown. B.B. infusible. Sol. in warm h. acid. C.c.: peroxide of manganese 89·9, water 10·1. Grandholm (Aberdeenshire), Cork, Upton Pyne (Exeter), Churchhill (Somerset), Warwickshire, Ihlefeld, Thuringia, Norway, Sweden, Nova Scotia.

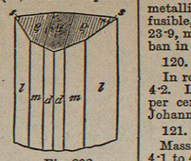

Fig. 298.

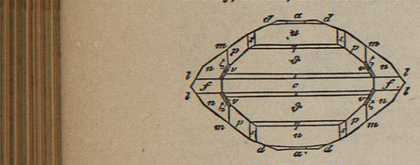

Fig. 299 (sp. 109).

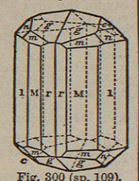

Fig. 300 (sp. 109).

110. **Limonite**, $2Fe_2O_3+3H_2O$.

Fibrous, botryoidal, and stalactitic, sometimes earthy. H.=4·5 to 5·5; G.=3·4 to 3·95. Opaque; lustre silky, glimmering, or dull. Brown, yellowish and blackish brown, often black on surface; streak ochre-yellow. In closed tube yields water and becomes red. B.B. in inner flame becomes magnetic, fusing to a glass. C.c.: peroxide of iron 85·6, water 14·4. Sandlodge (Shetland), Hoy (Orkney), Clifton, Bristol, Cornwall, Harz, Thuringia, Nassau, Styria, Carinthia, Siberia, United States.

111. **Xanthosiderite**, Fe_2O_3, $2H_2O$.

Fibrous, stellate, also as an ochre. H.=2·5. Silky or greasy, pitch-like or earthy. In needles, golden-yellow or brown-red; as an ochre, yellow, red, or brown; streak ochre-yellow. B.B. like limonite. C.c.: peroxide of iron 81·6, water 18·4. Hoy (Orkney), Achavarasdale, Kilbride, Wicklow, Ilmenau, Goslar, and Elbingerode in the Harz.

112. **Beauxite**, $(3Al_2O_3, Fe_2O_3)$, $2H_2O$.

Oolitic, concretionary, disseminated; also earthy and clay-like. G.=2·55. White, grey, ochre-yellow, brown, and red. C.c.: alumina 50·4, peroxide of iron 26·1, water 23·5. From Beaux (or Baux) near Arles, and elsewhere in France. In grains in compact limestone. Pure varieties used for manufacture of aluminium.

113. **Eliasite**, $U_2O_3+2H_2O$.

Amorphous masses; resin-like. H.=3·5 to 4·5; G.=4 to 5. Reddish brown to black; streak wax-yellow to olive-green. C.c.: 68·5 per cent. sesquioxide of uranium, 10 of water, with impurities. Elias mine (near Joachimsthal).

114. **Brucite**, MgO, H_2O.

Rhombohedral; R 82° 22′; also foliated and botryoidal columnar. Cl. basal, perfect; sectile; laminæ flexible. H.=2; G.=2·3 to 2·4. Translucent, pearly. Colourless. B.B. infusible. Easily soluble in acids. C.c.: 69 magnesia, 31 water. *Nemalite* is a fibrous variety with silky lustre. Swinaness and Quin Glo in Unst, Beresovsk in the Urals, Hoboken, New Jersey, Texas, Pennsylvania.

115. **Pyrochroite**, MnO, H_2O.

Foliated. H.=2·5. Pearly, white, but changing through bronze to black. Flesh-red by transmitted light. In matrass becomes verdigris-green, finally black, yielding water. Sol. in h. acid. C.c.: protoxide of manganese 79·8, water 20·2. In veins in magnetite at Paisberg in Sweden.

116. **Gibbsite** (*Hydrargillite*), Al_2O_3, $3H_2O$.

Hexagonal. C.c.: 65·5 alumina, 34·5 water. The crystals are from Zlatoust in the Urals; stalactites from Richmond in Massachusetts and Villa Rica in Brazil.

117. **Limnite**, Fe_2O_3, $3H_2O$.

Massive in stalactites, also as a yellow ochre. Like limonite, but pitchy lustre. C.c.: peroxide of iron 74·8, water 25·2. Leadhills, Botallack (Cornwall), Novgorod (Russia).

118. **Hydrotalcite**, Al_2O_3, $3H_2O+6MgO$, H_2O+6H_2O.

Hexagonal. Cl. basal, foliated, and somewhat fibrous. H.=2; G.=2·04. White, pearly. Greasy to the touch. Translucent. C.c.: alumina 16·8, magnesia 39·2, water 44. Zlatoust, Urals; Snarum, Norway; New York.

119. **Pyroaurite**, Fe_2O_3, $3H_2O+6MgO$, H_2O+6H_2O.

