A

NEW SYSTEM

OF

MINERALOGY,

IN THE FORM OF

CATALOGUE,

AFTER THE MANNER OF

BARON BORN'S SYSTEMATIC CATALOGUE

OF THE COLLECTION OF FOSSILS OF

MLLE ÉLÉONORE DE RAAB.

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1799.

TO

SIR JOHN ST. AUBYN, BART.

SIR,

ALTHOUGH I am far from conſidering the following performance as worthy of a formal Dedication, I cannot help availing myſelf of the opportunity which it offers (the only public one I may ever have) of acknowledging the many civilities which you have condeſcended to ſhow me. Permit me, at the ſame time, to aſſure you, that, however imperfect the Work may be, my ſolicitude in executing it has not been the leſs, that the Collection to which it refers has paſſed into your poſſeſſion: that Collection it may tend to render more valuable, and thereby entitle me in ſome degree to a continuance of the confidential freedom with which you have hitherto allowed me to conſult it.

I am, SIR,

with moſt ſincere reſpect,

your obliged and grateful ſervant,

Baſinghall-ſtreet,
Oct. 1, 1799.

W. BABINGTON.

ADVERTISEMENT.

In committing the following Work to the preſs, the Author has been influenced by the ſame motives that induced him to publiſh his SYSTEMATIC ARRANGEMENT OF MINERALS in 1795; of which this may be conſidered a continuation, neceſſary to complete the deſign with which that arrangement was undertaken. He had been employed, as then mentioned, in forming from the extenſive and valuable collection of the late *Earl of Bute* a more compendious and ſelect cabinet, now in the poſſeſſion of *Sir John St. Aubyn, Bart.* and as this required not only a conſiderable length of time, but alſo a degree of attention much beyond what was at firſt conceived neceſſary for ſuch an undertaking, the author thought, that in making public the ſyſtem which he had adopted, he might conſiderably abridge the labour of thoſe who ſhould hereafter engage in a ſimilar taſk, and likewiſe render an acceptable ſervice to ſuch as wiſhed to acquire a comprehenſive knowledge of mineralogy, but who had neither leiſure nor inclination, even if they had an opportunity, to conſult the numerous works through which the neceſſary information lay ſcattered. Beſides, as no endeavours had been ſpared to render the collection from which that ſynopſis was drawn up, one of the moſt perfect in a ſcientific point of view, it was hoped that the annexed catalogue would afford to ſuch as had advanced a conſiderable way in the buſineſs of collecting, an opportunity of determining the comparative value of what they already poſſeſſed, as well as what articles might yet be wanting to render their cabinets more complete.

The Work itſelf will ſhew of what aſſiſtance the author has principally availed himſelf; that in the diſtribution of his ſyſtem into CLASSES, ORDERS, GENERA, and SPECIES, as founded on *chemical*, and the varieties on *external* characters, he has nearly adopted the arrangement of *Baron Born*, in his catalogue of the collection of *Mademoiſelle Eléonore de Raab*; that *R. de Liſle* has been his guide on the ſubject of cryſtalliſation; that moſt

moſt of the generic deſcriptions correſpond with thoſe of *Widenmann* and *Emmerling*, diſciples of the celebrated *Werner*; and that he is chiefly indebted to *Mr. Kirwan* for what reſpects the chemical properties and analyſes of the different ſpecies.

The concluſion of the advertiſement prefixed to the Author's former work may, he thinks, with ſtill greater propriety, be applied to this, namely, that however ſimple the performance may appear to ſome, yet ſuch as are better acquainted with the nature of the ſubject muſt know, that to execute it, even with tolerable correctneſs, requires much labour in collecting, and ſome judgment in arranging, the materials. He had then occaſion to acknowledge his obligations to his friend *Dr. Mitchell*, and now he feels it equally incumbent on him to return his grateful thanks for the aſſiſtance which he has ſince received from his friends *Mr. Richard Stocker*, of *Guy's Hoſpital*, and *Mr. Arthur Aikin*, of *Broad-ſtreet*,

CLASS

CLASS I. *SALTS.*

The bodies comprehended under this claſs are diſtinguiſhed by being ſapid to the taſte, readily ſoluble in water, incombuſtible, and incapable of being metallized. They poſſeſs a ſtrong diſpoſition to unite with other bodies, therefore ſeldom found uncombined. When in a concrete form, they are differently affected by expoſure to air, ſome becoming deliqueſcent, others efflioreſcent, whilſt ſome remain unaltered. By ſolution in water they produce a change of temperature. Moſt of them are capable of being more or leſs perfectly cryſtalliſed, in which ſtate, if expoſed to heat, they undergo true or watery fuſion, decrepitation or decompoſition, according to the degree and mode in which it is applied.

They may be divided into ſimple and compound.

ORDER I. *SIMPLE.*

GENUS I. *ACID.*

The acids are uſually diſtinguiſhed by their being of a ſour taſte and changing vegetable blues to red. They all unite readily with water. In combination with alkalis they form, for the moſt part, what are called neutral ſalts; with earths and metallic oxyds, earthy and metallic ſalts. Moſt of the acids are antiſeptic; ſome powerfully corroſive. From modern experiments, they appear to conſiſt of different inflammable ſubſtances united to the baſis of oxygen.

The mineral acids hitherto found in an uncombined ſtate are,

SPECIES I. *CARBONIC ACID.*

Aërial Acid. Fixed Air. Acide Carbonique, Fr. *Luftſäure*, Germ.

Found either in a gaſeous ſtate in caverns and other ſubterranean ſituations, or impregnating the water of certain ſprings.

Analyſis.—Carbon 17, Oxygen 83. *Chaptal.*

SPECIES II. *BORACIC ACID.*

Sedative Salt. Acide Boracique, Fr. *Seditivſalz*, Germ.

VARIETY I. *IN SOLUTION.*

Diſcovered free from combination with alkali, by *Mr. Heffer*, in the waters of certain lakes in Tuſcany.

SPECIES III. *SUPHURIC ACID.*

Acid of Vitriol. *Acide Sulphurique*, Fr. *Vitrioliäure*, Germ.

VARIETY I. *CONCRETE.*

Glacial Vitriolic Acid.

Found concrete and even cryſtalliſed in certain volcanic grottos of Tuſcany and Ætna.

Analyſis.—Sulphur 72, Oxygen 28. *Bertbollet.*

VARIETY II. *LIQUID.*

VARIETY III. *GASEOUS.*

Volatile Vitriolic Acid.

GENUS II. *ALKALI.*

The alkalis are diſtinguiſhed by being of a pungent, lixivial, or urinous taſte, and changing moſt vegetable blue colours to green, and many of the yellows to brown. They have, like moſt of the acids, a ſtrong attraction for moiſture, and when applied to the living body are very powerfully cauſtic. In conſequence of their great tendency to union with other bodies, they have not, as yet, been found uncombined.

ORDER II. *COMPOUND.*

GENUS I. *BASE, POTASH.*

In this and the two following genera the alkalis and acids, of which they are compoſed, are united in ſuch proportions as that, except in the caſe of carbonates, neither are found to predominate.

SPECIES I. *CARBONATE OF POTASH.*

Aërated Vegetable Alkali. *Carbonate de Potaſſe*, Fr. *Gewächs Laugenſalz*, Germ.

Analyſis.—Acid 23, Alkali 70, Water 5. *Bergman.*

VARIETY

VARIETY I. *IN SOLUTION.*

SPECIES II. *MURIATE OF POTASH.*

Digeſtive Salt of Sylvius. Muriate de Potaſſe, Fr.

Analyſis.—Acid 31, Alkali 61, Water 8. *Berg.*

VARIETY I. *IN SOLUTION.*

SPECIES III. *NITRATE OF POTASH.*

Nitre. Salt Petre. Nitrate de Potaſſe, Fr.

Analyſis.—Acid 33, Alkali 49, Water 18. *Berg.*

VARIETY I. *IN SOLUTION.*

SPECIES IV. *SULPHATE OF POTASH.*

Vitriolated Tartar. Sulfate de Potaſſe, Fr.

Analyſis.—Acid 40, Alkali 52, Water 8. *Berg.*

VARIETY I. *IN SOLUTION.*

GENUS II. *BASE, SODA.*

SPECIES I. *CARBONATE OF SODA.*

Natron. Carbonate de Soude, Fr. *Mineraliſches Laugenſalz*, Germ.

Analyſis.—Acid 16, Alkali 20, Water 64. *Berg.*

VARIETY I. *EFFLORESCENT.*

I. *a* 1. Native mineral alkali, concrete, of a dull white colour. *Teneriffe.*

Of this very large quantities have been imported into this country in the courſe of the laſt few years.

VARIETY II. *IN SOLUTION.*

SPECIES II. *BORATE OF SODA.*

Borax. Borate de Soude, Fr. *Tinkal*, Germ.

VARIETY I. *CRISTALLISED.*

Analyſis.—Acid 34, Alkali 17, Water 47. *Delametherie.*

II. *a* 1. In truncated hexhedral priſms of a browniſh colour. *Thibet.*

The refinement of rough borax, of which this is a variety is now ſucceſsfully carried on by ſeveral artiſts in this country, and probably depends in a great meaſure upon cryſtallization on the large ſcale. The quantity annually imported from the Eaſt Indies amounts to ſeveral tons. It loſes in refinement from $\frac{1}{4}$ to $\frac{1}{2}$ per cent.

VARIETY II. *IN SOLUTION.*

SPECIES III. *MURIATE OF SODA.*

Common Salt. Sea Salt. Muriate de Soude, Fr.

VARIETY I. *CRISTALLISED.*

Analyſis.—Acid 52, Alkali 42, Water 6. *Berg.*

III. *a* 1. In colourleſs cubes aggregated on cryſtalliſed gypſum. *Tyrol.*

IV. *a* 2. In tranſparent cubes and rectangular parallelopepids of a ſmaller ſize and irregularly aggregated. *Salzbourg.*

V. *a* 3. In large tranſparent cubic cryſtals with opake muriate of ſoda imbedded in indurated clay. *Tyrol.*

VI. *a* 4. Fragment of a large rectangular tranſparent cryſtal. *Salzbourg.*

VARIETY II. *AMORPHOUS.*

VII. *a* 1. In an irregular maſs compoſed of parallel fibres, of a yellowiſh white colour with blue veins. *Same Place.*

VIII. *a* 2. In detached pieces tranſparent and of a fibrous texture. *Wirtemberg.*

IX. *b* 1. In an amorphous maſs of a fleſh red colour and granular texture. *Salzbourg.*

X. *b.* 2. The ſame of a whitiſh red colour, in ſome parts fibrous. *Same place.*

XI. *b*

XI. *b* 3. The ſame of a ſtill paler colour. *Same place.*

XII. *b* 4. Of a milk white colour, irregularly tuberculated on the ſurface of impure muriate of ſoda. *Upper Auſtria.*

XIII. *b* 5. In an irregular maſs of a pale fleſh red colour and granular texture. *Northwich, Cheſhire.*

The produce of the mines from which this ſpecimen is taken is greater than that of any other we are acquainted with, exceeding even the celebrated mines of Wilizka. Vide *Watſon's Chemical Eſſays, Vol. II.*

SPECIES IV. *SULPHATE OF SODA.*

Glauber's Salt. Salphate de Soude, Fr.

Analyſis.—Acid 27, Alkali 15, Water 58. *Berg.*

VARIETY I. *IN SOLUTION.*

GENUS III. *BASE AMMONIAC.*

SPECIES I. *CARBONATE OF AMMONIAC.*

Aërated Volatile Alkali. Carbonate Ammoniacal, Fr.

Analyſis.—Acid 45, Alkali 43, Water 12. *Berg.*

VARIETY I. *IN SOLUTION.*

SPECIES II. *MURIATE OF AMMONIAC.*

Crude Sal Ammoniac. Muriate d'Ammoniaque, Fr. *Salmiac,* Germ.

VARIETY I. *CONCRETE.*

Analyſis.—Acid 52, Alkali 40, Water 8. *Delameth.*

I. *a* 1. Native Sal Ammoniac in detached pieces. *Veſuvius.*

SPECIES III. *NITRATE OF AMMONIAC.*

Nitrate d'Ammoniaque, Fr.

