

to red or blackish brown on exposure. B.B. infusible, but becomes black and magnetic; with borax and salt of phosphorus shows reaction for iron; with soda often for manganese. In acids soluble with effervescence. C.c. carbonate of iron, with 62.1 protioxide of iron and 37.9 carbonic acid, but usually 0.5 to 10 or even 25 protioxide of manganese, 0.2 to 15 magnesia, and 0.1 to 2 lime. Unst. Kintyre. In beds or masses in Beeralston in Devonshire, Alston Moor in Cumberland, and in many of the tin-mines in Cornwall, in Styria, Carinthia, and Westphalia; in veins in Anhalt and the Harz; also in the Pyrenees and the Basque provinces of Spain, as near Bilbao; in crystals at Joachimsthal, Freiberg, Klausthal.

Clay Ironstone, grey, blue, brown, or black, —G. = 2.8 to 3.5, H. = 3.5 to 4.5, —is an impure variety.

278. **DIALOGITE** (*Red Manganese*), Mn_2O_3 . Crystals often curved, lenticular, or saddle-shaped; also spherical, reniform, and columnar or granular. Cl. R, perfect. H. = 3.5 to 4.5; G. = 3.3 to 3.6. Translucent; vitreous or pearly. Rose-red to flesh-red; streak white. C.c.: 62 manganese protioxide and 38 carbonic acid. Freiberg, Schemnitz, Kapnik, Nagyag, Elbingerode, and near Sargans.

279. **COBALTSPTH**, CoCO_3 . Rhombohedral and spheroidal. H. = 4; G. = 4 to 4.13. Peach-blossom-red; but dark externally. Schneeberg.

280. **SMITHSONITE** (*Calamine*), ZnCO_3 . Hexagonal rhombohedral; R $107^\circ 40'$. Usually reniform, stalactitic, and laminar or granular. Cl. R, perfect, but curved; fracture uneven, conchoidal; brittle. H. = 5; G. = 4.1 to 4.5. Translucent or opaque; pearly or vitreous. Colourless, but often pale greyish yellow, brown, or green. C.c.: 64.3 zinc oxide and 35.2 carbonic acid. Mendip in Somersetshire, Matlock in Derbyshire, compact at Alston Moor, Chessy near Lyons, Altenberg near Aix-la-Chapelle, Brilon in Westphalia, Tarnowitz in Silesia, Hungary, Siberia.

281. **ARAGONITE**, CaCO_3 . Right prismatic. ∞P $116^\circ 10'$; $\tilde{P}\infty$ $108^\circ 26'$. The most common combinations are $\infty P\infty$ (h), $\infty \tilde{P}$ (M), $P\infty$ (k, P) (fig. 275), generally long prismatic (like the separate crystals in fig. 184); $\infty \tilde{P}\infty$, ∞P , OP , generally short prismatic; crystals of $6\tilde{P}\frac{1}{2}$, ∞P , $\tilde{P}\infty$, $6\tilde{P}\infty$ (g) (fig. 373) acute pyramidal. But simple crystals are rare, from the great tendency to form twins, conjoined by a face of ∞P , and repeated either in linear arrangement (fig. 185) or in rosette grouping (fig. 186). Also columnar, fibrous, and in crusts, stalactites, and other forms. Cl. brachy-diagonal, distinct; fracture conchoidal or uneven. H. = 3.5 to 4; G. = 2.9 to 3 (massive 2.7). Transparent or translucent; vitreous. Colourless, but yellowish white to brick-red; also light green, violet-blue, or grey. In the closed tube, before reaching a red heat, it swells, and falls down into a white coarse powder, evolving a little water. Unst. and Leadhills; Valencia, Molina and elsewhere in Aragon; Leogang in Salzburg, and Antiparos. *Flos-ferri*, coralloid, in the iron-mines of Styria; *Satin-spar*, fine fibrous silky, at Dufton (Westmoreland). Stalactitic, coast of Galloway, Leadhills, Buckinghamshire, and Devonshire. Also deposited as tufa by the Carlsbad and other hot springs.

282. **WITHERITE**, BaCO_3 . Right prismatic. ∞P (g) $118^\circ 30'$; $2\tilde{P}\infty$ (P) 112° . Crystals not common like fig. 275, but generally with quite an hexagonal aspect from being twinned like aragonite (fig. 374). Often spherical botryoidal, or reniform, with radiated-columnar structure. Cl. ∞P , distinct; fracture uneven. H. = 3 to 3.5; G. = 4.2 to 4.3. Semitransparent or translucent; vitreous, or resinous on the fracture. Colourless, but generally yellowish or greyish. B.B. fuses easily to a transparent globule, opaque when cold; on charcoal boils, becomes caustic and sinks into the support; soluble with effervescence in n. or h. acid. C.c.: 22.3 carbonic acid and 77.7 baryta. Alston Moor and Hexham in Northumberland, also in Styria, Salzburg, Hungary, Sicily, Siberia, and Chili.

283. **ALSTONITE**, $\text{BaCO}_3 + \text{CaCO}_3$. Right prismatic. ∞P $118^\circ 50'$; $2\tilde{P}\infty$ $111^\circ 50'$; usual combination P , $2\tilde{P}\infty$, ∞P , resembling an hexagonal pyramid (fig. 375). Cl. ∞P

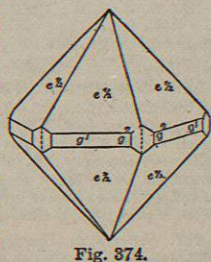


Fig. 374.

and $\infty \tilde{P}\infty$, rather distinct. H. = 4 to 4.5; G. = 3.65 to 3.76. 3.76. Translucent; weak resinous. Colourless or greyish-white. C.c.: 66 carbonate of baryta and 34 carbonate of lime. Fallowfield near Hexham, and Alston Moor.

284. **STRONTIANITE**, SrCO_3 . Right prismatic. ∞P $117^\circ 19'$;

$\tilde{P}\infty$ $108^\circ 12'$. Crystals (fig. 376) and twins like aragonite; also broad columnar, and fibrous. Cl. prismatic along ∞P (M). H. = 3.5; G. = 3.6 to 3.8. Translucent or transparent; vitreous or resinous on fracture. Colourless, but often light asparagus- or apple-green, more rarely greyish, yellowish, or brownish. B.B. fuses in a strong heat only on very thin edges, intumesces in cauliflower-like forms, shines brightly, and colours the flame red; easily soluble in acids, with effervescence. C.c.: 30 carbonic acid and 70 strontia, but often contains carbonate of lime (6 to 8). Strontian in Argyllshire, Sutherland, Leogang in Salzburg, Bräunsdorf in Saxony, Hamm in Westphalia, the Harz; at Schoharie (N.Y.) and elsewhere in United States (*Emmonite*). It is used to produce red fire in pyrotechnic exhibitions.

Fig. 375 (sp. 283).

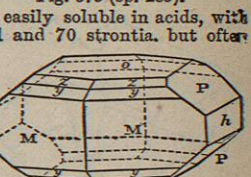


Fig. 376.

285. **MANGANOCALCITE**, $(\text{Mn}, \text{Ca}, \text{Fe})\text{CO}_3$. Right prismatic; in prisms like aragonite, and bears the same relation to dialogite that aragonite does to calc-spar. H. = 4 to 5; G. = 3.03. Red or reddish white. Vitreous. Schemnitz.

286. **CERUSSITE** (*Lead Spar*), PbCO_3 . Right prismatic; isomorphous with aragonite and nitre. ∞P (M) $117^\circ 14'$; $\tilde{P}\infty$ $108^\circ 16'$; $2\tilde{P}\infty$ (u) $69^\circ 20'$;

also OP ; P (s); $\frac{1}{2}\tilde{P}\infty$ (s); $\infty \tilde{P}\infty$ (s); $\infty \tilde{P}\frac{1}{2}$ (s) (fig. 377). Twins common (figs. 158, 159, 378, 379). Also granular or earthy. Cl. ∞P and $2\tilde{P}\infty$, rather distinct; fracture conchoidal; easily frangible. H. = 3 to 3.5; G. = 6.4 to 6.6. Transparent or translucent; adamantine or resinous. Colourless and often white, but also grey, yellow, brown, black, rarely green, blue, or red; streak white. B.B. decrepitates violently, but easily fused and reduced; soluble with effervescence in n. acid. C.c.: 83.5 protioxide of lead and 16.5 carbonic acid. Very common. Leadhills, Wanlockhead, Keswick, Alston Moor, Beeralston in Devonshire, St Minver in Cornwall; Przibram, Mies, and Bleistadt;

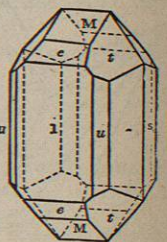


Fig. 377.