Hexagonal; tables and scaly coatings. Lustre pearly to submetallic. Colour white to gold-yellow. Translucent. B.B. infusible, yields water. Sol. in h. acid. C.c.: peroxide of iron 23·9, magnesia 35·8, water 40·3. Haaf Grunay in Shetland, Långban in Wermland.

120. **Gummite**, U_2O_3, $3H_2O$.

In rounded lumps, resembling gum. H.=2·5 to 3; G.=3·9 to 4·2. Lustre greasy. Reddish yellow to yellowish brown. C.c.: 72 per cent. sesquioxide of uranium water 14·75, with impurities. Johann-Georgenstadt.

121. **Psilomelane**, $(BaO, MnO)MnO_2+3H_2O$, MnO_2+3H_2O.

Massive and botryoidal; fracture conchoidal. H.=5·5 to 6; G.=4·1 to 4·3. Bluish black. B.B. infusible. About 80 per cent. of oxide of manganese, with baryta, potash, and water. Hoy (Orkney), Leadhills, Cornwall, Devon, Schneeberg, Ilmenau, Vermont in France. *Wad* is similar, but sometimes soft and light. Leadhills, Cornwall, Harz, France.

122. **Chalcophanite**, $MnOZnO+2MnO_2+2H_2O$.

Hexagonal. R:R 114° 30′. Cl. basal. H.=2·5; G.=3·91. Metallic lustre. Blue-black; streak brown, dull. Opaque; flexible. C.c.: manganese binoxide 59·94, protoxide 6·6, zinc oxide 21·7, water 11·6. Sterling Hill (New Jersey).

OXIDES OF NON-METALS.

1. Oxides of Arsenic-Antimony Family (Teroxides).

123. **Arsenolite**, As_2O_3.

Cubic; in octahedra; also botryoidal, stalactitic. H.=1·5; G.=3·7. Lustre vitreous. White; streak pale yellow. Translucent. Sublimes in closed tube, condensing in brilliant octahedra. C.c.: arsenic 75·76, oxygen 24·24. Cornwall, Andreasberg, Joachimsthal, Kapnik (Hungary), Nevada, California.

124. **Senarmontite**, Sb_2O_3.

Cubic; in octahedrons. Cl. octahedral, also massive granular. H.=2 to 2·5; G.=5·22 to 5·3. Transparent; adamantine. White or grey. B.B. in inner flame fuses and colours the flame greenish blue. Sol. in h. acid. C.c.: antimony 83·56, oxygen 16·44. Endellion in Cornwall, Constantine in Algeria, Malaczka in Hungary.

125. **Valentinite**, Sb_2O_3.

Right prismatic; ∞P137°. Cl. ∞P, perfect. H.=2·5 to 3; G.=5·5 to 5·6. Translucent; adamantine to pearly. Yellowish white, brown-grey; streak white. Other properties and composition like senarmontite. Glendinning (Dumfriesshire), Przibram, Bräunsdorf (Saxony), Harz, Hungary, Allemont (Dauphiné), Siberia.

126. **Bismite**, BiO_3.

Massive, earthy. G.=4·36. Grey, yellow, green. C.c.: bismuth 89·65, oxygen 10·35. St Agnes (Cornwall), Schneeberg, Siberia.

127. **Molybdite**, MoO_3.

Right prismatic; ∞P 136° 48′. In capillary crystals, also powdery. H.=1 to 2; G.=4·5. Straw-yellow to yellowish white. C.c.: molybdenum 65·71, oxygen 34·29. With molybdenite at many of its localities.

128. **Tungstite**, WO_3.

Earthy. Soft yellow or yellowish green. Sol. in alkalies. C.c.: tungsten 79·3, oxygen 20·7. Cumberland and Cornwall, Monroe in Connecticut.

129. **Cervantite**, SbO_3+SbO_2.

Right prismatic. Acicular, generally earthy. H.=4 to 5; G.=4·1. Isabel-yellow, reddish white. B.B. on charcoal reduced; unaltered *per se*. Sol. in h. acid. Marshill, Ayrshire; Endellion, &c., Cornwall; Cervantes, Spain; Felsöbanya, Hungary; Mexico; Canada; California.

130. **Stibiconite**, SbO_4, H_2O.

Massive, powdery. H.=4 to 5·5; G.=5·28. Pale yellow. In closed tube yields water. C.c.: antimony 74·9, oxygen 19·6, water 5·5. Goldkronach (Bavaria).

131. **Volgerite**, SbO_3, $5H_2O$.

Massive and powdery. White. In tube yields water, below redness. C.c.: antimony 58·9 oxygen 19·3, water 21·8. Constantine in Algeria.

132. **Zundererz** (*Tinder Ore*).