Analyſis.—Acid 46, Alkali 40, Water 14. *Delameth.*

VARIETY

VARIETY I. *Mixed with NITRATE OF POTASH.*

SPECIES IV. *SULPHATE OF AMMONIAC.*

Sulfate Ammoniacal, Fr.

VARIETY I. *CONCRETE.*

Analyſis.—Acid 42, Alkali 40, Water 18. *Dmlameth.*

CLASS II. *EARTHS.*

These are diſtinguiſhed by their brittleneſs, fixity, ſparing ſolubility in water, inſipidity, want of odour, incapacity of communicating a tinge to glaſs or of being metalliſed, and their ſpecific gravity not exceeding that of water more than in the proportion of 5 to 1. Some of the earths however poſſeſs theſe characters more perfectly than others, and hence the diſtinction into ſaline and inſipid. They are all naturally of a white colour; they are all alſo ſoluble in one or other of the acids, from their ſolutions in which they cannot be precipitated by pruſſiate of potaſh or of lime, as is the caſe with all metals, platina excepted.

The pure earths at preſent known are lime, ſtrontian, baryt, magneſia, alumine, ſilex, adamantine earth, jargon earth, of which the ſix firſt are the moſt common.

ORDER I. *HOMOGENEOUS.*

GENUS I. *LIME.*

The ſtate to which the properties of this earth more particularly refer, is that in which it is obtained from carbonate of lime for various purpoſes, by the continued application of a ſtrong heat. Its form is either concrete or powdery; colour, white; taſte, hot, pungent, cauſtic; ſpecific gravity 2.3. It is ſoluble in about 700 times its weight of water at a common temperature, and in this form, like the alkalis, changes vegetable blue colours to green. On expoſure to air, if in the concrete ſtate, it loſes gradually its attraction of coheſion, and in proceſs of time recovers its original hardneſs,

neſs, by the abſorption of carbonic acid gas from the atmoſphere. On being ſuddenly moiſtened, it falls more immediately into powder, becomes luminous in the dark, and, by the ſudden evolution of its caloric, produces a remarkable increaſe of temperature. Though by itſelf infuſible, it promotes very powerfully the fuſion of all the other earthy bodies, and is therefore ſucceſsfully employed as a flux on ſeveral very important occaſions. It melts with borax and microcoſmic ſalt without effervescence. It melts alſo with oxyd of lead. With the ſulphuric and carbonic acids, it forms compounds of little ſolubility in water, unleſs theſe acids be in exceſs; but with the nitric and muriatic, ſalts which are ſtrongly deliqueſcent. Though ſuppoſed in many inſtances to be of animal origin, yet in others it would ſeem impoſſible that it ſhould be derived from this ſource, as in the caſe of primitive marble and lime-ſtone, and more eſpecially granite.

SPECIES I. *PURE LIME.*

VARIETY I. *AMORPHOUS.*

I. *a* 1. Pure lime of a dull yellowiſh white colour and earthly texture. *Bath.*
* *b*. Looſe.

The uncombined calcareous earth contained in this ſtone was diſcovered by Dr. Falconer. We learn alſo from M. Monet that pure lime, of a yellowiſh colour, is found in great abundance in the mountains of Upper Auvergne.

SPECIES II. *CARBONATE OF LIME.*

Aërated or mild Lime. Carbonate calcaire, Chaux Aërée, Fr.

All the varieties of this ſpecies effervesce with the ſtronger acids, and burn into quick lime.

VARIETY I. *CRISTALLISED.*

Calcareous Spar. Spath calcaire, Fr. *Kalkſpath,* Germ.

Analyſis.—Acid 34, Lime 55, Water 11. *Berg.*

Beſides the great diverſity obſervable in the colour, tranſparency, and configuration of the individuals of this variety, they are alſo remarkable for being of a laminated texture and ſeparating into rhomboidal fragments, which, when tranſparent, have the property of giving a double refraction. When expoſed to heat, they become opake and decrepitate, if it be ſuddenly applied; but are infuſible without addition even in the focus of a burning glaſs. They are found principally in mountains compoſed of horizontal ſtrata, and have been conſidered as poſterior in their formation to primitive marble and lime-ſtone.

II. *a* 1. In ſmall compreſſed rhomboidal parallelopepids colourleſs and tranſparent, grouped on the ſurface of white cryſtalliſed quartz, with orange coloured pearl ſpar.
Romé de Liſle, Plate 4. *Figure* 1. *Schemnitz, Hungary.*

III. *a* 2. In larger tranſparent cryſtals of the ſame figure, with dodecahedral cryſtals of white tranſparent ſtaurolite, on laminated calcareous ſpar. *Strontian, Argyleſhire.*

IV. *a* 3. In very compreſſed rhomboidal parallelopepids, ſemitranſparent and of a whitiſh colour, ſet edgeways on laminated baroſelenite. *Andreaſberg, Hartz.*
R. de L. Pl. 4. *Fig.* 5.

V. *a* 4. The ſame, of a ſmoke grey colour, aggregated and without matrix. *Brittany.*

VI. *a* 5. The ſame, in more compreſſed cryſtals, aggregated ſo as to produce the ſemblance of cocks' combs. *Freyberg, Saxony.*

VII. *a* 6. The ſame, in ſmall cryſtals, white, ſemi-tranſparent, implanted one on the other, ſo as to form numerous columns on quartz intermixed with pyrites. *Schemnitz.*

VIII. *a* 7. The ſame, in very thin lenticular cryſtals, ſemitranſparent, and forming a groupe in which the cryſtals are ſet edgeways. *Joachimſthal, Bohemia.*

IX. *a* 8. In tranſparent compreſſed rhomboidal parallelopepids, having the ſolid angles, at the junction of their trihedral pyramids, truncated; with black blende and cubic fluor. *Durham.*
R. de L. Pl. 4. *Fig.* 6.

X. *a* 9. The ſame, in aggregated cryſtals, tranſlucid and of a whey colour, the ſolid angles more deeply truncated. *Cumberland.*
R. de L. Pl. 4. *Fig.* 6.

XI. *a* 10. The ſame, alſo tranſlucid and of a whey colour, ſtill more deeply truncated, on pyramidal quartz. *Same place.*
R. de L. Pl. 4. *Fig.* 7.

XII. *a.* 11. The ſame, forming numerous ſmall columns, which ſupport a large cryſtal of the ſame configuration (ſhewing the tranſition into the hexhedral priſm) terminated by trihedral pyramids with pentagonal faces. *Andreaſberg, Hartz.*
R. de L. Pl. 4. *Fig.* 7.

XIII. *a*

XIII. *b* 1. In lengthened rhomboidal parallelopepids, of a yellow colour, lining the internal ſurface of an hollow piece of petrified wood. *Norway.*
R. de L. Pl. 4. *Fig.* 45.

XIV. *b* 2. The ſame, lining the cavity of a foſſil bivalve. *Same place.*

XV. *b* 3. In aggregated cryſtals of the ſame figure, of a reddiſh white colour and tranſparent. *France.*

XVI. *b* 4. In cryſtals of a grey colour and of the ſame figure, but of different ſizes, with a partial ſparry coating; on white calcareous ſpar intermixed with baroſelenite. *Derbyſhire.*

XVII. *b* 5. In ſmall aggregated rhomboidal cryſtals, of a ſmoke grey colour, forming a tuberculated incruſtation on laminated white calcareous ſpar. *Cumberland.*

XVIII. *b* 6. In large aggregated cryſtals of a pale yellow colour, lengthened into acute trihedral pyramids, with numerous ſmaller ones projecting from their ſides. *Andreaſberg, Hartz.*

XIX. *b* 7. The ſame, in ſimilar ſmaller cryſtals, covering the ſurface of coarſe grained carbonate of lime. *Bath.*

XX. *b* 8. In very acute aggregated trihedral pyramids, having each face bevelled at its extremity. *Andreaſberg, Hartz.*
R. de L. Pl. 4. *Fig.* 50.

XXI. *b* 9. The ſame, in ſmaller and more obtuſe pyramids, with concave faces, forming a cryſtalliſed coating taken from the ſurface of blue clay. *Same place.*

XXII. *b* 10. The ſame, in ſmall white tranſparent cryſtals arranged in rows, in a cavity in white porous lime-ſtone. *Norway.*

XXIII. *c* 1. In ſhort hexhedral priſms, with trihedral pyramids, having rhombic faces, irregularly implanted on brown blende, partially incruſted by minute cryſtals of quartz. *Cumberland.*

XXIV. *d* 1. In hexhedral priſms of a water colour, terminated by trihedral pyramids with convex pentagonal faces, on blende and carbonate of lime. *Freyberg, Saxony.*
R. de L. Pl. 4. *Fig.* 9.

XXV. *d* 2. The ſame, in ſmoother and more tranſparent cryſtals on cryſtalliſed quartz. *Cumberland.*

XXVI *d* 3. The ſame, in larger cryſtals. *Same place.*
R. de L. Pl. 4. *Fig.* 9.

XXVII. *d* 4. The ſame, rather leſs tranſparent on quartz with yellow pyrites.
Andreaſberg, Hartz.

XXVIII. *d* 5. In ſmaller cryſtals of the ſame figure ſomewhat decompoſed, and having a bruſh-like appearance at their extremities on ſemitranſparent pyramidal quartz. *Same place.*

XXIX. *d* 6. In hexhedral priſms with a ſmoky grey tinge on the ſurface, having the faces of the pyramids perfectly flat, on calcareous ſpar intermixed with native biſmuth and yellow ſulphate of baryt. *Freyberg, Saxony.*

XXX. *d* 7. In ſhort hexhedral cryſtals of a milky colour, aggregated into irregular columns, on white quartz intermixed with miſpickel. *Andreaſberg, Hartz.*

XXXI. *d* 8. The ſame, in which the cryſtals have formed on hexhedral pyramidal cryſtals of calcareous ſpar; the apices of which protrude through the pyramids of the ſecondary cryſtals. *Freyberg, Saxony.*

XXXII. *d* 9. In tranſparent water coloured hexhedral priſms, with unequal ſides, and terminated by trihedral ſummits, on white quartz. *Cumberland.*
R. de L. Pl. 4. *Fig.* 10.

XXXIII. *d* 10. In tranſparent priſmatic cryſtals of the ſame figure, ſome extremely delicate, and needle-like, decuſſating each other in various directions, on grey calcareous ſpar intermixed with white quartz. *Andreaſberg, Hartz.*

XXXIV. *d* 11. In tranſparent hexhedral cryſtals ſomewhat opake at their extremities, irregularly aggregated on calcareous ſpar and galena. *Same place.*

XXXV. *e* 1. In hexhedral priſms, with trihedral pyramids, having the ſolid angle of the pyramid more or leſs deeply truncated.
R. de L. Pl. 4. *Fig.* 15, 16, 17.

XXXVI. *f* 1. In hexhedral priſms, truncated at both extremities and of a reddiſh brown colour, with red ferruginous calcareous earth, in white ſtriated gypſum.
R. de L. Pl. 4. *Fig.* 18. Between *Arragon* and *Valencia, Spain.*

XXXVII.

XXXVII. *f* 2. In hexhedral truncated prisms, perfectly transparent, but of a pearl colour at the summits, with larger rhomboidal crystals, implanted on the surface of an irregular crystallisation of transparent calcareous spar. *Andreasberg, Hartz.*

XXXVIII. *f* 3. The same, in hexhedral columns, composed of subordinate crystals, the columns variously inclined. *Same place.*

XXXIX. *f* 4. The same, in long transparent hexhedral prisms, on the truncated extremities of which lie thin hexhedral plates. *Same place.*

XL. *f.* 5. In short hexhedral transparent prisms, the sides alternately broad and narrow, of a milk white colour at their extremities, irregularly aggregated into a group. *R. de L. Pl.* 4. *Fig.* 19. *Same place.*

XLI. *f* 6. The same, also in short transparent prisms, and of an opake pearl colour at both extremities, lying on grey calcareous spar. *Same place.*
R. de L. Pl. 4. *Fig.* 21.