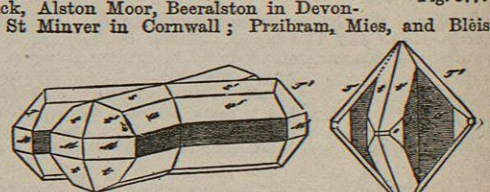


Fig. 378.

Tarnowitz, Johann-Georgenstadt, Zellerfeld, Klausthal, and many other places.

287. **BARYTO-CALCITE**, $\text{BaCO}_3 + \text{CaCO}_3$.

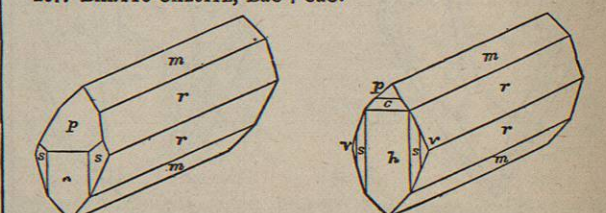


Fig. 379.

Oblique prismatic, C $69^\circ 30'$. ∞P (m) $84^\circ 52'$, P (s) $106^\circ 54'$

$P\infty$ (h) 61° (figs. 380, 381); also columnar and granular. Cl. P perfect, $P\infty$ less perfect. H. = 4; G. = 3.6 to 3.7. Transparent or translucent; vitreous, inclining to resinous. Yellowish white. C.c.: like alstonite. Alston Moor.

288. **BISMUTO-SPHERITE**, Bi_2O_3 . Small fibrous brown concretions from Neustädte, near Schneeberg.

HYDROUS CARBONATES.

289. **THERMONATRITE**, $\text{Na}_2\text{CO}_3 + \text{H}_2\text{O}$.

Right prismatic. $\infty \tilde{P}\frac{1}{2}$ (d) $107^\circ 50'$; $P\infty$ (o) $83^\circ 50'$; with $\infty \tilde{P}\infty$ (P) in rectangular tables (fig. 382). Cl. brachydiagonal, perfect. H. = 1.5; G. = 1.5 to 1.6. Colourless. B.B. like natron, but does not melt. C.c.: 50.1 soda, 35.4 carbonic acid, and 14.5 water. Natron lakes of Lagunilla in Venezuela, of Lower Egypt, and of the steppes between Urals and Altai.

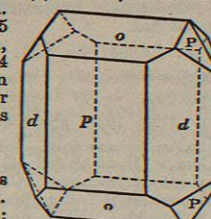


Fig. 382 (sp. 289).

290. **NATRON**, $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O}$. Oblique prismatic, C $57^\circ 40'$. Crystals artificial; with ∞P $79^\circ 41'$; P $76^\circ 28'$. Cl. orthodiagonal, distinct. H. = 1 to 1.5; G. = 1.4 to 1.5. Pellucid; vitreous. Colourless or greyish white. B.B. melts easily, colouring the flame yellow. C.c.: 22 soda, 15 carbonic acid, and 63 water; but mixed with chloride of sodium and other salts. Only as an efflorescence on the ground or rocks (lava of Vesuvius and Etna) in various countries (Hungary, Egypt, Tartary), and in mineral springs and lakes. Used in the manufacture of soap, in dyeing, and in bleaching.

291. **TRONA**, $\text{Na}_2\text{CO}_3 + 4\text{H}_2\text{O}$. Oblique prismatic. Crystals OP (T), $\infty P\infty$ (M), P (n). T: M $103^\circ 15'$ (fig. 383). Cl. orthodiagonal, perfect. H. = 2.5 to 3; G. = 2.1 to 2.2. Transparent to translucent. Colourless. Does not decompose in the air. Taste alkaline. C.c.: 38 soda, 40 carbonic acid, and 22 water. Fezzan and Barbary (Trona), Lagunilla (Urao).

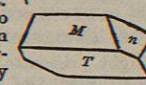


Fig. 383.

292. **GAYLUSSITE**, $\text{Na}_2\text{CO}_3 + \text{CaCO}_3 + 5\text{H}_2\text{O}$. Oblique prismatic, C $78^\circ 27'$. Cl. ∞P , imperfect; fracture conchoidal. H. = 2.5; G. = 1.9 to 1.95. Transparent; vitreous. Colourless. C.c.: 34.5 carbonate of soda, 33.6 carbonate of lime, 30.4 water, with 1.5 clay. Lagunilla.

293. **HYDROMAGNESITE**, $\text{Mg}_3\text{CO}_3 + 4\text{H}_2\text{O}$. Oblique prismatic. ∞P 88° nearly. Crystals small, rare; also massive. H. = 1.5 to 3; G. = 2.14 to 2.18. Vitreous or silky. White. C.c.: 36.2 carbonic acid, 44 magnesia, and 19.8 water. Unst (Shetland), Moravia, Kumi in Negropont, Hoboken in New Jersey, and Texas in Pennsylvania.

294. **AZURITE** (*Blue Copper*), $\text{Cu}_2\text{CO}_3 + \text{H}_2\text{O}$. Oblique prismatic, C $87^\circ 39'$. ∞P (M) $99^\circ 32'$; $-P$ (K') $106^\circ 14'$. Crystals OP , ∞P , $\infty P\infty$, $-R$ (or h, M, s, K', in fig. 384, but in another position); also radiated and earthy. Cl. clinodomatic (P) $59^\circ 14'$, rather perfect; fracture conchoidal or splintery. H. = 3.5 to 4.2; G. = 3.7 to 3.8. Translucent or opaque; vitreous. Azure-blue, the earthy varieties (and streak) smalt-blue. B.B. on charcoal fuses and yields a grain of copper; soluble with effervescence in acids, and also in ammonia. C.c.: 69.1 protioxide of copper, 25.7 carbonic acid, and 5.2 water. Crystals at Redruth, Alston Moor, Chessy near Lyons, in Siberia, Moldavia in the Banat, Burra-Burra (Australia). Valued as an ore of copper.

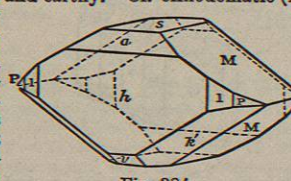


Fig. 384.

295. **MALACHITE**, $\text{Cu}_2\text{CO}_3 + \text{H}_2\text{O}$. Oblique prismatic, C $61^\circ 50'$. ∞P $104^\circ 20'$. Crystals ∞P (M), $\infty P\infty$ (s), OP (P), in hemitropes (fig. 385). In general acicular, scaly, or reniform, stalactitic, and radiated fibrous. Cl. basal and clinodomatic, very perfect. H. = 3.5 to 4; G. = 3.6 to 4. Transparent or translucent on the edges; adamantine, vitreous, silky, or dull. Emerald and other shades of green; streak apple-green. B.B. and with acids like azurite. C.c.: 71.3 copper protioxide (= 57.5 copper), 20 carbonic acid, and 8.2 water. Crystalline at Rheinbreitenbach on the Rhine and Zellerfeld in the Harz; fibrous and compact at Sandlodge in Shetland, Leadhills, Cornwall, Wales, and Ireland. at Chessy in France, Siberia, the Urals, Saalfeld in

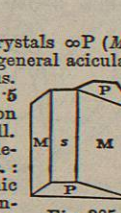


Fig. 385.

Thuringia, Moldavia in the Banat, in North America, Africa, and Australia. Frequently pseudomorphous after copper and its ores, also after calcite and cerussite. Valuable ore of copper; the finer varieties are prized for ornamental purposes.

296. **HYDROZINCITE**, $\text{ZnCO}_3 + 2\text{ZnH}_2\text{O}$. Massive. C.c.: zinc oxide 75.3, carbonic acid 13.6, water 11.1. Spain, Westphalia, Bavaria, Persia, United States. Valuable ore.

297. **AURICHALCITE**, $2\text{CuCO}_3 + 3\text{ZnH}_2\text{O}$. Acicular. H. = 2. Translucent, pearly, and verdigris-green. C.c.: 29.2 copper protioxide, 44.7 zinc oxide, 16.2 carbonic acid, and 9.9 water. Leadhills, Matlock, Loktevski in the Altai.