In soft, flexible, tinder-like masses. Colour dark cherry-red to blackish red; lustre glimmering. Two varieties:—one, from Klausthal, contains antimony oxide 33, iron oxide 40, lead 16, sulphur 4 the other, from Andreasberg and Klausthal, seems to be a mixture of jamesonite (82·04 per cent.), mispickel (13·46), and pyrargyrite (4·34).

133. **Tellurite**.

Yellowish or whitish. Radiated, spherical masses. Gives the reactions of tellurous acid. Facsebaya and Zalathna, Colorado.

134. **Tantalic Ochre**.

Powdery; brown; vitreous. Pennikoja in Finland.

2. Oxides of Carbon-Silicon Family (Binoxides).

135. **Quartz**, SiO_2.

Hexagonal; the purest varieties tetartohedral. The primary pyramid P has the middle edge=103° 34′, and the polar edges=133° 44′, and is often perfect. Very frequently it appears as a rhombohedron R (or 4P), with polar edges=94° 15′. Crystals often of ∞P, P or ∞P, P, 4P, the forms ∞P and 4P being combined in an oscillatory manner, producing striæ on the face of the prism (figs. 303, 304, 305); also ∞P, P, ⅓(2P2), the last face appearing as a rhomb replacing the alternate angles between the two other forms (figs. 307, 308). They are prismatic, or pyramidal, or rhombohedral, when P is divided into R and −R; the latter very often wanting. Many faces plagihedral, as in figs. 302, 306, 309.

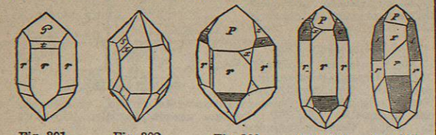

Fig. 301. Fig. 302. Fig. 303. Fig. 304. Fig. 305.

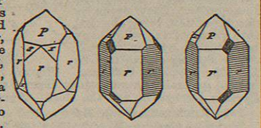

Fig. 306. Fig. 307. Fig. 308.

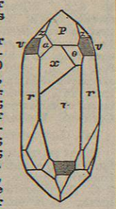

Fig. 309.

Twins common, with parallel axes, and either merely in juxtaposition (see fig. 173) or interpenetrating. Crystals often distorted, as in figs. 310 to 313. The crystals occur either single, attached, or imbedded, or in groups and druses. Most frequently granular, massive, fibrous, or columnar; also in pseudomorphs, petrifactions, and other forms. Cl. rhombohedral along R, very imperfect; prismatic along ∞P, still more imperfect; fracture conchoidal, uneven, or splintery. H.=7; G.=2·5 to 2·8; 2·65 in the purest varieties. Colourless, but more often white, grey, yellow, brown, red, blue, green, or even black. Lustre vitreous, inclining to resinous; transparent or translucent; when impure almost opaque. B.B. infusible alone; with soda effervesces, and melts into a clear glass. Insoluble in acids, except the hydrofluoric; when pulverized, slightly soluble in solution of potash. C.c.:

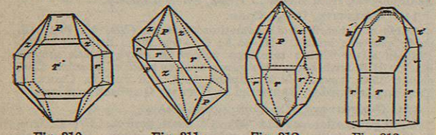

Fig. 310. Fig. 311. Fig. 312. Fig. 313.

48·05 silicon and 51·95 oxygen; but frequently a small amount of the oxides of iron or titanium, of lime, alumina, and other substances.

The following are varieties:—

Rock-crystal: highly transparent and colourless; Dauphiné, Switzerland, Tyrol, Hungary, Madagascar, and Ceylon.

Amethyst: violet-blue (from iron peroxide or manganese), and often marked by zigzag or undulating lines, and the colour disposed in clouds; Siberia, Persia, India, Ceylon, Brazil (white or yellow, named false topaz), Hungary, Ireland (near Cork), and Aberdeenshire. Wine-yellow (*Citrin* and *Gold Topaz*); the brown or *Smoky Quartz* (coloured by a substance containing carbon and nitrogen); and the black or *Morion*, from Siberia, Bohemia, Pennsylvania, and other places. *Cairngorm Stone*, black, brown, or yellow, from Aberdeenshire mountains. The above are valued as ornamental stones; those which follow are less so.

Rose Quartz: red inclining to violet-blue; Clashnaree Hill (Aberdeen), and Rabenstein in Bavaria. *Milk Quartz*: milk-white, and slightly opalescent; Greenland. *Prase*: leek and other shades of green; Saxony and Cedar Mountain in South Africa. *Cat's-eye*, inclosing asbestos: greenish white or grey, olive-green, red, brown, or yellow; Ceylon and Malabar. *Aventurine*, enclosing mica: yellow, red, green, or brown; India, Spain, and Scotland. *Siderite*: indigo or Berlin blue; Golling in Salzburg.