XLII. *f* 7. In larger crystals nearly of the same figure, but the pearly opacity of both extremities extending almost to the centre. *Same place.*
R. de L. Pl. 4. *Fig.* 21.

XLIII. *f.* 8. The same, in small grey crystals, aggregated into irregular columns. *Same place.*

XLIV. *f* 9. In numerous short hexhedral truncated prisms, on grey lime-stone. *Same place.*

XLV. *f* 10. The same, lying edgeways, on a calcareous incrustation. *Cumberland.*

XLVI. *f* 11. In white semitransparent hexhedral prisms, truncated at their summits; some with six sides, alternately broad and narrow; some with five, unequal; some with four, the opposite sides equal; on calcareous spar intermixed with blende. *Hartz.*

XLVII. *f* 12. In thin truncated hexhedral prisms, of a mother of pearl lustre, piled irregularly on one another, on greyish calcareous spar. *Same place.*
R. de L. Pl. 4. *Fig.* 23.

XLVIII. *f* 13. In large flat triangular plates, ſemitranſparent, and of a white colour, formed by the enlargement of three alternate ſides of the hexhedral priſm at the expence of the intermediate ones, attached to each irregularly. *Same place.*

XLIX. *f* 14. In rhomboidal cryſtals ſeemingly compounded of laminæ ſimilar to the laſt, applied to each other baſe to baſe and irregularly decreaſing, with numerous minute cryſtals of white zeolite, on greyiſh calcareous ſpar. *Same place.*

L. *g* 1. In acute hexhedral pyramids, joined alternately baſe to baſe, of a brown colour, forming a cluſter on an incruſtation of quartz. *Aſhbover, Derbyſhire.*
R. de L. Pl. 4. *Fig.* 28.

LI. *g* 2. The ſame, in larger tranſparent cryſtals, of a yellow colour, with brown blende. *Derbyſhire.*

LII. *g* 3. The ſame, in large yelloviſh opake cryſtals internally corroded. *Same place.*

LIII. *g* 4. The ſame, in ſmall tranſparent cryſtals aggregated into a group, and intermixed with arboreſcent galena. *Leiceſterſhire.*

LIV. *g* 5. The ſame, in larger compounded cryſtals, incloſing numerous ſpecks of yellow pyrites on a greyiſh lime-ſtone. *Derbyſhire.*

LV. *g* 6. The ſame, in cryſtals more acuminated and without pyrites, aggregated laterally into an irregular group. *Hartz.*

LVI. *g* 7. The ſame, in ſmall tranſparent cryſtals of a topaz colour, covering the ſurface of white calcareous ſpar. *Derbyſhire.*

LVII. *g* 8. In ſemitranſparent double pyramidal cryſtals of a white colour, on a whitiſh granular lime-ſtone. *Hartz.*

LVIII. *g* 9. The ſame, in larger cryſtals of a water colour, ſcabrous on the ſurface. *Same place.*

LIX. *g* 10. In a large tranſparent cryſtal having the apex of the pyramid bevelled ſo as to form a trihedral pyramid with rhombic faces, incloſing cryſtals of priſmatic quartz coloured green by chlorite. *Dauphiné.*
R. de L. Pl. 4. *Fig.* 27.

LX.

LX. *g* 11. In cryſtals of a topaz colour, and of the ſame figure, on calcareous ſpar and galena. *Derbyſhire.*

LXI. *g* 12. In lengthened tranſparent hexhedral priſms, terminated by hexhedral pyramids, implanted on a group of pyramidal quartz. *Cumberland.*

LXII. *g* 13. The ſame, in detached cryſtals. *Same place.*

LXIII. *g* 14. The ſame, in larger aggregated cryſtals, on ſemitranſparent cryſtalliſed quartz.
R. de L. Pl. 4. *Fig.* 30.

LXIV. *g* 15. The ſame, in ſmaller cryſtals, many of which are of a reddiſh tinge, on carbonate of lime with galena. *Same place.*

LXV. *g* 16. In tranſparent hexhedral cryſtals, terminated by hexhedral pyramids bevelled at their ſummits, on greyiſh calcareous ſpar. *Same place.*
R. de L. Pl. 4. *Fig.* 36.

LXVI. *g* 17. In large tranſparent hexhedral cryſtals more deeply truncated at their ſummits, with brown blende. *Same place.*

LXVII. *g* 18. In faſciculated tranſparent cryſtals, with yellowiſh brown pearl ſpar. *Fribourg* in *Briſgau.*

LXVIII. *g* 19. The ſame, of a white colour, more minutely cryſtalliſed, with irrideſcent yellow copper ore. *Hartz.*

LXIX. *g* 20. The ſame, of a dark ſmoke grey colour. *France.*

LXX. *g* 21. In larger faſciculated cryſtals, alſo of a ſmoke grey colour, on a mixture of kupfernickel and grey cobalt ore. *Freyberg, Saxony.*

LXXI. *g* 22. Minutely cryſtalliſed and of a dull white colour, on cubic galena. *Same place.*

LXXII. *g* 23. In ſemitranſparent diverging faſciculi, on grey argillite. *Heſſe.*

LXXIII. *g* 24. The ſame cryſtalliſed more confuſedly. *Same place.*

LXXIV.

LXXXVII. *i* 13. Forming white opake tuberculi on cryſtalliſed quartz with yellow pearl ſpar. *Same place.*

LXXXVIII. *i* 14. In a confuſed cryſtalline maſs, compoſed of ſemitranſparent columns aggregated laterally. *France.*

LXXXIX. *i* 15. In a tranſparent rhomboidal fragment. (*Duplicating Spar.*) *Iceland.*

XC. *i* 16. The ſame, of a milky colour at one extremity, with a ſmall portion of galena. *Andreaſberg, Hartz.*

XCI. *i* 17. The ſame, of a pale amethiſtine colour. *Same place.*

XCII. *i* 18. The ſame, of a yellowiſh tinge. *Derbyſhire.*

XCIII. *i* 19. Leſs tranſparent and of a whitiſh colour. *Same place.*

VARIETY II. *OF PARTICULAR SHAPES.*

Stalactites, Stalagmites, Flos Ferri, Piſolithus, Roeſtone, &c.

In the formation of theſe ſubſtances is ſtrikingly illuſtrated, not only the influence of the attraction of coheſion, in producing ſingularity of arrangement, but alſo of the difference of the menſtrual power of water at different temperatures, and the alteration induced in the properties of bodies by a variation in the proportion of their elements.

XCIV. *a* 1. Conical calcareous ſtalactites, hollow, detached, and of a dull white colour. *Derbyſhire.*

XCV. *a* 2. The ſame, of a ſnow white colour, aggregated and obſcurely cryſtalliſed on the ſurface. *Eiſenärzt, Stiria.*

XCVI. *a* 3. Mamillary, and of a browniſh yellow colour. *France.*

XCVII. *a* 4. The ſame, of a ſnow white colour and ſemitranſparent, on brown ſpathoſe iron ore. *Stiria.*

XCVIII. *b* & *c*. Calcareous ſtalactite, cylindrical and tubular. *Iſle of Sky.*

XCIX.

XCIX. *d* 1. Ramoſe, opake, and of a white colour, on a white calcareous incruſtation. *Lorraine.*

C. *e* 1. Coralli form (*Flos Ferri*), of a ſnow white colour, and having on the ſurface a delicate velvety appearance. *Stiria.*

CI. *e* 2. In ſmaller vermicular branches, ſmooth on the ſurface. *Same place.*

CII. *e* 3. Irregularly ſpherical, tinged green by oxyd of copper. *Same place.*

CIII. *f* 1. In a maſs compoſed of pea-like ſpherules, (*Piſolithus*) of a dull aſh colour. *Wolfenbuttel.*

CIV. *f* 2. The ſame, in a coarſer cement. *Derbyſhire.*

CV. *f.* 3. The ſame, of a yellowiſh white colour, the ſpherules compoſed of concentric layers. *Carlſbad, Bohemia.*

CVI. *f* 4. Of a brown colour, and compoſed of ſmaller ſpherules, producing the appearance of the roe of a fiſh. (*Hammites.*) *Goſlar, Iceland.*

CVII. *f* 5. The ſame, of a dull white colour and finer grain. *Ketton, Northamptonſhire.*

CVIII. *f* 6. The ſame, of a ſtill finer grain. *Bath.*

CIX. *g* 1. Semitranſparent calcareous incruſtation, compoſed of different coloured layers, white, brown, and yellow. *Derbyſhire.*

CX. *g* 2. Compoſed of opake layers. *Carlſbad, Bohemia.*

CXI. *g* 3. Calcareous incruſtation of a pale browniſh colour, appearing to have been formed on moſs. *Derbyſhire.*

CXII. *g* 4. The ſame, opake, porous, of a dull yellowiſh white colour, with numerous impreſſions of leaves. *Italy.*

CXIII. *g* 5. Of a reddiſh brown colour, covering a branch of thiſtle. *Carlſbad.*

CXIV. *g* 6. The ſame, incruſting the oak apple. *Same place.*

VARIETY III. *AMORPHOUS.*

Marble, Lime-Stone, Chalk, &c.

The properties of lime-ſtone in many inſtances ſo exactly correſpond with thoſe of marble, that it is often difficult, if not impoſſible, to diſtinguiſh them. The latter may however in general be conſidered, harder as well as more compact and ponderous than the former. It appears alſo, by chemical analyſis, to contain a larger proportion of alumine and iron, and is therefore ſo far leſs fitted for the preparation of lime. They are both found in ſtrata, more or leſs extenſive, conſtituting a large part of the ſurface of the globe, and have frequently the remains of organized bodies imbedded in them, more eſpecially thoſe which are of a granular texture.—Like the foregoing ſubſtances, they part with their carbonic acid upon the addition of the ſtronger acids, and by calcination loſe nearly one half their weight.

CXV. *a* 1. Brown marble, compoſed of irideſcent ſhells (*Fire Marble*).
Bleyberg, Carinthia.

This marble is found in a ſtratum of lime-ſtone, and being very friable when firſt taken from the mine, can ſeldom be procured in large pieces. It owes its ſplendour to portions of the ſhell of a particular ſpecies of *Nautilus*.

CXVI. *b* 1. White coarſe grained marble, ſo hard as to ſtrike fire with ſteel. *Lapland.*

From the hardneſs of this marble, it would ſeem to be analogous to the ſilicious lime-ſtone of *Kirwan, Vol. I. P.* 373.

CXVII. *b* 2. Marble, of a grey colour and finer grain. *Derbyſhire.*

CXVIII. *b* 3. The ſame, of a ſnow white colour. *Carrara, Italy.*

In this is contained a ſlight proportion of quartz and alumine. It loſes only $\frac{1}{2000}$ of its weight at 700° of *Farenheit*. Its ſpecific gravity is 2.716.

c. Fibrous.

d. Arenaceous.——Analyſis.—Acid 47, Lime 53. *Kirwan.*

e. Slaty.

CXIX. *f* 1. Compact marble of a black colour. *Derbyſhire.*

Marble of this colour frequently contains iron, and ſometimes only bitumen, as proved by its becoming white on calcination.

CXX. *f* 2. The ſame, of a grey colour and ochry on the ſurface.
St. Vincent's Rock, Briſtol.

CXXI. *f.* 3. The ſame, of a dull white colour. *Port Ruſh, Ireland.*

This is a ſpecimen of the white lime-ſtone mentioned by *Dr. Hamilton* as ſupporting the baſaltic columns on the northern coaſt of that country. It abounds with foſſil remains and nodules of dark flint.

CXXII. *f* 4. The ſame, of a grey colour, containing the foſſil remains of *Entrochi*. *Derbyſhire.*

*CXXII. *f* 5. Of a yellow colour with black arboriſations on the ſurface. *Tuſcany.*

The dendritic appearance on the ſurface of this marble is attributed to manganeſe.

CXXIII. *g* 1. Common chalk. *Kent.*

Analyſis.—Acid 42, Lime 53, Alumine 2, Water 3. *Kirw.*

It loſes 3 *per cent.* at 500 of *Faren.*

b. Looſe.