298. **EMERALD-NICKEL** (*Zar Nitel*), $\text{NiCO}_3 + 6\text{H}_2\text{O}$. Amorphous, reniform, and incrusting. H. = 3; G. = 2.6 to 2.7. Translucent; vitreous. Emerald-green. C.c.: 59.3 nickel protioxide, 11.7 carbonic acid, and 29 water. On chromite at Hagdale in Unst, Texas in Pennsylvania; also Cape Ortegal in Spain, Tyrol, and Ekaterinburg in the Urals.

299. **LINDAKERITE**, $\text{U}_2\text{O}_5 + 2\text{CaCO}_3 + 10\text{H}_2\text{O}$. In small siskin-green crystalline aggregates. H. = 2.5 to 3. From Elias mine near Joachimsthal, implanted on pitch-blende.

300. **VOGLITE**, $4\text{UO}_2 + 7\text{CaCO}_3 + 3\text{CuCO}_3 + 24\text{H}_2\text{O}$. Rhomboidal. Emerald-green scales with pearly lustre. Elias mine, Joachimsthal.

301. **LIEBIGITE**, $\text{U}_2\text{O}_5 + \text{CaCO}_3 + 20\text{H}_2\text{O}$. Mammillary concretions. H. = 2 to 2.5. Apple-green. Adrianople, Joachimsthal, and Johann-Georgenstadt.

302. **BISMUTHITE**, $\text{Bi}_2\text{O}_3 + 4\text{H}_2\text{O}$. Disseminated, investing or acicular; fracture conchoidal or uneven; very brittle. H. = 4 to 4.5; G. = 6.8 to 6.91. Opaque; dull vitreous. Grey, yellow, or green. C.c.: 90.1 bismuth oxide, 6.4 carbonic acid, and 3.5 water. Ullersreuth (Reuss), Schneeberg, Johann-Georgenstadt; also Chesterfield in South Carolina.

303. **LANTHANITE**, $\text{La}_2\text{O}_3 + 3\text{H}_2\text{O}$. Right prismatic. ∞P $92^\circ 46'$. Small tabular crystals; usually granular or earthy. Cl. basal. H. = 2; G. = 2.7. Dull or pearly. White or yellowish. C.c.: 21 carbonic acid, 55 lanthanum oxide, and 24 water. Bastnaes in Sweden, Lehigh in Pennsylvania.

304. **PHOSGENITE**, $\text{PbCl}_2 + \text{PbCO}_3$. Pyramidal. P $113^\circ 56'$. Crystals short-prismatic or sharp-pyramidal. Cl. ∞P , rather perfect; fracture conchoidal. H. = 2.5 to 3; G. = 6 to 6.2. Transparent or translucent; resinous adamantine. White, yellow, green, or grey. C.c.: 51 chloride and 49 carbonate of lead. Very rare. Stottfield near Elgin in Scotland, Matlock and Cromford in Derbyshire, Tarnowitz.

305. **PARISITE**, $3\text{CeO}_2 + \text{CaF}_2$. Hexagonal. P $164^\circ 58'$. Cl. basal, perfect. H. = 4.5; G. = 4.35. Vitreous; on cleavage-plane pearly. Brownish yellow, inclining to red. C.c.: 23.5 carbonic acid, 42.5 protioxide of cerium, 8.2 lanthanum oxide, 9.6 didymium oxide, 2.8 lime, 10.1 fluoride of calcium, and 2.2 fluoride of cerium. Emerald mines of the Muzo Valley in Colombia, Urals.

306. **LEADHILLITE** (*Maxite*), $\text{Pb}_{12}\text{C}_6\text{S}_6\text{O}_{21} + 5\text{H}_2\text{O}$. Right prismatic. P middle edge 137° ; ∞P $120^\circ 20'$; $2\tilde{P}\infty$ $43^\circ 12'$.

Mostly tabular; also twins. Cl. basal, perfect; slightly brittle. H. = 2.5; G. = 6.26 to 6.44. Transparent or translucent; resinous

Carbonates with haloid salts, &c.

307. **PARISITE**, $3\text{CeO}_2 + \text{CaF}_2$. Hexagonal. P $164^\circ 58'$. Cl. basal, perfect. H. = 4.5; G. = 4.35. Vitreous; on cleavage-plane pearly. Brownish yellow, inclining to red. C.c.: 23.5 carbonic acid, 42.5 protioxide of cerium, 8.2 lanthanum oxide, 9.6 didymium oxide, 2.8 lime, 10.1 fluoride of calcium, and 2.2 fluoride of cerium. Emerald mines of the Muzo Valley in Colombia, Urals.

308. **LEADHILLITE** (*Maxite*), $\text{Pb}_{12}\text{C}_6\text{S}_6\text{O}_{21} + 5\text{H}_2\text{O}$. Right prismatic. P middle edge 137° ; ∞P $120^\circ 20'$; $2\tilde{P}\infty$ $43^\circ 12'$.

Mostly tabular; also twins. Cl. basal, perfect; slightly brittle. H. = 2.5; G. = 6.26 to 6.44. Transparent or translucent; resinous

Carbonates with haloid salts, &c.

309. **PARISITE**, $3\text{CeO}_2 + \text{CaF}_2$. Hexagonal. P $164^\circ 58'$. Cl. basal, perfect. H. = 4.5; G. = 4.35. Vitreous; on cleavage-plane pearly. Brownish yellow, inclining to red. C.c.: 23.5 carbonic acid, 42.5 protioxide of cerium, 8.2 lanthanum oxide, 9.6 didymium oxide, 2.8 lime, 10.1 fluoride of calcium, and 2.2 fluoride of cerium. Emerald mines of the Muzo Valley in Colombia, Urals.

310. **LEADHILLITE** (*Maxite*), $\text{Pb}_{12}\text{C}_6\text{S}_6\text{O}_{21} + 5\text{H}_2\text{O}$. Right prismatic. P middle edge 137° ; ∞P $120^\circ 20'$; $2\tilde{P}\infty$ $43^\circ 12'$.

Mostly tabular; also twins. Cl. basal, perfect; slightly brittle. H. = 2.5; G. = 6.26 to 6.44. Transparent or translucent; resinous

Carbonates with haloid salts, &c.

311. **PARISITE**, $3\text{CeO}_2 + \text{CaF}_2$. Hexagonal. P $164^\circ 58'$. Cl. basal, perfect. H. = 4.5; G. = 4.35. Vitreous; on cleavage-plane pearly. Brownish yellow, inclining to red. C.c.: 23.5 carbonic acid, 42.5 protioxide of cerium, 8.2 lanthanum oxide, 9.6 didymium oxide, 2.8 lime, 10.1 fluoride of calcium, and 2.2 fluoride of cerium. Emerald mines of the Muzo Valley in Colombia, Urals.

312. **LEADHILLITE** (*Maxite*), $\text{Pb}_{12}\text{C}_6\text{S}_6\text{O}_{21} + 5\text{H}_2\text{O}$. Right prismatic. P middle edge 137° ; ∞P $120^\circ 20'$; $2\tilde{P}\infty$ $43^\circ 12'$.

Mostly tabular; also twins. Cl. basal, perfect; slightly brittle. H. = 2.5; G. = 6.26 to 6.44. Transparent or translucent; resinous

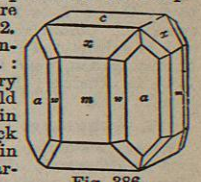


Fig. 386.

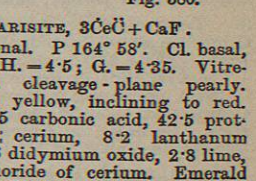


Fig. 387 (sp. 305).

10.1 fluoride of calcium, and 2.2 fluoride of cerium. Emerald mines of the Muzo Valley in Colombia, Urals.

308. **LEADHILLITE** (*Maxite*), $\text{Pb}_{12}\text{C}_6\text{S}_6\text{O}_{21} + 5\text{H}_2\text{O}$. Right prismatic. P middle edge 137° ; ∞P $120^\circ 20'$; $2\tilde{P}\infty$ $43^\circ 12'$.

Mostly tabular; also twins. Cl. basal, perfect; slightly brittle. H. = 2.5; G. = 6.26 to 6.44. Transparent or translucent; resinous

Carbonates with haloid salts, &c.

313. **PARISITE**, $3\text{CeO}_2 + \text{CaF}_2$. Hexagonal. P $164^\circ 58'$. Cl. basal, perfect. H. = 4.5; G. = 4.35. Vitreous; on cleavage-plane pearly. Brownish yellow, inclining to red. C.c.: 23.5 carbonic acid, 42.5 protioxide of cerium, 8.2 lanthanum oxide, 9.6 didymium oxide, 2.8 lime, 10.1 fluoride of calcium, and 2.2 fluoride of cerium. Emerald mines of the Muzo Valley in Colombia, Urals.