Common Quartz, crystallized or massive, white or grey, also red, brown, &c., is a frequent constituent in many rocks. Some impure varieties are properly rocks, as:—

(1) *Ferruginous Quartz*, or *Iron Flint*: red, yellow or brown; often associated with iron ores.

(2) *Jasper*: red, yellow, brown, also green, grey, white, and black; alone, or in spots, veins, and bands (*Ribbon* or *Egyptian Jasper*); Urals, Tuscan Apennines, Harz, and many parts of Scotland.

(3) *Lydian Stone*, or *Flinty Slate*: black, grey, or white; has a splintery or conchoidal fracture, breaks into irregular fragments, and passes by many transitions into clay-slate, of which it is often merely an altered portion, as in Scotland; used as a touchstone for gold, and at Elfdal (Sweden) manufactured into ornaments.

(4) *Hornstone* or *Chert*: compact, conchoidal, splintery fracture; translucent on the edges; dirty grey, red, yellow, green, or brown; passes into flinty slate or common quartz; common in the Mountain limestone, Oolite, and Greensand formations: and often contains petrifactions, as shells, corals, and wood.

Other siliceous minerals seem intimate mixtures of quartz and opal, as:—

Flint: greyish white, grey, or greyish black, also yellow, red, or brown; sometimes in clouds, spots, or stripes; semitransparent; lustre dull; fracture flat conchoidal; occurs chiefly in the Chalk formation, as in England, Ireland, Aberdeenshire, France, Germany, and other countries; sometimes in beds or vertical veins, often in irregular lumps or concretions, inclosing petrifactions, as sponges, echinoids, shells, or siliceous *Infusoria*. The colour is partly derived from carbon, or organic matter. Used formerly for gun-flints, and still for the manufacture of glass and pottery; and cut into cameos or other ornaments.

Chalcedony: semitransparent or translucent; white, grey, blue, green, yellow, or brown; stalactitic, reniform, or botryoidal, and in pseudomorphs or petrifactions; Iceland, Faroes, Trevascus in Cornwall, Scotland, Hungary, Bohemia, Oberstein. *Carnelian*: chiefly blood-red, but also yellow, brown, or almost black; India, Arabia, Surinam, and Siberia; also Bohemia, Saxony, and Scotland (Fifeshire). *Plasma*: leek- or grass-green, and waxy lustre; Olympus, Black Forest, India, and China.

Chrysoprase: apple-green; Silesia, and Vermont in North America. *Moss-Agate* and *Heliotrope*: dark green and dendritic (called *Bloodstone* when sprinkled with deep red spots); India, Siberia, Bohemia, Fassa Valley, island of Rum and other parts of Scotland.

136. **Tridymite**, SiO_2.

Hexagonal; P middle edge 124° 4′, polar edges 127° 35′. Single crystals, very minute hexagonal tables of 0P, ∞P, but with the edges replaced by P and ∞P2, are rare (fig. 314). Mostly twinned

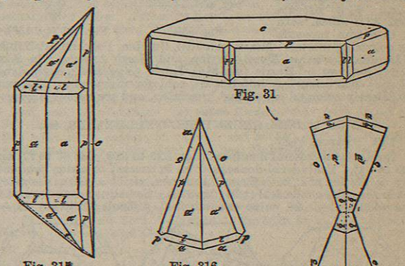

Fig. 314. Fig. 315. Fig. 316. Fig. 317.

in double or (oftener) triple combinations (figs. 315 to 317). Cl. basal, indistinct; fracture conchoidal. H.=7; G.=2·282 to 2·326. Colourless and transparent; vitreous, pearly on the base. B.B. like quartz. C.c.: 96 silica, with some alumina, magnesia, and iron peroxide, probably from the matrix. Discovered by Von Rath in the trachyte of San Cristobal, near Pachuca, in Mexico; also in the trachyte of Mont-Dore (Puy-de-Dôme), the Drachenfels, and Hungary. Many opals, treated with solution of potash, leave crystals, as those from Zimapan, Kaschau, Silesia, and the cacholong from Iceland. Where such crystals are abundant, the opal becomes opaque or snow-white. Jenzsch regards these as still another variety of silica.

137. Opal, $9SiO_2, H_2O$ to $3SiO_2, H_2O$.

Amorphous; fracture conchoidal; very brittle. H.=5·5 to 6·5; G.=2 to 2·2. Transparent to opaque; vitreous, inclining to resinous. Colourless, but often white, yellow, red, brown, green, or grey, with a beautiful play of colours. B.B. decrepitates and becomes opaque, but is infusible; in the closed tube yields water; almost wholly soluble in solution of potash. C.c.: silica, with 5 to 13 per cent. water. Most opals are mixtures of various minerals.