SPECIES III. *SWINE STONE.*

Pierre puante, Fr. *Stink-Stein*, Germ.

Analyſis—Carbonate of Lime impregnated by Bitumen.

Though the characteriſtic property of the varieties of this ſpecies, namely their producing an offenſive ſmell when ſcraped or pounded, has been generally attributed to the preſence of petroleum, yet, from the diverſity of their odour, and from ſome which have been examined not yielding any bituminous matter upon diſtillation, it would ſeem probable that it may alſo ariſe from other cauſes. This property they loſe on being heated, and differ in no other reſpect materially from marble and lime-ſtone.

VARIETY I. *AMORPHOUS.*

CXXIV. *a* 1. Of a black colour and foliated texture. *Sweden.*

CXXV. *a* 2. The ſame, productive of a different kind of fœtor. *Same place.*

CXXVI. *a* 3. Of a light grey colour and ſcaly texture, extremely offenſive. *Portugal.*

CXXVII. *b* 1. Of a dark brown colour and granular texture. *Namur.*

c. Compact.

SPECIES IV. *SIDERO-CALCITE.*

Pearl Spar. Spath perlé, Fr. *Braunſpath*, Germ.

Analyſis.—Carbonate of Lime 60, Oxyd of Manganeſe 35, Iron 5. *Woulfe.*

The colours of this ſpar are various, brown, yellow, grey, white, &c. its ſurface for the moſt part ſplendid, its texture laminated, and the figure of its cryſtals rhomboidal, ſpecific gravity from 2.39 to 2.83. It effervesces with the ſtronger acids, becomes darker coloured by long expoſure to air, and when heated decrepitates and becomes red, brown or black, according to the proportion of manganeſe or iron. The quantity of the latter is often ſuch as to render it magnetical. It has been frequently confounded with certain varieties of calcareous ſpar, with ſiliceous manganeſe, and more eſpecially with ſpathoſe iron ore, to which it ſeems in many reſpects very nearly allied.

VARIETY I. *CRYSTALLISED.*

CXXVIII. *a* 1. In compreſſed rhomboidal parallelopepids of a white colour, on purpliſh fluor incruſted with brown pearl ſpar. *Cumberland.*

R. de L. Pl. 4. *Fig.* 1.

CXXIX. *a* 2. The ſame, with dodecahedral calcareous ſpar and cubic fluor. *Brittany.*

CXXX. *a* 3. The ſame, of a dark brown colour, with ſmall tubercles of opake calcareous ſpar, on white cryſtalliſed quartz. *Schemnitz, Hungary.*

CXXXI. *a* 4. The ſame, of a white colour, incruſted with minutely cryſtalliſed yellow pyrites, on brown ſpathoſe iron ore. *Hartz.*

CXXXII. *a* 5. Forming a minutely cryſtalliſed incruſtation of a white colour and pearly luſtre, on tranſparent priſmatic quartz. *Cremnitz, Hungary.*

CXXXIII. *a* 6. The ſame, inclining to a cream colour, on white pyramidal quartz. *Same place.*

CXXXIV. *a* 7. The ſame, more minutely cryſtalliſed, of a ſpongy texture internally. *Schemnitz.*

CXXXV. *a* 8. Forming a thin cellular incruſtation of a milk white colour, minutely cryſtalliſed on the ſurface, and partially covered by lenticular calcareous ſpar. *Same place.*

CXXXVI. *a* 9. Minutely cryſtalliſed, of a cream colour and aggregated into tubercles, on brown cellular pearl ſpar. *Northumberland.*

CXXXVII. *a* 10. Forming a partial incruſtation of a reddiſh white colour, with ſpecks of yellow pyrites, on red cryſtalliſed quartz. *Schemnitz, Hungary.*

XXXVIII. *a* 11. Of an ochry yellow colour and metallic luſtre, incruſting white calcareous ſpar. *Crennitz.*

CXXXIX. *a* 12. Forming a thin tubercular incruſtation of a bronze colour, cellular underneath. *Hungary.*

CXL. *a* 13. The ſame, leſs ſplendid, taken from the ſurface of pyramidal calcareous ſpar. *Same place.*

CXLI. *a* 14. In aggregated rhomboidal cryſtals of a brown colour and metallic luſtre, on cryſtalliſed quartz, with indurated clay underneath. *Same place.*

CXLII. *a* 15. Of a yellowiſh brown colour, forming a partial incruſtation on tranſparent priſmatic quartz. *Schemnitz.*

CXLIII. *a* 16. The ſame with mammillary calcareous ſpar, on quartz with brown blende. *Same place.*

CLXIV. *a* 17. In aggregated lenticular cryſtals of a light brown colour, with yellow pyrites and quartz. *Hartz.*

CXLV. *a* 18. Of a light yellowiſh brown colour, in very minute cryſtals, on cryſtalliſed quartz, with priſmatic cryſtals of tranſparent gypſum lying on the ſurface. *Schemnitz.*

CXLVI. *a* 19. In ſmall tubercles, more inclining to yellow, alſo on cryſtalliſed quartz. *Hungary.*

CXLVII. *a* 20. Of a ſparkling appearance, and more inclining to brown, on tranſparent cryſtalliſed quartz. *Same place.*

CLXVIII. *a* 21. The ſame, of a dark brown colour, on cryſtalliſed quartz, with mammellated calcareous ſpar. *Same place.*

CXLIX. *a* 22. The ſame, alſo of a dark brown colour, on cubic fluor. *Cumberland.*

CL. *a* 23. Of a pinchbeck colour, incruſting trihedral pyramids of calcareous ſpar, on white cryſtalliſed quartz. *Hungary.*

CLI. *a* 24. Of a dark brown colour, forming a minutely cryſtalliſed incruſtation on white priſmatic quartz. *Hungary.*

CLII. *a* 25. Internally of a white colour, externally confuſedly cryſtalliſed and of a ſhining brown colour, on ſcaly grey limeſtone. *Cumberland.*

CLIII.

CLIII. *a* 26. In an irregular cellular maſs, of a light liver brown colour. *Hungary.*

CLIV. *a* 27. The ſame, forming an irregular cavernous incruſtation on cryſtalliſed amethiſtine quartz. *Same place.*

VARIETY II. *AMORPHOUS.*

a. Foliated.

SPECIES V. *BARYTO-CALCITE.*

The account given by *Sir T. Bergman* of this ſtone is, that it is of a dark or light grey colour, and of little tranſparency; its form either ſpherical, cuneiform, or cryſtalliſed in quadrangular priſms; of a ſtriated texture; that it effervesces with acids, and contains 92 *per cent.* Carbonate of Lime, and 8 Carbonate of Baryt.

VARIETY I. *CRYSTALLISED.*

a. In tetrahedral priſms.

VARIETY II. *AMORPHOUS.*

a. Striated.

SPECIES VI. *MURI-CALCITE.*

This occurs either in ſolitary cryſtals imbedded in talc, ſteatite, or chlorite; or in an earthy form and of an olive colour; or indurated and amorphous. The colour of the cryſtals is white, greyiſh white, pearl-coloured, red or brown. They are ſemitranſparent, rough and ſhining on the ſurface, of a laminated texture, and brittle; the figure of their fragments rhomboidal. They poſſeſs a greater degree of hardneſs than calcareous ſpar, and do not effervesce with acids unleſs previouſly reduced to powder. Specific gravity 2.480. In a red heat they loſe nearly one half of their weight.

VARIETY I. *CRYSTALLISED.*

Compound Spar. Chaux Magneſiée, Fr. *Bitter Spath*, Germ.

Analyſis.—Carbonate of Lime 52, Carbonate of Magneſia 45, Iron and Manganeſe 3. *Klaproth.*

CLV. *a* 1. In perfect rhomboids of an obſcure yellow colour and rough ſurface, imbedded in pale mountain green chlorite. *Zillarthal, Tyrol.*

VARIETY

VARIETY II. *AMORPHOUS.*

a. Indurated.

b. Looſe.

SPECIES VII. *ARGENTINE.*

Schiefer Spath, Germ.

The colour of this ſpar is greyiſh, reddiſh, greeniſh or pure white, with ſomewhat of a ſilvery luſtre. It poſſeſſes a ſlight degree of tranſparency, is of a foliated texture, rather unctuous to the feel, moderately hard and very brittle. Specific gravity 2.647. It effervesces ſtrongly with acids, and when heated to redneſs, becomes of a reddiſh brown colour. *Mr. Kirwan* ſuppoſes it to contain magneſia, with a ſmall portion of alumine, and oxyd of iron.

VARIETY I. *AMORPHOUS.*

CLVI. *a* 1. In broad foliated milk white laminæ, with grey quartz, brown blende, and cryſtalliſed yellow pyrites. *Kongſberg, Norway.*

SPECIES VIII. *DOLOMITE.*

Elaſtic Marble. Dolomie (*Sauſſure*).

A particular kind of lime-ſtone, ſuperſaturated with carbonic acid, firſt analyſed by *Mr. Dolomieu*. Its colour pure, greyiſh, or yellowiſh white, or light red, with but little luſtre or tranſparency. Its fracture concoboidal or granularly foliated. Of moderate hardneſs. Its ſpecific gravity from 2.85 to 2.86. It effervesces ſlowly with acids, and under calcination loſes nearly one half its weight.

Analyſis.—Lime 44.29, Carbonic Acid 46.1, Alumine 5.86, Magneſia 1.4, Iron 0.074. *Sauſſure Jr.*

VARIETY I. *AMORPHOUS.*

a. Granular.

*CLVI. *b* 1. In ſlabs of a compact texture and fleſh red colour. *Malaga, Spain.*

SPECIES IX. *FLUATE OF LIME.*

Fluor Spath fuſible, Fr. *Fluſs*, Germ.

Fluor is generally found of different colours, either cryſtalliſed in cubes more or leſs regular, or in amorphous maſſes. It poſſeſſes, for the moſt part, more or leſs tranſparency,

rency; is of a compact ſparry texture, very brittle, and of conſiderable hardneſs, but not ſo great as to ſtrike fire with ſteel. The cloſeneſs of its texture renders it ſuſceptible of a fine poliſh. Its ſpecific gravity varies from 3.09 to 3.19. It undergoes no change upon expoſure to air, and is nearly inſoluble in water. When pulverized and expoſed to a moderate heat, it becomes phoſphoreſcent; but loſes this property if it be ignited; and if in the cryſtalline form it be ſuddenly expoſed to heat, it decrepitates without calcination. It appears to have received its name from the property which it poſſeſſes of promoting the fuſibility of clay and other earthy ſubſtances, though by no means very fuſible of itſelf. *Mr. Scheele* firſt ſhewed it to contain, in union with lime, an acid of a particular kind, which may be ſeparated from it by diſtillation with any of the ſtronger acids, more eſpecially the ſulphuric.

VARIETY I. *CRYSTALLISED.*

Analyſis.—Acid 16, Lime 57, Water 27. *Scheele.*

CLVII. *a.* 1. In cubic cryſtals of a ſea-green colour, covered on the ſurface by a thin olive coloured coating, on grey opake quartz. *Cumberland.*
R. de L. Pl. 2. *Fig.* 1 & 2.

CLVIII. *a* 2. In tranſparent cubic cryſtals of a ſea-green colour, in black indurated ſchiſtus, with brown ſpathoſe iron ore underneath. *Same place.*

CLIX. *a* 3. The ſame, partially covered by cryſtalliſed white quartz, and brown ſpathoſe iron ore. *Same place.*

CLX. *a* 4. In ſemitranſparent cubic cryſtals of a light purpliſh colour, on an aggregated cryſtalliſation of quartz, with laminated ponderous ſpar. *Lorraine.*

CLXI. *a* 5. The ſame, of a light yellow colour, with white opake ſulphate of baryt, and white ſemitranſparent arboreſcent calcareous ſpar. *Annaberg, Saxony.*

CLXII. *a* 6. Of a pale green colour, covered by pyramidal quartz. *Saxony.*

CLXIII. *a* 7. Of a water colour, with minute cryſtals of fluor underneath. *Derbyſhire.*

CLXIV. *a* 8. The ſame, ſprinkled on the ſurface with ſmall grains of yellow copper ore. *Same place.*

CLXV. *a* 9. In ſemitranſparent rectangular parallelopepids of a muddy water colour, corroded in different parts. *Saxony.*

CLXVI.