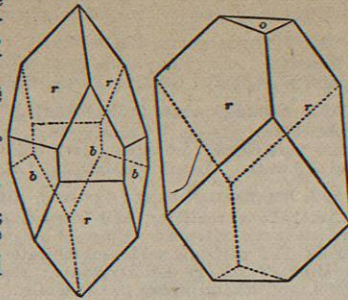
314. **LEADHILLITE** (*Maxite*), $\text{Pb}_{12}\text{C}_6\text{S}_6\text{O}_{21} + 5\text{H}_2\text{O}$. Right prismatic. P middle edge 137° ; ∞P $120^\circ 20'$; $2\tilde{P}\infty$ $43^\circ 12'$.

Mostly tabular; also twins. Cl. basal, perfect; slightly brittle. H. = 2.5; G. = 6.26 to 6.44. Transparent or translucent; resinous

or adamantine, pearly on OP. Yellowish white, inclining to grey, green, yellow, or brown. C.c.: 81.98 oxide of lead, 8.03 carbonic acid, 8.12 sulphuric acid, 1.8 water. Leadhills, Taunton, Nertschinsk, Granada. *Mazite* from Sardinia.

307. SUSANNITE, $3\text{PbO} + \text{PbS}$.

Rhombohedral; R $72^\circ 29'$. Cl. basal, perfect. H.—2.5; G.—6.55. White, green, yellow, brownish. Resinous to adamantine; pearly on the cleavage faces. Powder white. C.c.: 72.5 carbonate and 27.5 sulphate of lead. From the Susanna mine at Leadhills, but very rare; also in large dark crystals from the Banat.



ANHYDROUS SULPHATES.

308. ARCANITE (*Glaserite*), K_2S .

Right prismatic. Acute pyramids, with ∞P $120^\circ 24'$; dimorphous and also rhombohedral, with R $88^\circ 14'$. Mostly in crusts, or pulverulent. Cl. basal, imperfect. H.—2.5 to 3; G.—2.7. Pellucid; vitreous or resinous. Colourless or white. C.c.: 54 potash and 46 sulphuric acid. Lavas of Vesuvius and other volcanoes.

309. MASCAGNINE, $(\text{NH}_4)_2\text{S}$.

Right prismatic. ∞P $121^\circ 8'$; but chiefly in crusts and stalactites. Cl. perfect; sectile. H.—2 to 2.5; G.—1.7 to 1.8. Pellucid; vitreous. Colourless, white, or yellowish. Taste pungent and bitter. C.c.: 25.9 ammonia, 60.5 sulphuric acid, and 13.6 water. Near volcanoes, as Etna, Vesuvius, the Solfatara, the Lipari Islands, in the marshes near Siena, and in ignited coal-beds, as at Bradley in Staffordshire.

310. THENARDITE, Na_2S .

Right prismatic. Acute pyramids P, with OP and ∞P , in crusts and druses. Cl. basal, perfect; fracture uneven. H.—2.5; G.—2.6 to 2.7. Pellucid; vitreous. White. C.c.: 43.82 soda and 56.18 sulphuric acid. In salt deposits near Aranjuez (Spain) and at Tarapaca (Peru).

311. GLAUBERITE (*Bronniartine*), $\text{Na}_2\text{S} + \text{CaS}$.

Oblique prismatic, C $68^\circ 16'$. OP, —P, or with ∞P (P, f, M, fig. 392). Cl. basal, perfect; along ∞P traces. H.—2.5 to 3; G.—2.75 to 2.85. Translucent; vitreous to resinous. Colourless. C.c.: 51 sulphate of soda, and 49 sulphate of lime. Villarubia in Spain, Vic, Berchtesgaden, near Brugg in Aargau, Aussee and Ischl in Austria; Tarapaca in Peru, with 1 to 5 boracic acid.



312. ANHYDRITE (*Karstenite*), CaS .

Right prismatic. ∞P $90^\circ 4'$. Chiefly granular, or almost compact or columnar. Twins rare. Cl. macrodiagonal and brachydiagonal, both perfect; basal perfect. H.—3 to 3.5; G.—2.8 to 3. Transparent or translucent; vitreous; on ∞P pearly. Colourless or white, but often blue, red, or grey; streak greyish white. C.c.: 58.75 sulphuric acid and 41.25 lime.

The crystalline, or *Muriacite*, occurs in the salt-mines of Bex, Hall in Tyrol, and Aussee in Styria, also at Sulz, Stassfurt, and Bleiberg. Compact at Ischl in Austria, Berchtesgaden, Eisleben, and the Harz. Granular, or *Vulpinite*, near Bergamo. The contorted, or *Gekrümmte*, chiefly at Wieliczka and Bochnia.

313. BARYTE (*Heavy Spar*), BaS .

Right prismatic. $\text{P}\infty$ (g) $78^\circ 20'$; $\text{P}\infty$ (f) $105^\circ 22'$; ∞P (d) $77^\circ 44'$; also $\infty\text{P}\infty$ (c) (figs. 125, 126, 127, but in a different position, d, d being placed vertical). The crystals show very many forms and combinations, and are tabular or columnar, often in druses or groups; also foliated, fibrous, granular, or compact. Cl. brachydiagonal perfect, along $\text{P}\infty$ less perfect; basal, traces. H.—3 to 3.5; G.—4.3 to 4.7. Transparent to translucent; vitreous or resinous. Colourless and white, but generally reddish white, or flesh-red, yellow, grey, bluish, greenish, or brown. B.B. decrepitate violently, and fuses very difficultly, or only on the edges, colouring the flame yellowish green; not soluble in acids. C.c.: 84.3 sulphuric acid and 65.7 baryta, but occasionally with 1 to 15 sulphate of strontia. Very common, chiefly in veins, either alone or accompanying ores. Crystals at Arran, Strontian, Elie, Sutherland; Dufton, Bohemia, Felsöbanya and Kremnitz in

Hungary, Auvergne, and United States. Columnar at Freiberg. The radiated from near Bologna, or the *Bolognese Stone*, phosphoresces in the dark. Massive, or *Cavok*, from Derbyshire and Staffordshire, Leadhills, and Arran.

Lime Barytes, from Derbyshire, Strontian, Freiberg, seems a mixture with sulphate of lime; crystals tabular, in rosettes and other groups; G.—4 to 4.3. *Hepatite*, dark grey, from carbonaceous matter; Kongsberg. *Allomorphite*, scaly, white, and pearly, near Rudolstadt, agrees essentially with barytes.

314. BARYTO-CELESTINE, $2\text{SrS} + \text{BaS}$.

Radiated and foliated. Bluish white. Brittle and friable. H.—2.5; G.—3.92. Difficultly fusible. Lake Erie, Upper Canada, and Biunenthal.

315. CELESTINE, SrS .

Right prismatic; forms like barytes and anglesite. $\text{P}\infty$ (o) $104^\circ 8'$; $\text{P}\infty$ (M) $75^\circ 58'$. Usual combinations $\text{P}\infty$, $\text{P}\infty$, $\infty\text{P}\infty$; or this with ∞P (d); also columnar and foliated; or fibrous, fine granular, or compact. Cl. macrodiagonal, perfect; along $\text{P}\infty$ less perfect. H.—3 to 3.5; G.—3.9 to 4. Transparent or translucent; vitreous or resinous. Colourless, but usually bluish white to indigo-blue, and rarely reddish or yellowish. B.B. decrepitate and fuses easily to a milk-white globule; colours the flame carmine-red. Distinguished from barytes by a splinter, after ignition in the inner flame, on being moistened with h. acid, and held in the blue border of the flame of a candle, colouring this of a lively purple-red. Scarcely affected by acids. C.c.: 43.6 sulphuric acid and 56.4 strontia, but often some baryta or lime. Tantallon Castle, Calton Hill, Clachnaharry; near Bristol and Knarborough; sulphur-mines of Girgenti and other parts of Sicily, Herrengrund in Hungary, Bex, Salzburg, Monte Viale near Verona, and Meudon and Montmartre near Paris. Used for producing a red light in pyrotechnic mixtures.

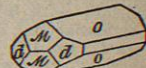


Fig. 393.