The following varieties may be noticed:—(1) *Hyalite, Glassy Opal*, or *Müller's Glass*: transparent, colourless, very glassy; small botryoidal, or incrusting; Kaiserstuhl in the Breisgau, Schemnitz, Silesia, Moravia, Mexico, and other places. (2) *Fire Opal* or *Girasol*: transparent; brilliant vitreous lustre; bright hyacinth-red or yellow; Zimapan in Mexico, and the Faroes. (3) *Noble Opal*, semi-transparent or translucent; resinous, inclining to vitreous; bluish or yellowish white, with brilliant prismatic colours; most show double refraction and are binaxal; in irregular masses or veins near Eperies in Hungary; Australia. (4) *Common Opal*: semitransparent, vitreous; white, yellow, green, red, or brown; Hungary, also Faroes, Iceland, the Giant's Causeway, and the Western Isles of Scotland. (5) *Semi-opal*: duller and less pellucid; *Wood Opal* or *Lithoxylon*: with the form and texture of wood distinctly seen; Hungary, Bohemia, and other countries. (6) *Menilite*: compact, reniform; opaque and brown or bluish grey; Menilmontant, near Paris. (7) *Opal Jasper*: blood-red, brown, or yellow. (8) *Cacholong*: opaque, dull, glimmering, or pearly, and yellowish or rarely reddish white; in veins or reniform and incrusting; Faroes, Iceland, the Giant's Causeway. One variety is named *Hydrophane*, from imbibing water, and becoming translucent (9) *Siliceous Sinter*: deposited from the Geyser and other hot springs; and *Pearl Sinter*: incrusting volcanic tufa at Santa Flora in Tuscany (*Fiorite*), and in Auvergne.

138. Zircon, ZrO_2, SiO_2.

Pyramidal; P 84° 20′. Crystals, ∞P, P; often with 3P3 ; also ∞P∞, P; or ∞P∞ (*e*), ∞P (*l*), P (*f*), 3P3 (*x*), P∞ (*t*), 4P4 (*y*), 5P5 (*z*), (fig. 318, also 86, 87, 585). Chiefly prismatic or pyramidal, and in rounded grains. Transparent to opaque; vitreous, often adamantine. Rarely white, generally grey, yellow, green, or frequently red and brown. B.B. loses its colour, but is infusible. Not affected by any acid except concentrated s. acid, after long digestion. C.c.: 66·3 zirconia and 33·7 silica, with 0 to 2 iron peroxide as colouring matter. Miask, Arendal, Sweden, Belgium (at Nil-St-Vincent), Carinthia, Tyrol, Ceylon, and North America; in Scotland, Scalpay in Harris (fig. 319), Lewis (*Hyacinth*), Sutherland, Ross. The colourless varieties are sold for diamonds. The more brilliantly coloured are named hyacinths, and are valuable gems.

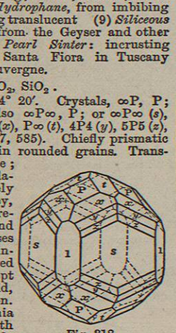
Fig. 318.

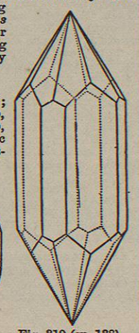
Fig. 319 (sp. 138).

SULPHIDES, SELENIDES, TELLURIDES, &c.

139. Pyrite, FeS_2.

Cubic; semitesseral dominant (figs. 320 to 323, also 67 to 77, and 26 to 34). Pentagonal-dodecahedron in excess; or striæ, produced by oscillation of it with faces of the cube, visible. Often distorted, as in the cubo-octahedral twin (fig. 323). Sometimes massive and in pseudomorphs. Cl. cubic or octahedral, difficult; brittle. H.=6 to 6·5; G.=4·9 to 5·2. Brass-yellow, often somewhat golden-yellow; streak brownish black, when broken emits smell of sulphur. In closed tube sulphur sublimes. B.B. on charcoal burns with blue flame, and odour of sulphurous acid. In inner flame fuses to magnetic bead. Sol. in n. acid, with deposition of sulphur. C.c.: iron 46·7, sulphur 53·3; often contains gold in visible grains, when broken. Common to rocks of all ages. Tomnadashin, Birnam, Scotland; Cornwall, England; Elba and Traversella; Peru; Rossie, Middletown, and Schoharie in U.S. Auriferous pyrites, Berezoff (Siberia), Adelfors (Sweden), Mexico. Used to be cut in facets and set as an ornament, under the name of marcasites; also for striking fire in the old firelocks, whence the name of firestone; now used for manufacture of sulphuric acid.

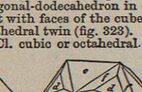
Fig. 320.

Fig. 321.

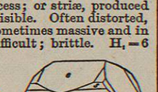
Fig. 322.