CLXVI. *a* 10. In ſemitranſparent cubic cryſtals, of a light topaz yellow colour, with cryſtalliſed quartz, and white opake ſulphate of baryt, ſprinkled over with pyrites. *Annaberg, Saxony.*

CLXVII. *a* 11. The ſame, incruſted on the ſurface by minutely cryſtalliſed quartz. *Same place.*

CLXVIII. *a* 12. The ſame, of a deeper colour, with white calcareous ſpar and yellow pyrites on the ſurface. *Same place.*

CLXIX. *a* 13. In ſmaller cryſtals of a yellow colour, with an admixture of purple, on a browniſh micaceous ſchiſtus. *Brittany.*

CLXX. *a* 14. Of a pale purple colour, with white pyramidal quartz, and truncated cubic galena. *Cumberland.*

CLXXI. *a* 15. In very diſtinct cubic cryſtals, of a bluiſh purple colour, on opake ferruginous quartz. *Durham.*

CLXXII. *a* 16. In ſmaller cryſtals of the ſame colour, with cryſtalliſed quartz, on amorphous green fluor. *Same place.*

CLXXIII. *a* 17. In large cryſtals of a darker purple colour, detached from their matrix. *Same place.*

CLXXIV. *a* 18. In numerous ſmall aggregated cryſtals, of a pale purple colour, on grey argillite. *Saint Marie Aux Mines.*

CLXXV. *a* 19. The ſame, of a deeper purple, on compact miſpickel intermixed with grey quartz. *Brunſdorf, Saxony.*

CLXXVI. *a* 20. In aggregated cubes, of a bluiſh purple colour, incruſted with yellow pyrites, and having black blende and miſpickel underneath. *Derbyſhire.*

CLXXVII. *a* 21. In larger cryſtals, of a purple colour, with an admixture of dull white, the purple part being ſemitranſparent, the white opake, with brown blende. *Durham.*

CLXXVIII. *a* 22. In cubic cryſtals of a topaz yellow colour, with galena, on a browniſh argillite. *Annaberg, Saxony.*

CLXXIX. *a* 23. In larger cubes, ſemitranſparent, and of a water colour inclining to yellow, bevilled at all their edges, and partially incruſted with yellow pyrites. *Derbyſhire.*

CLXXX.

CLXXX. *a* 24. In ſemitranſparent purple cryſtals, ſeveral of which are truncated at their ſolid angles, on amorphous yellow fluor. *Ehrenfriederſdorf, Saxony.*
R. de L. Pl. 2. *Fig.* 5.

CLXXXI. *a* 25. A fragment of a large cubic cryſtal of a verdegris green colour, truncated at the ſolid angles and internally corroded. *Saint Marie aux Mines, Alſace.*

CLXXXII. *a* 26. The ſame, without truncation, of a purple colour, with a partial coating of cryſtalliſed quartz and calcareous ſpar. *Northumberland.*

CLXXXIII. *a* 27. The ſame, of a graſs green colour with indurated clay. *Saxony.*

CLXXXIV. *a* 28. In cubes of a ſea-green colour, with an admixture of purple, having on each face of the cube an obtuſe tetrahedral pyramid from whence reſults a figure of 24 trihedral faces, on amorphous green fluor, with cryſtalliſed iron pyrites.
Catal. de Raab. Tab. 1. *Fig.* 1. *Cornwall.*

CLXXXV. *a* 29. In ſmaller cryſtals, of the ſame configuration, on opake grey quartz. *Cumberland.*

CLXXXVI. *b* 1. In detached aluminiform octohedrons, of a ſea-green colour.
R. de L. Pl. 3. *Fig.* 9. *Cornwall.*

c. In tetrahedral priſms terminated by tetrahedral pyramids.

VARIETY II. *AMORPHOUS.*

CLXXXVII. *a* 1. Fluor, of a foliated texture, ſemitranſparent and of a deep purple colour. *Derbyſhire.*

CLXXXVIII. *a* 2. The ſame, of a ſea-green colour inclining to blue, intermixed with white quartz. *Saxony.*

CLXXXIX. *a* 3. Of a graſs-green colour, intermixed with purple fluor. *Bavaria.*

CXC. *a* 4. Of a topaz yellow colour, on blue fluor with galena, the ſurface artificially poliſhed. *Derbyſhire.*

b. Granular.

CXCI. *c* 1. In a ſmall detached compact piece, tranſlucid, and of a roſe red colour. *Savoy.*

d. Earthy.

d. Earthy.

Analyſis.—Acid 28.5, Lime 21, Water 1, Silex 31, Alumine 15.5, Iron 1, Muriatic Acid 1, Phoſphoric Acid 1. *Pelletier.*

SPECIES X. *PHOSPHATE OF LIME.*

Appetite, Wern. Phoſpholite, Kirw.

This mineral, which was thought to exiſt only in a cryſtalliſed form, has lately been diſcovered in irregular maſſes of a laminated texture at *Schleggenwald* in *Bohemia*, and in an earthy form, both in *Hungary* and *Spain*; in the latter country, in ſtrata ſo extenſive as to form entire mountains. When cryſtalliſed its colour is various, white, brown, green, red, blue, &c. the form of its cryſtals truncated hexhedral priſms, laminated in their tranſverſe fracture; their ſurface ſhining and longitudinally ſtriated; inferior in hardneſs to fluor; ſemitranſparent; brittle; ſpecific gravity from 3.098 to 3.218; found generally with tin and fluor.

It diſſolves with ſcarcely any effervеſcence both in the nitric and muriatic acids. By the ſulphuric it is alſo decompoſed, but not ſo readily on account of the inſolubility of the compound produced by the union of this acid with the lime. It phoſphoreſces in a moderate heat; does not decrepitate when in powder, and is ſcarcely fuſible by the blow-pipe, even with the addition of alkali, microcoſmic ſalt, or borax. *Mr. Klaproth*, to whom we are indebted for its analyſis, found it in the cryſtalliſed form to contain, Acid 45, Lime 55.

VARIETY I. *CRYSTALLISED.*

CXCII. *a* 1. In ſhort hexhedral truncated priſms, ſemitranſparent and of a pale ſea-green colour, implanted ſideways on a mixture of cryſtalliſed tin and miſpickel, partially incruſted with browniſh yellow talc. *Ehrenfriederſdorf, Saxony.*

CXCIII. *a* 2. The ſame, in a very ſhort ſolitary cryſtal, with cryſtalliſed tin and quartz, on ſteatite. *Same Place.*

CXCIV. *a* 3. In a long ſolitary cryſtal of a yelloviſh colour, with cryſtalliſed tin and fluor and pulverulent lithomarga, on grey gneiſs. *Same place.*

VARIETY II. *AMORPHOUS.*

Analyſis.—Acid 34, Lime 59, Silex 2, Fluoric Acid 2.5, Muriatic Acid 0.5, Carbonic Acid 1, Iron 1. *Pellet.*

a. Striated.

b. Earthy.

SPECIES

SPECIES XI. *SULPHATE OF LIME.*

Gypſum, Selenite. Gypſe, Fr. *Gips*, Germ.

This compound of lime, like the former, occurs either in a cryſtalliſed form, or in irregular maſſes, for the moſt part of a white colour, and of a foliated, fibrous, or laminated texture. It is generally ſo ſoft as to bear the impreſſion of the nail, and varies in its ſpecific gravity from 1.870 to 2.320. It is ſoluble in about 500 times its weight of water, at a common temperature. When pure, it does not effervesce with any acid, and is ſoluble only in the concentrated ſulphuric, with the aſſiſtance of heat. By calcination, it parts with its water of cryſtalliſation, and is converted into a white powder, which, when mixed with water, has the uſeful property of becoming concrete. It melts at about 130 of *Wedgewood* in a clay crucible, although incapable of fuſing *per ſe* even in a ſolar heat. According to *Mr Kirwan*, the eaſieſt method of decompoſing it is by boiling it in a ſolution of carbonate of potaſh. Though met with in ſeveral parts of the world in great abundance, it is conſidered as poſterior in its formation to what are called primitive mountains, which are chiefly compoſed of granite. In many inſtances its production is owing obviouſly to the decompoſition of pyritical matter in the neighbourhood of other calcareous ſubſtances, more eſpecially carbonate of lime; ſtriking examples of which are found at *Shotover-Hill* in *Oxfordſhire*.

VARIETY I. *CRYSTALLISED.*

Analyſis.—Acid 46, Lime 32, Water 22. *Berg.*

CXCV. *a* 1. In detached tranſparent rhomboidal decahedral cryſtals. *Shotover-Hill.*
R. de L. Pl. 5. *Fig.* 28.

CXCVI. *a* 2. A large ſolitary cryſtal of the ſame. *Simna, Italy.*

CXCVII. *a* 3. In ſmaller tranſparent aggregated cryſtals, on ſnow white granular gypſum. *Derbyſhire.*

CXCVIII. *a* 4. In large ſemitranſparent cryſtals, with a curvilinear truncation of their acute angles. *Shotover-Hill.*

CXCIX. *a* 5. In aggregated hexhedral priſms with curvilinear indeterminate ſummits. *Same place.*
R. de L. Pl. 5. *Fig.* 32.

CC. *a* 6. In long and ſlender priſms, with an ochry incruſtation, on a matrix of the ſame.
R. de L. Pl. 5. *Fig.* 37. *Upper Hungary.*

CCI. *a* 7. In ſlender tranſparent priſmatic cryſtals, on native ſulphur. *Italy.*

CCII. *a* 8. The ſame, with oblique dihedral ſummits having equal faces, on white cryſtalliſed quartz. *Schemnitz, Hungary.*
R. de Pl. 5. *Fig.* 40.

CCIII. *a* 9. The ſame, in numerous and more ſlender cryſtals, with black clay and white quartz. *Lententhall, Hartz.*

CCIV. *a* 10. In large colourleſs hexhedral priſms, terminated by tetrahedral pyramids with unequal faces, lying in different directions on browniſh indurated clay.
R. de L. Pl. 5. *Fig.* 38. *Salt Mines, Cheſhire.*

CCV. *a* 11. In ſmaller cryſtals of a yellowiſh colour cloſely interwoven, being formed in a narrow fiſſure. *Hartz.*
R. de L. Pl. 5. *Fig.* 39.

CCVI. *a* 12. In large tranſparent aggregated cryſtals of the ſame figure. *Bavaria.*

CCVII. *a* 13. In flatted tranſparent priſms, ſome with tetrahedral, others with bifurcated ſummits, on black ſaline indurated clay. *Hall, Tyrol.*
R. de L. Pl. 5. *Fig.* 40.