316. ANGLESITE, PbS .

Right prismatic. ∞P $103^\circ 43'$; $\text{P}\infty$ $75^\circ 35'$. The crystals, of many forms and combinations, are short prismatic, pyramidal, or tabular. Cl. prismatic along ∞P , and basal; fracture conchoidal; very brittle. H.—3; G.—6.2 to 6.35. Transparent or translucent; adamantine or resinous. Colourless and white, but occasionally yellow, grey, brown, or blue; streak white. Decrepitate in candle; B.B. on charcoal fuses in the oxygen flame to a milk-white bead; very difficultly soluble in acids, wholly in solution of potash. C.c.: 73.7 lead protoxide and 26.3 sulphuric acid. Leadhills (fig. 397), St Ives in Cornwall, Derbyshire, Parys mine in Anglesea, Zellerfeld, Klausthal, Baden-

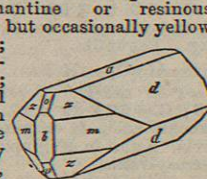


Fig. 394.

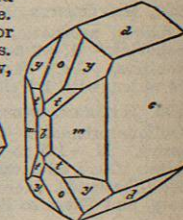


Fig. 395.

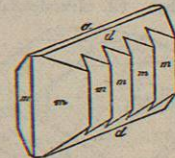


Fig. 396.

weiler, Siegen, Silesia, Linares, Phoenixville in Pennsylvania.

317. LANARKITE, $\text{PbS} + \text{Pb}$.

Oblique prismatic. ∞P $49^\circ 50'$. Cl. basal, perfect; sectile; thin laminae flexible. H.—2 to 2.5; G.—6.3 to 6.7. Transparent;

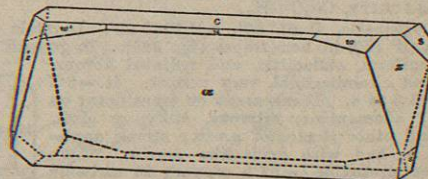


Fig. 398.

resinous or adamantine; on OP pearly. Greenish or yellowish white, inclining to grey; streak white. B.B. on charcoal fuses to a white globule containing metallic lead; partially soluble in n.

acid with effervescence. C.c.: sulphate of lead 57.6, oxide of lead 42.4. Leadhills; rare.

HYDROUS SULPHATES.

318. MIRABILITE (*Glauber Salt*), $\text{Na}_2\text{S} + 10\text{H}_2\text{O}$.

Oblique prismatic, C $72^\circ 15'$. Cl. orthodiagonal; fracture conchoidal. H.—1.5 to 2; G.—1.4 to 1.5. Pellucid and colourless. C.c.: 19.2 soda, 24.8 sulphuric acid, and 56 water. As an efflorescence in quarries, on old walls, or on the ground; in the waters of lakes and springs in Russia and Egypt, and on Vesuvius on lava.

319. GYPSUM, $\text{CaS} + 2\text{H}_2\text{O}$.

Oblique prismatic, C $80^\circ 57'$. The most common forms are ∞P $111^\circ 30'$; P $138^\circ 40'$; —P $143^\circ 30'$; and $\infty\text{P}\infty$. Two common combinations are ∞P (f), $\infty\text{P}\infty$ (p), —P (l) (fig. 129), and this with P. Lenticular crystals often occur; hemitropes frequent (figs. 161, 150, 151); also granular, compact, fibrous, scaly, or pulverulent. Cl. clinodiagonal perfect, along P much less perfect; sectile; thin plates flexible. H.—1.5 to 2 (lowest on P); G.—2.2 to 2.4. Transparent or translucent; vitreous, on cleavage pearly or silky. Colourless, and snow-white, but often red, grey, yellow, brown, and more rarely greenish or bluish. In the closed tube yields water. B.B. becomes opaque and white; soluble in 400 to 500 parts of water, scarcely more so in acids. C.c.: 46.5 sulphuric acid, 32.6 lime, and 20.9 water.

Transparent crystals, or *Selenite*, occur in the salt-mines of Bex in Switzerland, of the Tyrol, Salzburg, and Bohemia, in the sulphur-mines of Sicily, at Lockport in New York, in porphyry at Gourrock, in the clay of Shotover Hill near Oxford, at Chatley near Bath, and many other localities. Fibrous gypsum at Campsie, Matlock in Derbyshire, and at Ilfeld in the Harz. Compact gypsum in whole beds in many parts of England, Germany, France, and Italy, at Volterra in Tuscany (*Alabaster*) often with rock-salt. The finer qualities (or alabaster) are cut into various ornamental articles.

320. KIESERITE, $\text{MgS} + \text{H}_2\text{O}$.

Rhombohedral, but chiefly massive. G.—2.52. Pellucid; greyish white. C.c.: magnesia 29, sulphuric acid 58, water 13. In beds at Stassfurt.

321. EPSOMITE (*Epsom Salt*), $\text{MgS} + 7\text{H}_2\text{O}$.

Right prismatic. P mostly hemihedral; ∞P $90^\circ 38'$. ∞P (M), $\infty\text{P}\infty$ (o), P (l) (fig. 399). Granular, fibrous, or earthy. Cl. brachydiagonal, perfect. H.—2 to 2.5; G.—1.75. Pellucid; vitreous; and white. Taste bitter. C.c.: 16.32 magnesia, 32.53 sulphuric acid, and 51.15 water. Efflorescence on various rocks, as at Hurler near Paisley, Idria, Montmartre, and Freiberg; on the ground in Spain and the Russian steppes; in mineral waters, as at Epsom in Surrey, Salschitz and Seidlitz in Bohemia. Used in medicine.

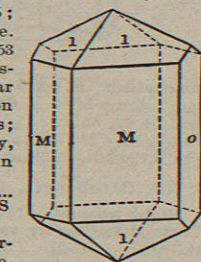


Fig. 399 (sp. 321).

322. GOSLARITE (*White Vitriol*), $\text{ZnS} + 7\text{H}_2\text{O}$.

Right prismatic. ∞P , $90^\circ 42'$; isomorphous with epsomite. ∞P , $\infty\text{P}\infty$, P (M, o, l) (fig. 399). Mostly granular or stalactitic; reniform and incrusting. Cl. brachydiagonal, perfect. H.—2 to 2.5; G.—2 to 2.1. Pellucid; vitreous. White, inclining to grey, yellow, green, or red. Taste nauseous-astringent. C.c.: 28.2 zinc oxide, 27.9 sulphuric acid, and 43.9 water. Holywell in Flintshire, Cornwall, Ramsdelsberg near Goslar in the Harz, Falun, Schemnitz. Used in dyeing and medicine.

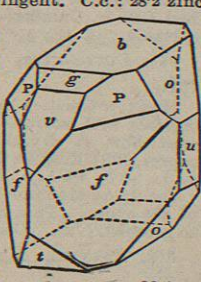


Fig. 400 (sp. 324).

323. MORENOSITE, $\text{NiS} + 7\text{H}_2\text{O}$.

Acicular, fibrous, and as an efflorescence. H.—2 to 2.25; G.—2. Lustre vitreous. Apple-green; streak white. Soluble. Morvern in Argyllshire, Cape Ortegal (Spain), Lake Huron, Pennsylvania.

324. MELANTERITE (*Green Vitriol*, *Cop-*

peras), $\text{FeS} + 7\text{H}_2\text{O}$.

Oblique prismatic, C $75^\circ 45'$. ∞P (f) $83^\circ 22'$; —P (P) $101^\circ 34'$; $\text{P}\infty$ (o) $67^\circ 30'$ (fig. 400); chiefly stalactitic, reniform, or in crusts. Cl. basal, perfect; prismatic less so. H.—2; G.—1.8 to 1.9. Translucent, rarely transparent; vitreous. Leek or mountain-green, often with a yellowish coating; streak white. C.c.: 26 protoxide of iron, 29 sulphuric acid, and 45 water. Hurler near Paisley, Bodenmais, Ramsdelsberg, Falun, Schemnitz, Bilitz. Used in

dyeing, and in manufacturing ink, Prussian blue, and sulphuric acid.

325. SMIKITE, $\text{Mn}_2\text{S} + \text{H}_2\text{O}$.

Stalactitic aggregates. Rose to white. Felsöbanya (Hungary).

326. MALLARDITE, $\text{MnS} + 7\text{H}_2\text{O}$.

Crystalline foliated masses; apparently oblique prismatic. Lucky Bay mine in Utah.

327. BIEBERITE (*Cobalt Vitriol*), $\text{CoS} + 7\text{H}_2\text{O}$.

Oblique prismatic; usually stalactitic, or an efflorescence. Pale rose-red. C.c.: 20 cobalt oxide, 4 magnesia, 29 sulphuric acid, and 47 water. Bieber near Hanau, and Leogang.