140. Marcasite, FeS_2.

Right prismatic; ∞P (*M*) 106° 5′. Crystals tabular, thin prismatic, or pyramidal. Twins very frequent, also cockscomb-like groups, or spherical and stalactitic. Cl. ∞P; fracture uneven; brittle. G.=4·65 to 4·9. Greyish bronze-yellow to greenish grey, often with brown crust; streak greenish grey or brownish black. B.B., &c., like pyrite. Very prone to decomposition, being changed into green vitriol, which may be detected by the tongue. *Spear Pyrites* are twins like fig. 325; Littmitz, Przibram.

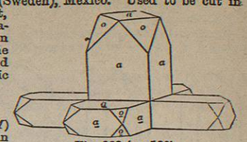
Fig. 323 (sp. 139).

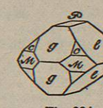
Fig. 324.


Fig. 325.

Hepatic Pyrites or *Leberkies*, liver-brown, generally decomposing; Harz, Saxony, Sweden. *Cockscomb Pyrites*: Derbyshire and the Harz. *Kyrosite* contains arsenic.

141. Mispickel, FeS_2+FeAs_2.

Right prismatic; ∞P (*M*) 111° 12′ (fig. 326). Twins common also massive or columnar. Cl. ∞P; fracture uneven; brittle. H.=5·5 to 6; G.=6 to 6·2. Silver-white to steel-grey; streak black. In closed tube yields first a red then a brown sublimate, lastly metallic arsenic. B.B. on charcoal fuses to a black magnetic globule. Sol. in n. acid, with separation of arsenious acid and sulphur. C.c.: 34·3 iron, 46·1 arsenic, 19·6 sulphur; sometimes silver or gold, or 5 to 9 of cobalt. Cornwall, Freiberg, Zinnwald, Sweden, Franconia. America.

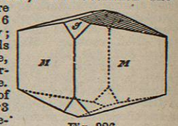
Fig. 326.

142. Leucopyrite, $FeAs_2$.

Right prismatic; ∞P (*d*) 122° 26′; P∞ (*o*) 51° 20′. Crystals like fig. 327; generally massive or columnar. Cl. basal; fracture uneven; brittle. H.=5 to 5·5; G.=7 to 7·4. Silver-white with darker tarnish; streak greyish black. B.B. emits strong smell of arsenic, and fuses to a black magnetic globule. C.c.: iron 27·2, arsenic 72·8; sometimes iron 32·2 and arsenic 66·8; always some sulphur, and often nickel and cobalt. Fossum in Norway, Andreasberg, Styria, and Silesia. *Spathiopyrite*, from Bieber in Hesse, seems a variety.

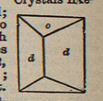
Fig. 327.

143. Cobaltite, CoS_2+CoAs_2.

Cubic and hemihedral; sometimes massive (figs. 67, 74). Cl. cubic, perfect; brittle. H.=5·5; G.=6 to 6·3. Brilliant lustre. Pinkish silver-white; tarnishes yellow or grey; streak greyish black. B.B. with borax blue glass; evolves smell of arsenic. C.c.: cobalt 35·9, arsenic 44·9, sulphur 19·2. St Just in Cornwall, Tunaberg in Sweden, Skutterud in Norway, Querbach in Silesia.

144. Glaucodote, $(Co, Fe)S_2+(Co, Fe)As_2$.

Right prismatic; ∞P 112° 36′. Cl. basal, perfect. H.=5; G.=6. Lustre metallic. Greyish white; streak black. C.c.: cobalt 24·7, iron 11·9, arsenic 43·2, sulphur 20·2. Huasco in Chili.

145. Smaltine, $(Co, Fe, Ni)As_3$.

Cubic; generally like fig. 27; also reticulated and granular compact. Cl. octahedral; fracture uneven; brittle. H.=5·5; G.=6·4 to 7·3. Tin-white to steel-grey, with dark or iridescent tarnish; streak greyish black. Evolves odour of arsenic, when broken or heated. C.c.: 71·4 arsenic, 28·6 cobalt; sometimes 3 to 19 iron, and 1 to 12 nickel, or 4 bismuth. Dolcoath and Redruth in Cornwall, Schneeberg, Annaberg, Tunaberg, Allemont, Chatham in Connecticut.

146. Chloantite (*White Nickel*), NiAs.

Cubic; generally fine granular or compact; fracture uneven; brittle. H.=5·5; G.=6·4 to 6·6. Tin-white, rapidly tarnishing black. In the closed tube yields a sublimate of arsenic, and becomes copper-red. Gives odour of arsenic when broken. B.B. fuses with much smoke, becomes coated with crystals of arsenious acid, and leaves a brittle grain of metal. C.c.: 28·2 nickel, 71·8 arsenic, but often with cobalt. Schneeberg, Riechelsdorf, Allemont, Chatham in Connecticut.