CCVIII. *a* 14. In delicate tranſparent priſmatic cryſtals with oblique ſummits, grouped in diverging faſciculi, on greyiſh lime-ſtone. *Derbyſhire.*

CCIX. *b* 1. In ſemitranſparent lenticular cryſtals, on amorphous ferruginous gypſum.
R. de L. Pl. 5. *Fig.* 33. *Oxfordſhire.*

CCX. *b* 2. In broader lenticular cryſtals of a pale yellowiſh brown colour, with whitiſh clay in the interſtices. *Mont Martre.*

CCXI. *b* 3. In large ſemitranſparent aggregated angular fragments of a browniſh yellow colour, (*Arrow-headed Gypſum*). *Same place.*

CCXII. *c* 1. In ſtriated cryſtals of a yellow colour, lying confuſedly on aſh-coloured indurated clay.

CCXIII. *c* 2. In white laminated diverging cryſtals, on aſh coloured indurated clay incloſing a vein of black ſcaly blende. *Same place.*

CCXIV. *c* 3. In ſmaller and more numerous cryſtals, on the ſurface of grey indurated clay intermixed with muriate of ſoda. *Salzbourg.*

CCXV. *c* 4. In flatted priſmatic cryſtals, diverging from a common centre and producing a ſtellated appearance, on a fragment of yellow ſeptarium. *Iſle of Sheppy, Kent.*

CCXVI. *c* 5. In looſe filaments of a ſnow white colour. *Derbyſhire.*

VARIETY II. *IN PARTICULAR SHAPES.*

CCXVII. *a* 1. Forming a ſnow white incruſtation, with projecting contorted branches, on aſh-coloured lime-ſtone. *Matlock.*

VARIETY III. *AMORPHOUS.*

CCXVIII. *a* 1. In a tranſparent quadrangular plate of a laminated texture, compoſed of broad tranſparent folia.

CCXIX. *a* 2. Laminated and tranſparent, with yellow copper ore. *Torda, Tranſylvania.*

CCXX. *a* 3. The ſame, leſs tranſparent and of a grey colour. *Hartz.*

CCXXI. *a* 4. The ſame, with a white efflorescence on the ſurface, probably ariſing from calcination. *Salzbourg.*

CCXXII. *a* 5. In an irregular piece, of a grey colour, having the laminæ applied to each other in a zigzag direction. *Mount Corcyra, Italy.*

CCXXIII. *b* 1. In an irregular piece, of a grey colour, granular and ſomewhat filamentous. *Hartz.*

CCXXIV. *b* 2. Of a granular texture, tranſlucid and of a ſnow white colour. *Derbyſhire.*

CCXXV. *b* 3. Granular, of a ſpongy texture, opake and of a red colour. *Brittany.*

CCXXVI. *c* 1. *d* 1. In a lengthened piece compoſed of parallel ſhining fibres or ſtriæ, tranſlucid and ſnow white. *Derbyſhire.*

CCXXVII. *e* 1. In a quadrangular tablet, compact, and of a milk white colour. *Same place.*

CCXXVIII.

CCXXVIII. *e* 2. In a flatted piece, ſemitranſparent, and of a dull white colour, with native ſulphur on the ſurface. *Spain.*

CCXXIX. *e* 3. Forming an irregular cellular incruſtation of a yellowiſh colour. *Herrengrund, Hungary.*

f. Farinaceous.

GENUS II. *STRONTIAN.*

The moſt correct account of this earth is given by *Mr. Kirwan,* from which it would appear, that its properties are intermediate between thoſe of lime and baryt. When freed by calcination from its union with carbonic acid, it is found to be ſoluble in 100 parts of water at a temperature of 60°, and to poſſeſs the remarkable property of ſeparating from a ſaturated ſolution in the form of rhomboidal cryſtals. It diſſolves readily in the nitric and muriatic acids, and decompoſes, in the moiſt way, all the ſaline compounds of the ſulphuric, with which it forms an inſoluble precipitate. It promotes the fuſibility of moſt of the other earths. Its affinities ſeem to be ſuperior to thoſe of lime, but inferior to baryt. This earth has been hitherto only found in combination with carbonic acid in *Scotland,* at *Strontian,* from whence it has received its name.

SPECIES I. *CARBONATE OF STRONTIAN.*

Strontianite. Kirw.

The colour of this is whitiſh or light green, with a moderate degree of luſtre. Its tranſparency intermediate between the ſemitranſparent and opake. Its fracture ſtriated, preſenting oblong diſtinct concretions, ſomewhat uneven and bent. Its hardneſs moderate, being eaſily ſcraped; but very brittle. Its ſpecific gravity from 3.4 to 3.644. It loſes in calcination more than 20 *per cent.* of its weight; and diſſolves with conſiderable effervеſcence both in the muriatic and diluted nitric acids.

Analyſis.—Acid 26.5, Strontian 73.5. *Kirw.*

VARIETY I. *AMORPHOUS.*

I. *a* 1. Compoſed of long ſtriæ of a dull yellowiſh green colour, diverging from different centres, with whitiſh baroſelenite. *Strontian.*

II. *a* 2. The ſame, of a greeniſh white colour. *Same place.*

GENUS

GENUS III. *BARYT.*

Schwererde, Germ.

In the ſeparate ſtate, to which this earth may be reduced by the application of a ſtrong heat to artificially prepared carbonate of baryt, its form is pulverulent, its colour white, taſte ſomewhat pungent, ſpecific gravity 400. It is ſoluble in about 900 times its weight of water, and communicates to it properties analogous to thoſe of lime-water. It is infuſible *per ſe*, though affected by the uſual fluxes in the ſame manner as lime. The compound which it forms with ſulphuric acid is nearly inſoluble, requiring for its ſolution 40,000 times it weight of water. With the nitric and muriatic acids, it forms cryſtalliſable ſalts. It unites with ſulphur into a particular ſpecies of hepar, and is remarkable for the violent effects which it produces upon the living body when exhibited internally, which is found alſo to be the caſe with all the ſaline forms of this earth.

SPECIES I. *CARBONATE OF BARYT.*

Barolite, Kirw. Witherite, Wern.

It is found either cryſtalliſed or in ſolid maſſes, ſemitranſparent, and of a ſtriated or compact texture, the ſtriæ for the moſt part diverging. Its colour either greyiſh white, or milk white, with moderate luſtre, and having ſometimes a ſlight tinge of yellow. It may be pretty eaſily ſcraped with the knife. Its ſpecific gravity is from 4.3 to 4.33. It is ſoluble, with effervescence, both in the nitric and muriatic acids, and in the concentrated ſulphuric in a ſtrong heat. It loſes its tranſparency when heated, but does not part with its carbonic acid, nor melt even in the moſt intenſe degree of heat.

It was firſt analyſed by *Dr. Withering*, who found it to contain of carbonic acid 20.8, baryt 78.6.

VARIETY I. *CRYSTALLISED.*

a. In hexhedral pyramids, joined baſe to baſe.

I. *b* 1. In hexhedral priſmatic cryſtals, of a dull white colour, terminated by hexhedral pyramids; lining a cavity in a compact maſs of the ſame interſperſed with yellow pyrites. *Angleſark near Chorley, Lancaſhire.*

VARIETY

VARIETY II. *AMORPHOUS.*

II. *a* 1. Of a fibrous texture, ſemitranſparent, and of a water colour, the fibres running nearly parallel, and having one ſide covered by a cellular ochry incruſtation.

Same place.

III. *a* 2. The ſame, compoſed of fibres diverging from different centres and without incruſtation. *Same place.*

b. Foliated.

IV. *c* 1. Of a compact texture, with white opake ſulphate of baryt, and yellow ſulphuret of iron.

SPECIES II. *SULPHATE OF BARYT.*

Baroſelenite. Ponderous Spar. Spath Peſant, Fr. *Schwerſpath*, Germ.

This is alſo found cryſtalliſed or amorphous. When cryſtalliſed, it is for the moſt part more or leſs tranſparent, and of a laminated texture. Its colour generally white, fleſh red, ochry yellow or grey. Its luſtre and hardneſs nearly the ſame with thoſe of carbonate of baryt. Specific gravity when pure 4.865. It requires for its ſolution 43,000 times its weight of water. It is ſoluble in the concentrated ſulphuric acid with the aſſiſtance of heat, but precipitates from it on the addition of water. When ſuddenly heated, it decrepitates like calcareous ſpar, and may be melted by an intenſe heat into a coloured glaſs. It melts alſo with ſoda, borax, and miſrocoſmic ſalt; in the two latter inſtances with ſcarcely any effervеſcence. If calcined in the open fire, in contact with the fuel, it acquires the property of being luminous in the dark. It occurs frequently in metallic mines, in veins or nodules, and has alſo been diſcovered as a conſtituent part of certain compounded rocks.

VARIETY I. *CRYSTALLISED.*

Analyſis.—Acid 32.8, Baryt 67.2. *Withering.*

V. *a* 1. In aggregated lengthened octohedrons with cuneiform ſummits, ſemitranſparent and of a water colour intermixed with red. *Freyberg, Saxony.*

R. de L. Pl. 3. *Fig.* 53.

VI. *a* 2. In octohedrons, of a pale yellow colour, having their pyramids deeply truncated, implanted on cubic galena. *Brittany.*

R. de L. Pl. 3. *Fig.* 57.

VII.

VII. *a* 3. In thin white ſemitranſparent cryſtals, of the ſame figure with the former, united by an oblique application of their faces into a laminated maſs, with their edges projecting on the ſurface. *Hartz.*

R. de L. Tom. 3. *P.* 591.

VIII. *a* 4. In larger and very deeply truncated cryſtals, ſomewhat ochry on the ſurface, and more projecting, attached to brown ſpathoſe iron ore, with large ſpecks of yellow ſulphuret of iron. *Same place.*

IX. *a* 5. The ſame, of a darker colour, having the poſition of the ſuperficial cryſtals more diverſified, with pyramidal calcareous ſpar and cryſtalliſed yellow copper ore. *Freyberg, Saxony.*

X. *a* 6. In ſemitranſparent colourleſs cryſtals, bevelled both at their edges and angles. *R. de L. Pl.* 3. *Fig.* 67. *Dove Town Mine, Cumberland.*

XI. *a* 7. The ſame, in very large tranſparent colourleſs quadrangular tabular cryſtals, bevelled at their angles and edges of their extremities. *Same place.*

XII. *a* 8. A ſolitary cryſtal of the ſame. *Same place.*

XIII. *a* 9. The ſame, ſmall, tranſparent, and colourleſs, on indurated ferruginous clay, intermixed with grey quartz. *Marienberg, Saxony.*

XIV. *a* 10. In tranſparent plated rhomboidal cryſtals, bevelled at their obtuſe angles, and imbricated or lying over each other in the manner of tiles. *Same place.*

R. de L. Pl. 3. *Fig.* 75.

XV. *a* 11. In ſemitranſparent flated projecting hexhedral cryſtals, with acute didedral ſummits, having a ſmoky appearance on the ſurface. *Felſobanya, Upper Hungary.*

R. de L. Pl. 3. *Fig.* 61.

XVI. *a* 12. In large tabular rhombic cryſtals, ſemitranſparent, of a greyiſh colour, mortiſed into each other in various directions, and having a downy covering of plumoſe antimonial ore, with numerous minute cryſtals of white opake quartz.

R. de L. Pl. 3. *Fig.* 71. *Felſobanya, Upper Hungary.*

XVII. *a* 13. The ſame, in ſmaller cryſtals, tranſparent in the middle, but opake and of an ivory colour at the edges, on yellow iron pyrites intermixed with galena, the pyrites incruſting many of the cryſtals. *Brittany.*

XVIII. *a* 14. In thin rhomboidal cryſtals, ſemitranſparent, and of a yellowiſh colour, forming an irregular group without matrix. *Cremnitz, Hungary.*

XIX. *a* 15. In ſmaller ſemitranſparent cryſtals, on white cryſtalliſed quartz. *Same place.*

XX. *a* 16. In ſtill ſmaller and more tranſparent rhombic cryſtals, on white ſpongy quartz. *Same place.*

XXI. *a* 17. In aggregated tetrahedral cryſtals, tranſparent and almoſt colourleſs, truncated at both extremities, on amorphous baroſelenite. *Durham.*

XXII. *a* 18. In thin hexhedral tabular cryſtals, ſemitranſparent and of a pearly grey colour, attached to each other in cluſters, on cryſtalliſed quartz, covered by a minutely cryſtalliſed ferruginous quartzy incruſtation. *Schemnitz, Hungary.*
R. de L. Pl. 3. *Fig.* 73.

XXIII. *a* 19. The ſame, in broader cryſtals of the ſame figure, leſs aggregated and of an ochry appearance. *Same place.*

XXIV. *a* 20. In numerous ſemitranſparent tabular cryſtals of a whitiſh colour, on a mixture of blende and galena. *Cremnitz, Hungary.*

XXV. *a* 21. The ſame, in broader cryſtals, with a cream coloured quartzy incruſtation, on greyiſh cryſtalliſed quartz intermixed with brown blende. *Same place.*

XXVI. *a* 22. In flatted priſmatic hexhedral cryſtals, truncated at their extremities, internally ſemitranſparent and of a water colour, opake and of a dull white colour on the ſurface, on whitiſh quartz incruſted with yellow pyrites. *Schemnitz, Hungary.*

XXVII. *a* 23. The ſame, on the ſurface of ferruginous quartz, intermixed with yellow ſulphuret of copper. *Same place.*

XXVIII. *b* 1. In white ſtriated priſmatic cryſtals, intricately interwoven and coloured on the ſurface by yellow ochre, on ſpongy quartz. *Freyberg, Saxony.*
Catal. de Raab. Tom. II. D. b. 10.