328. ALUNOGENE (*Hair-Salt*), $\text{Al}_2\text{S} + 18\text{H}_2\text{O}$.

Capillary or acicular, in crusts or reniform masses. H.—1.5 to 2; G.—1.6 to 1.7. Silky. White, inclining to green or yellow. C.c.: 36 sulphuric acid, 15.4 alumina, 48.6 water. Volcanoes of South America, in coal and lignite in Germany, and on old walls.

329. ALUMINITE (*Websterite*), $\text{Al}_2\text{S} + 9\text{H}_2\text{O}$.

Reniform, and very fine scaly, or fibrous. Fracture earthy; sectile or friable. H.—1; G.—1.7. Opaque; dull or glimmering; snow-white or yellowish white. C.c.: 29.8 alumina, 23.2 sulphuric acid, and 47 water. Newhaven in Sussex; Epervay, Auteuil, and Lunel Vieil in France; Halle and Mori in Prussia. *Felsöbanyite*, from Hungary, in rhombic tubes, is similar, but has 10 per cent. of water.

330. COQUIMBITE, $\text{Fe}_2\text{S} + 9\text{H}_2\text{O}$.

Hexagonal. P 58° . Crystals OP; with ∞P and P; usually granular. Cl. ∞P , imperfect. H.—2 to 2.5; G.—2 to 2.1. White, also brown, yellow, red, and blue. C.c.: 28.5 iron peroxide, 42.6 sulphuric acid, and 28.9 water. Copiapo in Chili, and Calama in Bolivia.

331. COPAPIITE, $2\text{Fe}_2\text{S} + 13\text{H}_2\text{O}$.

Six-sided tables, but system uncertain; also granular. Cl. perfect. Translucent; pearly. Yellow. C.c.: 34 iron peroxide, 42 sulphuric acid, and 24 water. Copiapo in Chili. Also radiated-fibrous masses, dirty greenish yellow, incrusting the former, with 32 sulphuric acid and 37 water. Both probably mixtures. *Fibroferrite*, also from Chili, and *Yellow Iron Ore*, from the brown coal at Kelosoruk in Bohemia and Modum in Norway, are both reniform, or compact and earthy. H.—2.5 to 3; G.—2.7 to 2.9. Colour ochre-yellow. *Apateite*, reniform-earthly, yellow, from Auteuil near Paris, is similar; also *Vitriol Ochre* from Falun. *Misy*, from Ramsdelsberg in the Harz, containing sulphates of iron, copper, zinc, and other metals, is a product of decomposition.

332. PISSOPHANE, $(\text{Al}_2\text{Fe}_2)\text{S} + 15\text{H}_2\text{O}$.

Stalactitic; fracture conchoidal; very easily frangible. H.—2; G.—1.9 to 2. Transparent or translucent; vitreous. Olive-green to liver-brown; streak greenish white to pale yellow. C.c.: 7 to 35 alumina, 10 to 40 iron peroxide, 12 sulphuric acid, and 41 water. Saalfeld and Reichenbach in Saxony.

Carphosiderite, reniform, opaque, resinous, and straw-yellow, with a greasy feel, is related. H.—4.5; G.—2.5. Consists of hydrous sulphate of iron. Labrador.

333. CHALCANTHITE, $\text{CuS} + 5\text{H}_2\text{O}$.

Anorthic. $\infty\text{P}\infty$ (n): $\infty\text{P}\infty$ (r) $79^\circ 19'$. P' (P): ∞P (T) $127^\circ 40'$. P: n $120^\circ 50'$. P: r $103^\circ 27'$. ∞P (T): ∞P (M) $123^\circ 10'$ (fig. 401). Generally incrusting. Cl. T' and M, imperfect. H.—2.5; G.—2.2. Blue. C.c.: 32 protoxide of copper, 32 sulphuric acid, 36 water. Cornwall, Wicklow, Hungary, Tyrol, Falun, and on lava of Vesuvius.

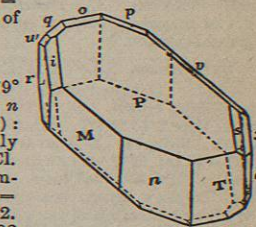


Fig. 401 (sp. 333).

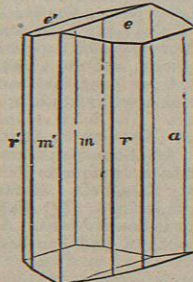


Fig. 402 (sp. 334).

334. BROCHANTITE, $\text{CuS} + 3\text{CuH}_2\text{O}$.

Right prismatic. ∞P $104^\circ 32'$; $\text{P}\infty$ $152^\circ 37'$; and $\infty\text{P}\infty$; also reniform. Cl. brachydiagonal, perfect. H.—3.5 to 4; G.—3.75 to 3.9. Transparent or translucent; vitreous. Emerald or blackish green; streak bright green. C.c.: 70 copper protoxide, 18 sulphuric acid, and 12 water. Sandlodge (Unst), Roughton Gill in Cumber

land, Rezbanya, Ekaterinburg; also Krisuvig in Iceland (*Krisuvigite*).

835. **LANGITE**, $\text{CuS} + 3\text{CuH}_2 + 2\text{H}_2$.
Right prismatic. ∞P $123^\circ 44'$. Crystals long-tabular, mostly in twins. Also in fibro-lamellar and concretionary crusts, with earthy surface. Cl. basal and brachydiagonal. $H = 2.5$; $G = 3.5$. Vitreous. Greenish blue. C.c.: 65.1 copper protoxide, 16.4 sulphuric acid, and 18.5 water. Cornwall.
Warringtonite is similar; also *Konigite* from Siberia.

836. **JOHANNITE** (*uran-vitriol*).

Oblique prismatic, C $85^\circ 40'$. ∞P 69° . Crystals similar to trona (No. 291, fig. 383), but minute; arranged in concretionary and reniform masses. $H = 2$ to 2.5 ; $G = 3.19$. Semitransparent; vitreous. Soluble. Taste bitter. Bright grass-green. C.c.: oxides of uranium 67.72, oxide of copper 5.99, sulphuric acid 20.02, water 5.59. Joachimsthal (Bohemia), Johann-Georgenstadt.

837. **BLÖDITE** (*Astrakhanite*), $(\text{MgNa})\text{S} + 2\text{H}_2$.

Oblique prismatic, C $100^\circ 43'$. ∞P^2 $112^\circ 55'$; ∞P (m), ∞P^∞ (b), ∞P^2 (n), ∞P^∞ (a), $-P$ (p), P^∞ (d), OP (c) (fig. 403). In prismatic crystals, or efflorescent. $H = 3.5$; $G = 2.2$. Transparent. White or red. C.c.: 47.9 sulphuric acid, 8.5 soda, 12 magnesia, and 21.5 water. Salt lakes on the Volga near Astrakhan, Ischl, Stassfurt, and near Mendoza in South America.

Reussite from Seidlitz is similar, but a mixture.

838. **LOWEITE**, $2(\text{Na}_2\text{S} + \text{MgS}) + 5\text{H}_2$.

Pyramidal, but only compact. Cl. basal, distinct; also octahedral, with angles $110^\circ 44'$ and $105^\circ 2'$. $H = 2.5$ to 3 ; $G = 2.376$. Vitreous. Yellowish white to flesh-red. C.c.: 20 soda, 13 magnesia, 52 sulphuric acid, and 15 water. Ischl.

839. **SYNGENITE**, $\text{K}_2\text{S} + \text{CaS} + \text{H}_2$.

Oblique prismatic, C 76° . ∞P $73^\circ 55'$. Crystals ∞P^∞ (a), ∞P^∞ (b), OP (c), ∞P (p), ∞P^2 (n), ∞P^3 (m), $2P^2$ (d), P (e), $2P$ (f), P^∞ (g), P^∞ (h), P^∞ (i), P^∞ (j), P^∞ (k), P^∞ (l), P^∞ (m), P^∞ (n), P^∞ (o), P^∞ (p), P^∞ (q), P^∞ (r), P^∞ (s), P^∞ (t), P^∞ (u), P^∞ (v), P^∞ (w), P^∞ (x), P^∞ (y), P^∞ (z). Cl. ∞P , perfect; fracture conchoidal. $H = 2.5$; $G = 2.25$. Colourless to milk-white. C.c.: lime 16.88, potash 28.55, sulphuric acid 48.45, water 5.47. Soluble in 400 parts of water. In cavities in halite at Kalusz (Galicia).