147. Gersdorffite, NiS_2+NiAs_2.

Cubic (figs. 74, 30, 26). Cl. cubic, generally granular. H.=5·5; G.=6·67. Lustre metallic. Silver-white to steel-grey, decrepitates in closed tube. B.B. fuses to a black slag; partially sol. in n. acid. C.c.: 35·2 nickel, 45·4 arsenic, and 19·4 sulphur; sometimes with cobalt. Craignuir, near Loch Fyne, with 23 nickel and 6 cobalt. The Harz, Sweden, Spain, and Brazil.

148. Ullmannite, $NiSb+NiS_2$.

Cubic (figs. 31, 29, 27); often tetrahedral, and in twins as in figs. 328, 329. Cl. cubic, perfect; fracture uneven. H.=5 to 5·5; G.=6·2 to 6·5. Lead-grey to tin-white, often with iridescent tarnish. B.B. fuses with dense fumes. Sol. in n. acid. C.c.: 27·4 nickel, 57·5 antimony, and 15·1 sulphur. Westerwald, Siegen, Harzgerode, Lölling (Carinthia), Lobenstein, and Bleiberg.

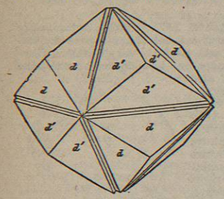
Fig. 328.

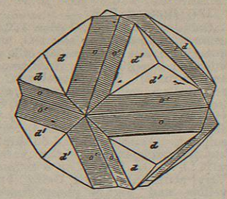
Fig. 329.

149. Rammelsbergite, $NiAs_2$.

Right prismatic; ∞P 123° to 124°. Chiefly massive, or in radiating and botryoidal aggregates. H.=5; G.=7·2. Colour tin-white. Schneeberg, Reichelsdorf, and Wittichen in Baden.

150. Hauerite, MnS_2.

Cubic (figs. 30, 30–26, 30–33–37). Crystals single or in spherical groups. Cl. cubic, perfect; H.=4; G.=3·46. Reddish brown to brownish black; streak brownish red. In closed tube yields sulphur, and leaves a green mass, which is sol. in h. acid. C.c.: 46 manganese and 54 sulphur. Kalinka in Hungary.

151. Pyrrhotite (*Magnetic Pyrites*), Fe_7S_8.

Hexagonal; P 126° 48′. Crystals rare, sometimes hemihedral on $\frac{2}{3}$, commonly massive or granular. Cl. ∞P, imperfect; brittle. H.=3·5 to 4·5; G.=4·5 to 4·6. Colour bronze-yellow with pinchbeck-brown tarnish; streak greyish black. More or less magnetic. C.c.: 63·65 iron and 36·35 sulphur; sometimes with nickel. Common in primary limestones and diorites of Scotland. Crystallized in above forms at Askaig, on Loch Shia, Sutherland; Carnarvon, Cornwall, Fahlun, Bodenmais, Andreasberg. Distinguished by its colour and its solubility in h. acid.

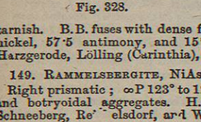
Fig. 330.

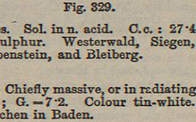
Fig. 331.

152. Linnæite, $2(Co, Cu)S+CoS_2$.

Cubic (figs. 29, 30); often twinned; twin face O; also massive. Cl. cubic; brittle. H.=5·5; G.=4·9 to 5. Silver-white, with a yellow tarnish; streak blackish grey. B.B. fuses to a grey magnetic globule, which is bronze-yellow when broken. C.c.: cobalt 43·2, copper 14·4, iron 3·5, sulphur 38·5. Bastnaes (Sweden).

153. Siegenite, $CoS+Ni_2S_3$ (?).

Cubic; generally in crystals like fig. 29; also massive. Colour silver-white, inclining to pink. Other features like linnæite. C.c.: cobalt 40·8, nickel 14·3, sulphur 43·1. Müsen near Siegen, Maryland, and Missouri. The American mineral has 30·5 of nickel.

154. Polydymite, Ni_4S_5.

Cubic; in minute octahedral crystals and flattened twins. Cl. cubic. H.=4·5; G.=4·81. C.c.: 39·45 nickel, 40·55 sulphur, but generally with 4 of iron. Westphalia. *Saynite* or *grunauite* seems to be a bismuthic and cobaltic variety; it is from Grunau in Sayn-Altenkirchen.

155. Byrichrite, $3NiS+2Ni_2S_3$.

H.=3 to 3·5; G.=4·7. C.c.: 54·23 nickel, 2·79 iron, 42·86 sulphur. From the Westerwald.

156. Horbachite, $4Fe_2S_3+Ni_2S_3$.

Crystalline masses. H.=4·5; G.=4·43 to 4·7. Colour pinchbeck-brown; streak black. C.c.: nickel 11·98, iron 41·96 sulphur 45·87. Horbach in the Black Forest.