From the appearance of this variety, it has been often miſtaken for white ſpathoſe lead ore.

c. Lenticular.

XXIX. *d* 1. In very minute tranſparent cryſtals, on cream coloured hollow ramoſe ſtalactites of the ſame. *Hartz.*

XXX. *d* 2. The ſame, on ſtalactitical baroſelenite, of a pale fleſh colour, irregularly cylindrical and of a cellular texture. *Same place.*

XXXI. *d* 3. In confuſedly aggregated cryſtals of a dull white colour, having a cock's comb appearance on the ſurface, with yellow pyrites and dodecahedral calcareous ſpar. *Annaberg, Saxony.*

XXXII. *d* 4. The ſame, of a reddiſh white colour, with ſmall tubercles of ſulphuret of iron on the ſurface. *Hartz.*

XXXIII. *d* 5. The ſame, of a paler colour with more numerous tubercles of pyrites. *George Tuſenſtollu.*

XXXIV. *d* 6. The ſame, in a flatted piece, of a pale fleſh red colour, without pyrites. *Same place.*

XXXV. *d* 7. The ſame, internally white, externally ochry and more ſcabrous, with calcareous ſpar on the ſurface. *Brittany.*

XXXVI. *d* 8. The ſame, of a cream colour, without calcareous ſpar. *Derbyſhire.*

XXXVII. *d* 9. The ſame, of a fleſh red colour, with quartz and black blende. *Auvergne.*

XXXVIII. *d* 10. Of a yellowiſh white colour, tranſparent, arboreſcent on the ſurface, and of a ſpongy texture. *Angleſark*, near *Chorley*, *Lancaſhire.*

XXXIX. *d* 11. Of a light aſh colour, and tuberous on the ſurface, with cryſtalliſed calcareous ſpar. *Freyberg, Saxony,*

XL. *d* 12. In a flat, ſemitranſparent, rhomboidal, cryſtalline fragment. *Same place.*

XLI. *d* 13. The ſame, leſs tranſparent and of a more irregular figure. *Auvergne.*

VARIETY II. *OF PARTICULAR SHAPES.*

a. Stalactitic. *Vide* No. XXX.

b. Tubuliform, &c. *Vide* No. XXIX.

VARIETY III. *AMORPHOUS.*

a. Foliated. *Vide* No. XL. and XLI.

XLII. *b* 1. Of a dark grey colour, internally ſtriated, and having a penniform appearance. *Scotland.*

XLIII. *b* 2. In a flatted ſpherical nodule, of a grey colour. (*Bolognian Stone.*) *Mount Paterno, Bologne, Italy.*

The property of becoming luminous in the dark, being firſt obſerved in this variety of barofelenite, it has therefore when calcined been called *Bolognian Phoſphorus.* It has been analyſed by *Mr. Arvidſon*, and found to contain Sulphate of Baryt 62, Silex 16, Alumine 15, Sulphate of Lime 6, Water 2.

XLIV. *b* 3. Of a yellowiſh aſh colour, opake, irregular, and faſciculated in its ſtructure. *Derbyſhire.*

XLV. *c* 1. Of a compact texture, with veins of galena, artificially poliſhed. *Same place.*

XLVI. *c* 2. Of a browniſh colour and veined, alſo cut and poliſhed. *Same place.*

XLVII. *d* 1. In an irregular maſs, of an aſh colour and earthy texture (*Cawk*). *Same place.*

XLVIII. *d* 2. Of a lighter colour intermixed with red. *Andaluſia, Spain.*

The phoſphoreſcent property of this variety is ſuch, that upon ſimple friction it becomes luminous in the dark, and remarkably ſo if expoſed to a low red heat, the luminous appearance very much reſembling that which is exhibited by common phoſphorus.

SPECIES III. *LIVER-STONE.*

Liberſtein, Germ.

A ſtone which emits a ſmell of liver of ſulphur when rubbed or heated to redneſs, of a grey, yellowiſh grey, brown, or greyiſh black colour, with ſome luſtre and but little tranſparency; of a foliated and partly ſtriated texture, and of conſiderable hardneſs. Specific gravity 2.666. It does not effervеſce with acids. It is found in *Andrarum* in *Scania*, and contains, according to *Bergman*'s analyſis, Sulphate of Baryt 38, Silex 33, Sulphate of Alumine 22, Sulphate of Lime 7, Petroleum 5.

VARIETY I. *AMORPHOUS.*

a. Foliated.

b. Striated.

GENUS

GENUS IV. *MAGNESIA.*

Talkerde, Germ.

The pureſt magneſia is that which is prepared artificially from the decompoſition of ſulphate of magneſia by either of the fixed alkalis; or by carbonate of ammoniac, and ſubſequent calcination. When free from foreign admixture it aſſumes the form of a light, pure white, inſipid powder. Its ſpecific gravity about 2.3. It requires for its ſolution 7.900 times its weight of water. It is infuſible without addition, even in the moſt intenſe degrees of heat, but melts into a glaſs with lime, microcoſmic ſalt, or borax. It unites with all the acids and may be combined in ſmall proportions with ſulphur. It has long been employed as an antacid and laxative in diſorders of the *primæ viæ*; and, in the form of ſteatite, is a principal ingredient in the preparation of the finer kinds of porcelain. Magneſia has not as yet, in any inſtance, been met with in an uncombined ſtate.

SPECIES I. *CALCI-MURITE.*

Magneſia mixed with a notable proportion of Calcareous Earth and ſome Oxyd of Iron. *Kirw.*

It is deſcribed as of the conſiſtence of clay, and of a blue or olive green colour. The green contains no alumine, but merely lime and magneſia tinged by iron; the blue has a larger quantity of lime, and is uſed in pottery. They are both found near *Thionville*.

VARIETY I. *AMORPHOUS.*

a. Earthy.

SPECIES II. *ARGILLO-MURITE.*

Carbonate of magneſia mixed with alumine and oxyd of iron.

Found either of a greeniſh colour and earthy texture in *Sileſia*; or of a farinaceous conſiſtence in *Italy*, where it has been analyſed by *Mr. Fabroni*, who found it to conſiſt of Magneſia 13, Silex 50, Alumine 10, Lime 3, Oxyd of Iron 0.9, Water 12. Of this the ancients made bricks ſo light as to float on water.

VARIETY I. *AMORPHOUS.*

a. Earthy.

b. Looſe.

SPECIES

SPECIES III. *SILICI-MURITE.*

This is found either of a hard, ſolid, and ſparry texture, and of a grey, or ochry yellow colour (*Martial Muriatic Spar, Kirw.*), or plaſtic, and of a yellow colour when recently dug (*Keffekill, Meerſchaum*). The firſt is ſo hard as to ſtrike with ſteel. It effervesces with acids, and melts in a ſtrong heat. 100 parts of it are ſaid to contain 50 of Silex, with carbonate of Magneſia and Iron. The latter is the ſubſtance of which the large Turkey pipes are formed, by boiling it in oil, and ſubſequent expoſure to air. By a very intenſe heat it may be converted into a white porcelain maſs. *Baron Born* conſiders it as ſemitranſparent talc (*Catal. de Raab. Tom. 1. P. 244*). By *Mr. Weigleb's* analyſis it contains equal parts of magneſia and ſilex.

VARIETY I. *AMORPHOUS.*

a. Foliated.

I. *b* 1. In a white maſs of an earthy texture (*Spuma Maris*). *Burza, Lower Turkey.*

SPECIES IV. *TALC.*

This is met with either of a foliated, flaty, or ſcaly texture, and of a white, greeniſh, yellowiſh, or reddiſh white, or greyiſh green colour, with ſomewhat of a metallic luſtre. It is for the moſt part more or leſs tranſparent, of a moderate hardneſs, and is unctuous to the feel. It does not effervesce with acids. The purer ſorts when ſtrongly heated, become whiter, leſs tranſparent, and more brittle. By an intenſe heat it melts into an opake greeniſh maſs, ſpotted ſlightly with red. It fluxes with difficulty with the fixed alkalis, but more readily with microcoſmic ſalt and borax.

VARIETY I. *AMORPHOUS.*

II. *a* 1. Compoſed of broad, ſhining, flexible folia, cloſely compacted and of a greeniſh white colour. (*Venetian Talc.*) *Zillerthal, Tyrol.*

This, from being of a white colour when reduced to powder, and leaving a beautiful poliſh on the ſkin, has long been employed as a coſmetic. *Mr. Hæpfner* found it to contain Magneſia 44, Silex 50, Alumine 6.

III. *a* 2. The ſame, on the ſurface of ſemitranſparent felſpar of a pale reddiſh white colour and ſhining fracture. *Same place.*

IV.

IV. *a* 3. A poliſhed ſlab of the ſame, of a pale green colour and intermixed with ſhining ſilvery laminæ. *Scotland.*

V. *b* 1. Of a flaty texture and greeniſh white colour. (*Shiſtoſe Talc.*) *Bareuth.*

VI. *b* 2. The ſame, of a duller colour, and ſomewhat more compacted. *Hungary.*

VII. *b* 3. The ſame, more indurated and of a ſhining yellowiſh grey colour. *Zillerthal, Tyrol.*

VIII. *b* 4. In thin undulating laminæ, of a dark greeniſh grey colour. *Fahlun, Sweden.*

IX. *b* 5. The ſame, of a divergingly ſtriated texture and dark grey colour. *Scotland.*

X. *c* 1. Compoſed of ſmall compacted ſcales (*Talcite*) of a white colour and ſilvery luſtre, incloſing priſmatic cryſtals of green quartz. *Dauphiné.*

SPECIES V. *LAPIS OLLARIS.*

Pot Stone. Pierre Ollaire, Fr. *Topfſtein,* Germ.

Of a greeniſh, reddiſh, or yellowiſh grey colour, and foliated or flaty texture; nearly or altogether opake, having little luſtre; of moderate hardneſs and ſomewhat unctuous feel. The ſpecific gravity of the moſt perfect kind, 2.872. It becomes white by calcination, and acquires ſufficient hardneſs to ſtrike fire with ſteel. It takes its name from the capability which it poſſeſſes of being turned upon the lathe into veſſels, which have been long in uſe in *Switzerland* and other parts of the world.

VARIETY I. *AMORPHOUS.*

XI. *a* 1. In a quadrangular ſlab, of a foliated texture and greeniſh grey colour. *Como, Milan.*

Analyſis.—Magneſia 38, Silex 38, Alumine 7, Iron 5, Carbonate of Lime 1, and a trace of Fluoric Acid. *Weigl.*

*XI. *b* 1. In an irregular piece, of a granularly foliated texture and grey colour. *Mont Muſate, Italy.*

SPECIES

SPECIES VI. *STEATITES.*

Soap-Rock. Pierre de Lard, Fr. *Speckſtein*, Germ.

The properties of this are in many reſpects analogous to thoſe of the two foregoing ſpecies. Though ſometimes cryſtalliſed, it occurs, for the moſt part, in irregular maſſes or veins, of a white, yellowiſh, greeniſh, reddiſh, or grey colour, often ſtreaked or ſpotted, and of different degrees of induration, being in ſome inſtances ſo ſoft as to yield eaſily to the nail, in others, nearly as hard as ſerpentine. Its texture generally compact, often of a ſomewhat ſplintery fracture. In moſt inſtances unctuous to the feel; ſometimes ſlightly tranſparent, and varying in its ſpecific gravity from 2.4 to 2.7. It has more or leſs of any earthy ſmell when breathed on; but does not adhere to the tongue. The principal chemical difference between this and pot-ſtone ſeems to be, that it contains a ſmaller proportion of ſilex and magneſia, as well as a ſmaller proportion of iron.