840. **POLYHALITE**, $2\text{CaS} + \text{MgS} + \text{K}_2\text{S} + 2\text{H}_2$.

Right prismatic. ∞P 115° . Mostly fibrous. $H = 3.5$; $G = 2.7$ to 2.8 . Translucent; resinous. Colourless, generally brick-red. C.c.: sulphate of lime 45, of magnesia 20.5, of potash 29, water 5.5. Ischl, Aussee, and Berchtesgaden.

841. **ALUM**, $\text{RS} + (\text{Al}_2\text{Fe}_2)\text{S}_2 + 24\text{H}_2$.

Cubic. O, sometimes with ∞O and $O\infty$. Generally efflorescent in fibrous crusts. Cl. octahedral; fracture conchoidal. $H = 2$ to 2.5 ; $G = 1.75$ to 1.9 . Translucent. White. Taste sweetish-astringent. Soluble. B.B. evolves sulphurous fumes. (a) *Potash Alum*: $\text{RO} = \text{K}_2\text{O}$; 33.7 sulphuric acid, 10.9 alumina, 9.9 potash, and 45.5 water. In the coal formation at Hurler and Campsie in Scotland; the Tertiary brown coals of Hesse and the Rhine; the Lias near Whitby; Silurian alum slates of Scotland, Norway, and Sweden; the volcanic formations of the Lipari Islands, Sicily, and the Azores. (b) *Ammonia Alum*: $\text{RO} = (\text{NH}_4)_2\text{O}$; about 4 per cent. oxide of ammonium and 48 water. In closed tube forms a sublimate of sulphate of ammonia. Tschermig in Bohemia. (c) *Soda Alum*: $\text{RO} = \text{Na}_2\text{O}$; with 7 of soda and 48 water. Mendoza in South America, Solfatara near Naples, and Milo. (d) *Magnesia Alum*: $\text{RO} = \text{MgO}$. Translucent and silky. South Africa, Iquique in Peru (*Pickeringite*). (e) *Iron Alum* (*Feather Alum*): $\text{RO} = \text{FeO}$. Hurler near Paisley, Morsfeld in Bavaria, Krisuvig in Iceland. (f) *Manganese Alum*: $\text{RO} = \text{MnO}$. From Delagoa Bay in South Africa. An alum with 3.7 oxide of zinc occurs at Felsobanya, and has been termed *Dietrichite*.

842. **VOLTAITE**, $3(\text{Fe}, \text{K})\text{S} + 2(\text{Fe}, \text{Al})_2\text{S}_3 + 12\text{H}_2$.

Cubic. O; ∞O ; $O\infty$. Black, brown, or green. $H = 3$; $G =$

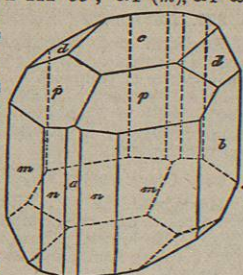


Fig. 403 (sp. 337).

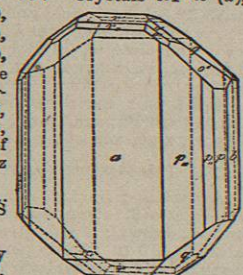


Fig. 404 (sp. 339).

2.79. Solfatara near Naples, Goslar in the Harz, and Kremnitz.

843. **ALUNITE**, $\text{K}_2\text{S} + 3\text{Al}_2\text{S}_3 + 6\text{H}_2$.

Rhombohedral; R $89^\circ 10'$. Crystals R and OR (fig. 405); also earthy. Cl. basal. $H = 3.5$ to 4 ; $G = 2.6$ to 2.8 . Translucent; vitreous, pearly on O. Colourless, but often stained. Hungary, Tolfa (near Civita Vecchia), Lipari Islands, Auvergne, and Milo.

844. **JAROSITE**, $\text{K}_2\text{S} + \text{Fe}_2\text{S}_3 + 2(\text{Fe}, 3\text{H}_2)$.

Rhombohedral; R $88^\circ 58'$. Cl. basal; also fibrous in nodules or incrusting. $H = 2.5$ to 3.5 ; $G = 3.24$. Colour ochre-yellow. Spain, Saxony, and Mexico.

845. **GELBEISENERZ**, $\text{K}_2\text{S} + 4\text{Fe}_2\text{S}_3 + 9\text{H}_2$.

Foliated and massive. $H = 2.5$ to 3 ; $G = 2.7$ to 2.9 . Bohemia, Norway, and Tchelen Island in the Caspian Sea.

846. **URUSITE**, $\text{Fe}_2\text{S}_3 + 2\text{Na}_2\text{S}_2 + 8\text{H}_2$.

Tchelen Island in the Caspian.

847. **BOTRYOGENE** (*Red Vitriol*), $\text{Fe}_2\text{S}_3 + 3(\text{Fe}, 2\text{S}_2) + 36\text{H}_2$.

Oblique prismatic, C $62^\circ 26'$. ∞P $119^\circ 56'$. Commonly botryoidal. $H = 2$ to 2.5 ; $G = 2$. Translucent; vitreous. Hyacinth-red and orange-yellow. Falun in Sweden.

848. **HERRENGRUNDITE**.

Oblique prismatic, C $88^\circ 50'$. Dark emerald-green crystals. $H = 2.5$; $G = 3.13$. C.c.: 57.22 oxide of copper, 23.04 sulphuric oxide, 19.44 water, sometimes with lime. Herrengrund (Hungary).

849. **LINARITE**, $(\text{PbS} + \text{H}_2\text{Pb}) + (\text{CuS} + \text{H}_2\text{Cu})$.

Oblique prismatic, C $77^\circ 22'$. ∞P (M) $61^\circ 41'$; $2P^\infty$ (n) $52^\circ 31'$. Crystals ∞P^∞ (a), OP (c), and the above forms generally. Hemitropes united by ∞P^∞ (a). Cl. orthodiagonal, perfect; fracture

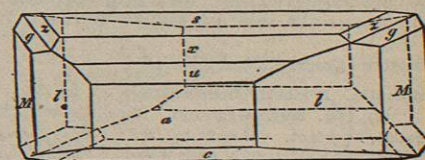


Fig. 406.

conchoidal. $H = 2.5$ to 3 ; $G = 5.2$ to 5.45 . Translucent; adamantine. Azure-blue to dark blue; streak pale blue. C.c.: oxide of lead 55.69, oxide of copper 19.83, sulphuric acid 19.98, water 4.5. Leadhills, Red Gill and Roughton Gill (Cumberland), Linares in Spain, and Nerzhinsk.

850. **CALEDONITE**, $5\text{PbS} + 2(\text{H}_2\text{Pb}) + 3(\text{H}_2\text{Cu})$.

Right prismatic. ∞P (m) 95° ; P^∞ (e) $70^\circ 57'$; $2P^\infty$ (x) $36^\circ 16'$. Crystals frequently as in fig. 407, but generally hemihedral. Cl. brachydiagonal, a distinct; m , c imperfect. $H = 2.5$ to 3 ; $G = 6.4$. Transparent; resinous. Verdigris-green and mountain-green; streak greenish white. C.c.: 68.42 oxide of lead, 10.17 oxide of copper, 17.8 sulphuric acid, 4.05 water. Leadhills, Red Gill in Cumberland, Rezbanya in Transylvania.

851. **LETTSMITE**, $3\text{Cu}_2\text{S} + 2(\text{Al}, 3\text{H}_2)$.

Right prismatic; but in tufts of capillary crystals with velvet-like appearance. Colour small-blue to sky-blue. C.c.: 49 oxide of copper, 2.97 lime, 11.21 alumina, 1.41 oxide of iron, 12.1 sulphuric acid, 22.5 water. Moldavia in the Banat. Woodwardite is probably an aluminous variety of the above. Turquoise-blue to greenish blue. Cornwall.

852. **KAINITE**, $\text{MgS} + \text{KCl} + 3\text{H}_2$.

Oblique prismatic, C $85^\circ 5'$ (fig. 408). $G = 2.13$. Cl. orthodiagonal. White to reddish. C.c.: 16.1 magnesia, 15.7 potash, 32.2 sulphuric acid; 14.3 chlorine, 21.7 water. Stassfurt.

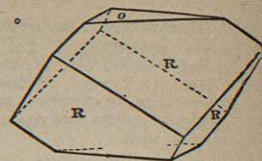


Fig. 405 (sp. 343).