157. Skutterudite, $CoAs_3$.

Cubic (figs. 30, 26 with 33, 40) and granular. Cl. cubic; fracture conchoidal; brittle. H.=6; G.=6·74 to 6·84. Tin-white to lead-grey. Lustre brilliant. In closed tube gives sublimate of metallic arsenic, otherwise like smaltine. C.c.: 79 arsenic, 21 cobalt. Skutterud, near Modum in Norway.

158. Galena, PbS.

Cubic; crystals chiefly cube, octahedron, and rhombic dodecahedron; rarely 20 and 202. Also massive and granular, compact, or laminar, and in pseudomorphs of pyromorphite and other minerals. Cl. cubic, very perfect; fracture scarcely observable; sectile. H.=2·5; G.=7·2 to 7·6. Lead-grey, with darker or rarely iridescent tarnish; streak greyish black. B.B. decrepitates, fuses, and leaves a globule of lead. Sol. in n. acid. C.c.: 86·7 lead, and 13·3 sulphur; but usually contains a little silver, ranging from 1 to 3 or 5 parts in 10,000; rarely 1 per cent. or more. Some contain copper, zinc, or antimony, others selenium, and other (the "supersulphuret") probably free sulphur (2 to 8 per cent.). Most common ore of lead in many countries. Leadhills, Pentland Hills, Linlithgow, Inverkeithing, Monaltrie, Tyndrum, Strontian, Islay, Orkney, Cornwall, Derbyshire (Castletown), Cumberland (Alston Moor), Durham (Allenhead), Wales, Isle of Man.

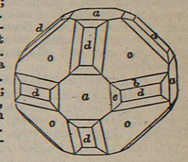
Fig. 332.

159. Cuproplumbite, $2PbS+Cu_2S$.

Cubic. H.=2·5; G.=6·4. Bluish grey. Chili.

160. Beegerite, $6PbS+Bi_2S_3$.

Cubic. G.=7·27. Cl. cubic. Light to dark grey. Lustre brilliant. C.c.: sulphur 15, bismuth 20·6, lead 64·2, with copper 1·7. Grant (Park county, Colorado).

161. Clausthalite, PbSe.

Cubic; but massive granular. H.=2·5 to 3; G.=8·2 to 8·8. Lead-grey; streak grey. B.B. fuses, smells of selenium, colours the flame blue, stains the support red, yellow, and white, and volatilizes, except a small residue, without fusing. C.c.: 72·7 lead, 27·3 selenium; but sometimes 11·7 of silver. Zorge, Lerbach, and Clausthal in the Harz. *Tilkerodite*, or *Selen-Cobalt-Blei*, containing 3 per cent. of cobalt from Tilkerode, is a variety.

162. Zorgite.

Massive granular; like clausthalite, but inclining to reddish, and often tarnished. There are four varieties. (*a*) *Selen-Blei-Kupfer*: G.=7·4 to 7·5; 5PbSe+CuSe; with 4 copper, 65 lead, 30 selenium. (*b*) The same, but with G.=5·6; 4Pb, 4Cu, 7Se; with 15·8 copper, 48·4 lead, and 35 selenium. (*c*) *Selen-Kupfer-Blei*: with G.=7; 2PbSe+CuSe; with 8 copper, 57 lead, and 32 selenium. (*d*) 2PbSe+9CuSe; with 46·64 copper, 16·58 lead, and 36·59 selenium. From Tilkerode and Zorge in the Harz, and near Gabel in Thuringia.

163. Altaite, PbTe.

Cubic and granular; fracture uneven; sectile. H.=3 to 3·5; G.=8·1 to 8·2. Tin-white to yellow, with yellow tarnish. B.B. colours the flame blue, fusing to a globule, which almost wholly volatilizes. C.c.: 61·9 lead and 38·1 tellurium. Zavodinski in the Altai, California, Colorado, and Chili.

164. Redruthite (*Copper Glance*), Cu_2S.

Right prismatic. ∞P (*o*) 119° 35′; P (*P*) middle edge 125° 22′; $\frac{1}{2}\breve{P}$ (*a*) middle edge 65° 40′; $2\breve{P}\infty$ (*d*) middle edge 125° 40′; $\frac{3}{2}\breve{P}\infty$ (*s*) middle edge 65° 48′. Crystals 0P (*s*), ∞P (*o*), ∞P∞ (*y*) (figs. 333, 334); with hexagonal aspect; also twins; and massive. Cl. ∞P, imperfect; fracture conchoidal or uneven; sectile. H.=2·5 to 3;

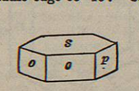
Fig. 333.

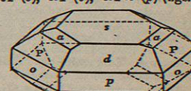
Fig. 334.