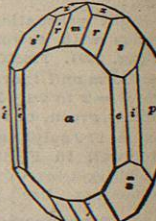


Fig. 407 (sp. 350).

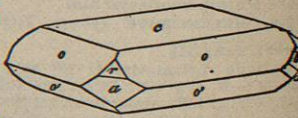


Fig. 408 (sp. 352).

TELLURATES AND CHROMATES.

853. **MONTANITE**, $\text{Bi}_2\text{Te} + 2\text{H}_2$.

Incrusting, earthy. Lustre waxy. Yellowish. Opaque. C.c. bismuth 66.8, tellurium 26.8, water 5.9. Highland in Montana.

854. **MAGNOLITE**, HgTe .

White acicular crystals from Keystone mine in Colorado.

855. **CROCOISITE**, PbCr .

Oblique prismatic, C $77^\circ 27'$. ∞P $93^\circ 42'$ (M), $-P$ $119^\circ 12'$ (e), ∞P^2 (f) $56^\circ 10'$, ∞P^∞ (g) (fig. 409). Cl. ∞P , distinct; sectile. $H = 2.5$ to 3 ; $G = 5.9$ to 6.1 . Translucent; adamantine. Hyacinth- or aurora-red; streak orange-yellow. C.c.: 31 chromic acid, and 69 lead protoxide. Berezoff, Mursinsk, and Nijni-Tagilek in the Ural, Congonhas do Campo in Brazil, Rezbanya, Moldavia, and Tarnowitz. Used as a pigment, but not permanent.

856. **PHENICO-CHROITE**, $2\text{PbCr} + \text{Pb}$.

Right prismatic; dimensions unknown. $H = 3$ to 3.5 ; $G = 5.75$. Translucent on the edges; resinous or adamantine. Cochineal- to hyacinth-red; streak brick-red. C.c.: 23 chromic acid, and 77 protoxide of lead. Berezoff.

857. **VAUQUELINITE**, $2(2\text{PbCr} + \text{Pb}) + (2\text{CuCr} + \text{Cu})$.

Oblique prismatic, C $67^\circ 15'$. Crystals OP , $-P$, $-P^\infty$ (or P , f , h), always twinned (fig. 410), the faces of OP forming an angle of $134^\circ 30'$; also botryoidal or reniform. $H = 2.5$ to 3 ; $G = 5.5$ to 5.8 . Semitranslucent or opaque; resinous. Blackish or dark olive-green; streak siskin-green. C.c.: 61 lead protoxide, 11 copper protoxide, 28 chromic acid. Leadhills, Berezoff, Congonhas do Campo (Brazil).



Fig. 409 (sp. 355).

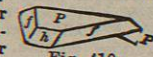


Fig. 410.

MOLYBDATES AND TUNGSTATES.

858. **WULFENITE**, PbMo .

Pyramidal. P $131^\circ 48'$. OP (a), $\frac{1}{2}P$ (b), P , ∞P (m), ∞P^2 (r) (figs. 411-414). Cl. P ; brittle; fracture uneven, or conchoidal. $H = 3$; $G = 6.3$ to 6.9 . Pellucid; resinous to adamantine. Orange-yellow, honey-yellow, and colourless. C.c.: protoxide of lead 61.5, molybdic acid 33.5; red varieties have some chromic acid. Lackentype in Kirkcudbright (fig. 412), Bleiberg, Rezbanya, Pennsylvania, Zaccatecas. $2\text{PbO} \cdot \text{MoO}_3 + \text{CaO} \cdot \text{MoO}_3$, with 6.88 of lime, occurs in Chili.

859. **EOSITE**.

Pyramidal. OP (c): $p' 117^\circ 10'$; $p' : p 125^\circ 40'$ (fig. 415). $H = 3$ to 4 . Colour deep aurora-red. Streak orange-yellow. A vanadio-molybdate of lead. Leadhills.

860. **MEGABASITE**, Mg_4W_5 .

Oblique prismatic; similar to wolframite. In fine needles. $H = 3.5$ to 4 ; $G = 6.45$ to 6.97 . Vitreous to adamantine. Yellowish brown to brownish red, translucent hyacinth-red; streak ochre-yellow. C.c.: protoxide of manganese 23.1, protoxide of iron 5.4, tungstic acid 71.5. Schlaggenwald, Sadsdorf, Morococha in Peru.

861. **SCHERERITE**, CaW .

Pyramidal; with many of the modifying planes hemihedral. P $113^\circ 32'$. Cl. $2P^\infty$ (n) $130^\circ 33'$, perfect; P and OP less so. Fracture conchoidal. $H = 4$ to 4.5 ; $G = 5.9$ to 6.2 . Translucent; resinous to adamantine. Colourless, and grey, yellow, or brown; streak white. C.c.: 19.4 lime, 80.6 tungstic acid. Caldbeckfell near

Fig. 413 (sp. 358).

Fig. 414 (sp. 358).

Fig. 415 (sp. 359).

Fig. 416 (sp. 361).

Fig. 417 (sp. 361).

Fig. 418.

Fig. 419 (sp. 366).

Fig. 420 (sp. 368).

Fig. 421 (sp. 368).

Fig. 422 (sp. 368).

Fig. 423 (sp. 368).

Fig. 424 (sp. 368).

Fig. 425 (sp. 368).

Fig. 426 (sp. 368).

Fig. 427 (sp. 368).

Fig. 428 (sp. 368).

Fig. 429 (sp. 368).

Fig. 430 (sp. 368).

Fig. 431 (sp. 368).

Fig. 432 (sp. 368).

Fig. 433 (sp. 368).

Fig. 434 (sp. 368).

Keswick, Pengelly in Cornwall, Zinnwald, Schlaggenwald, Salzburg, Chili, Siberia, Connecticut. Employed for the extraction of yellow tungstic acid, a fine pigment.

862. **STOLZITE**, PbW .

Pyramidal, generally hemihedral. P $131^\circ 25'$. Crystals sometimes spindle-shaped. Cl. P , imperfect. $H = 3$; $G = 7.9$ to 8.1 . Translucent; resinous. Grey, yellow, brown. C.c.: 48.4 protoxide of lead, 51.6 tungstic acid. Keswick, Zinnwald, Coquimbo (Brazil).

863. **REINITE**, FeW .

Pyramidal. P $103^\circ 32'$; basal angle $122^\circ 8'$. Cl. ∞P . $H = 4$; $G = 6.64$. C.c.: protoxide of iron 23.4, tungstic acid 75.45. Kimbosan in Japan.

864. **WOLFRAMITE**, $(\text{Fe}, \text{Mn})\text{W}$.

Oblique prismatic, C $89^\circ 22'$. ∞P (M) $100^\circ 37'$, $-P^\infty$ (P) $61^\circ 54'$, P^∞ (u) $98^\circ 6'$, ∞P^∞ (r), ∞P^2 (b), $-P$ (a), $\frac{1}{2}P^2$ (s). Twins common. Also laminar. Cl. clinodiagonal, perfect; fracture uneven. $H = 5$ to 5.5 ; $G = 7.1$ to 7.5 . Opaque; resinous, metallic, adamantine on the cleavage. Brownish black; streak black (varieties with most iron) to reddish brown (most manganese). C.c.: 76 tungstic acid, 9.5 to 20 protoxide of iron, and 4 to 15 protoxide of manganese, in some with 1.1 niobic acid. East Pool, Carnbrae, and mines near Redruth; Godolphin's Ball in Cumberland; Altenberg, Geyer, Ehrenfriedersdorf, Schlaggenwald, Zinnwald, the Harz; also Ural, Ceylon, and North America.

Ferberite, with 26 protoxide of iron and $2\text{FeW} + \text{Fe}$ ($H = 4$ to 4.5 ; $G = 6.7$ to 6.8), from Spain, may be different.

865. **HÜBNERITE**, MnW .

Right prismatic. ∞P (M). $M : M$ 105° . Cl. ∞P^∞ , perfect; usually foliated or columnar. $H = 4.5$; $G = 7.14$. Adamantine on cleavage; elsewhere greasy. Brown-red; streak yellow-brown. C.c.: protoxide of manganese 23.4, tungstic acid 76.6. Mammoth district in Nevada.

Fig. 416 (sp. 361).

Fig. 417 (sp. 361).

Fig. 418.

Fig. 419 (sp. 366).

Fig. 420 (sp. 368).

Fig. 421 (sp. 368).

Fig. 422 (sp. 368).

Fig. 423 (sp. 368).

Fig. 424 (sp. 368).