VARIETY I. *CRYSTALLISED.*

a. In cubes, truncated at their angles.

b. In hexhedral priſms.

c. In octohedral priſms, truncated.

VARIETY II. *AMORPHOUS.*

a. Foliated.

b. Striated.

XII. *c* 1. Compact, indurated and of a greeniſh grey colour. *Briançon, France.*

XIII. *c* 2. Indurated, and of a pale roſe red colour. *Saxony.*

XIV. *c* 3. The ſame, of a piſtachio green colour. *Durham.*

XV. *c* 4. Semi-indurated, and of a dull white colour with black dendretic figures. *Saxony.*

Analyſis.—Magneſia 20.84. Silex 48.42. Alumine 14. Iron 1. Air and Water 16. *Klapr.*

XVI.

XVI. *c* 5. Of a dull white colour and ſoapy texture. *Cornwall.*

At the Lizard in Cornwall, many of the neighbouring inhabitants are conſtantly employed in collecting this kind of ſteatite, for the uſe of the potteries in *Staffordſhire.*

XVII. *c* 6. The ſame, of a mottled appearance. *Same place.*

XVIII. *c* 7. More indurated and leſs unctuous. *Same place.*

XIX. *c* 8. Indurated, ſemitranſparent, and of a greeniſh white colour. *Eaſt Indies.*

XX. *c* 9. Very much indurated, ſemitranſparent, and of a chocolate brown colour, intermixed with pearly grey. *China.*

XXI. *c* 10. Indurated, of a dark aſparagus green colour, intermixed with dull white. *Saxony.*

XXII. *c* 11. Indurated, of a pale green colour, marked by two black lines interſecting each other. *France.*

XXIII. *c* 12. Three varieties of indurated ſteatite, carved into figures. *China.*

XXIV. *c* 13. Indurated, approaching to the nature of ſerpentine, of a dark green colour, coated by dark leek green chlorite. *Sileſia.*

SPECIES VII. *SERPENTINE.*

This ſtone is commonly of a greeniſh, yellowiſh, reddiſh, or greyiſh colour, with green or red ſpots, veins or clouds. Its fracture earthy, granular, or ſcaly; of conſiderable hardneſs and ſomewhat brittle; without luſtre, and having little or no tranſparency. Its ſpecific gravity from 2.40 to 2.60. It has in moſt inſtances an earthy ſmell when breathed on, and feels ſomewhat unctuous. When heated, it hardens and becomes red, but is infuſible by the blow-pipe. It occurs moſt commonly in amorphous maſſes, ſeldom intermixed with other ſubſtances. The green colour of ſerpentine is ſuſpected by *Mr. Klaproth* to be derived from *Nickel.*

Analyſis.—Magneſia 33, Silex 45, Magnetic Iron 14, Carbonate of Lime 6.25, Alumine 0.25, with a little Muriate of Magneſia and Water. *Knock.*

XXV. *a* 1. Of a ſlaty texture, and pale mountain-green colour, coating dark leek green ſerpentine. *Zöplitz, Saxony.*

XXVI. *a* 2. The ſame, of a more compact texture and greeniſh colour. *Same place.*

XXVII. *a* 3. Thirteen varieties of poliſhed ſerpentine, of various colours, from *Scotland*, *Saxony*, *Italy*, and other parts.

SPECIES VIII. *CHLORITE.*

Terre Talqueuſe Verdâtre, Born.

Found either cryſtalliſed, or indurated and amorphous, or in looſe ſcales. Its colour graſs green or greeniſh brown, or dark green inclining to black. The indurated is of an earthy, ſomewhat ſcaly or ſlaty texture, opake, with but little luſtre; of moderate hardneſs and not remarkably heavy. It does not effervеſce with acids. The looſe gives an earthy ſmell when breathed on. It melts into a dull black compact ſlag, and then becomes magnetic. By the analyſis of *Mr. Hopfner* it contains Magneſia 0.3947, Silex 0.415, Alumine 0.0613, Lime 0.015, Iron 0.1015, Air and Water 0.015. The indurated contains ſomewhat leſs Magneſia and more Silex.

VARIETY I. *CRYSTALLISED.*

a. In tetrahedral priſms.

VARIETY II. *AMORPHOUS.*

XXVIII. *a* 1. Indurated, of a ſlaty texture and dark mountain-green colour. *Corſica.*

XXIX. *a* 2. The ſame, incloſing cryſtals of black ſchorl and pale fleſh red felſpar. *Zillerthal, Tyrol.*

XXX. *a* 3. The ſame, thickly interſperſed with garnets. *Scotland.*

XXXI. *b* 1. Indurated and of an earthy texture and dark mountain-green colour, interſperſed with minute cryſtals of ſpathoſe iron ore. *Cornwall.*

XXXII. *b* 2. The ſame, of a pale verdegris-green colour. *Aberdeenſhire.*

XXXIII. *c* 1. In ſmall ſcales ſlightly cohering, of a pale mountain-green colour. *Scotland.*

SPECIES IX. *ASBESTOS.*

Aſbeſte non mure, Fr.

Is of a fibrous, or ſtriated texture, the fibres for the moſt part parallel, though often curved and diverging. It is generally of a leek or olive green colour, more rarely yellowiſh grey, and ſometimes greeniſh white. Its hardneſs ſuch, that it yields with difficulty to the knife; not brittle; fragments ſplintery; feels ſomewhat unctuous to the touch;

ſpecific gravity about 2.547. It does not effervesce with acids, and fuſes with great difficulty. From the experiments of *Bergman* and others, it appears to conſiſt principally of Silex combined with Carbonate of Magneſia.

VARIETY I. *AMORPHOUS.*

XXXIV. *a* 1. Of a ſtriated compact texture and dark green colour, having one ſide poliſhed. *Scotland.*

XXXV. *a* 2. The ſame, of a lighter green colour. *Danemora, Sweden.*

This probably is of the ſame kind with that from *Baſtnas, Grufva*, analyſed by *Bergman*, and found to contain Carbonate of Magneſia 16, Silex 63.9, Carbonate of Lime 12.8, Alumine 1.1, Oxyd of Iron 6.

b Fibrous.

XXXVI. *c* 1. Of a flaty compact texture, and browniſh green colour, inclining to yellow. *Scotland.*

XXXVII. *c* 2. Of a lighter yellowiſh green colour, having a more ſilky appearance on the ſurface. *Same place.*

SPECIES X. *AMIANTHUS.*

This is alſo of a fibrous ſtructure, and ſometimes of an olive or mountain green colour, though moſt commonly of a greyiſh or greeniſh white; more rarely yellowiſh or ſilvery white. It is likewiſe occaſionally met with of a pale fleſh-red, or ochry yellow colour. It differs principally from aſbeſtos in being compoſed of fibres which are flexible, whilſt thoſe of the former are rigid and oftener incurvated, and in being more eaſily fuſed. It is beſides of leſs ſpecific gravity, and inferior to aſbeſtos in point of hardneſs. In many inſtances, however, the ſenſible as well as chemical properties of theſe bodies are ſo ſimilar, that it is difficult if not impoſſible to diſtinguiſh them with accuracy.

VARIETY I. *CRYSTALLISED.*

a. In compreſſed rhomboidal parallelopepids.

In this form amianthus has been ſaid to be found near *Bagneres* of a grey or bluiſh colour, and at firſt of a ſoft and filamentous texture, but hardening on expoſure to the air. *Vide* 26 *Rozier Journal de Phyſique* 429.

VARIETY II. *AMORPHOUS.*

XXXVIII. *a* 1. In long flexible cotton-like filaments ſlightly cohering, and of a dull white colour, on greeniſh ſchiſtus. *Pyrenees.*

XXXIX. *a* 2. In broad and ſoft ſhining laminæ, of a reddiſh cinnamon colour, on greyiſh indurated ſchiſtus. *Dauphiné.*

XL. *a* 3. Of a fibrous texture and dark reddiſh brown colour. *Pyrenees.*

XLI. *a* 4. In white and very minute filaments ſlightly cohering. *Same place.*

XLII. *a* 5. In looſe white ſilky filaments. *Tarentaiſe, Savoy.*

This kind, according to the analyſis of *Bergman*, contains Silex 64, Carbonate of Magneſia 18.6, Carbonate of Lime 6.9, Sulphate of Baryt 6, Alumine 3.3, Oxyd of Iron 1.2.

XLIII. *a* 6. Of a fibrous cottony texture and dull white colour, on coarſe ſchiſtoſe talc. *Dauphiné.*

XLIV. *a* 7. The ſame, of a yellowiſh colour, on greeniſh grey indurated ſchiſtus. *Pyrenees.*

XLV. *a* 8. The ſame, artificially matted. *Same place.*

XLVI. *a* 9. Various ſpecimens of wrought amianthus. *Alps.*

For the manner in which theſe are manufactured; the advantage taken of their incombuſtibility by the ancients to collect the aſhes of their kings; the uſe of amianthine napkins; the conſtruction of perpetual wicks for lamps, &c. See *Waller Syſt. Min. Tom.* I. *Pag.* 409.

XLVII. *a* 10. Of a thread-like appearance and dull white colour, on whitiſh indurated clay. *Alps.*

XLVIII. *a* 11. In lengthened pieces compoſed of very long thread-like filaments of a light greeniſh white colour. *Alps.*

XLIX. *a* 12. In ſhort fibres of a greeniſh white colour and ſilky luſtre, forming veins in green ſerpentine. *Angleſea.*

b. Farinaceous.

SPECIES

SPECIES XI. *SUBER MONTANUM.*

Mountain Cork. *Liege de Montagne*, Fr. *Bergkork*, Germ.

This is met with in irregular pieces of different colours, white, yellow, brown, green, blue, or grey. It varies conſiderably in texture, being either cork-like, ſpongy, or membranaceous. It is generally ſo light as to ſwim on water. It is meagre to the feel, ſomewhat elaſtic, of little hardneſs, ſeldom of any luſtre, and always opake. Its ſpecific gravity (according to *Briſſon*) is, when dry, from 0.68 to 0.99, but when moiſt, from 1.24, to 1.34. It does not effervesce with acids, except by the aſſiſtance of heat, and is very difficult of fuſion. By *Bergman*'s analyſis it contains Carbonate of Magneſia 22, Silex 62, Allumine 2.8, Carbonate of Lime 10, and Oxyde of Iron 3.2.

VARIETY I. *AMORPHOUS.*

L. *a* 1. In a light irregular nodule of a ſky blue colour. *Perſia.*

LI. *b* 1. Of a ſpongy texture, and dull yellowiſh white colour. *Bohemia.*

LII. *b* 2. More compact and of a light brown colour. *Saxony.*

LIII. *b* 3. Conſiderably more ponderous, and of an ochry yellow colour. *Johngeorgenſtadt.*

LIV. *c* 1. Of a membranaceous texture and white colour. (*Caro Montana. Cuire foſſile.*) *Kongſberg.*

LV. *c* 2. The ſame, of a dull white colour, enveloping cryſtals of calcareous ſpar. *Sweden.*

SPECIES XII. *ACTYNOLITE.*

Strahlſtein, Wern.

This is met with either in long priſmatic cryſtals with ſmooth or ſtriated ſurfaces, or in aggregated maſſes of a lamellated, foliated, ſtriated, or fibrous texture. Its colour is generally green, brown, yellow, or white, with more or leſs tranſparency and luſtre. Its cryſtals are remarkably brittle. In the amorphous ſtate it is harſh to the feel, and ſometimes of great hardneſs. Specific gravity from 2.80 to 3.45. It does not effervesce with acids. When heated to redneſs it only changes colour, but in the higher degrees of heat it melts into a compact glaſs. By moſt authors till lately, the principal varieties of this ſpecies, particularly the cryſtalliſed, have been deſcribed as ſchorls.

VARIETY

VARIETY I. *CRYSTALLISED.*

LVI. *a* 1. In compreſſed hexhedral priſms with ſmooth ſurfaces, tranſparent, and of a leek-green colour (*Glaſſy Actynolite*), imbedded in white flaty talc.

Zillerthal, Tyrol.

Analyſis.—Carbonate of Magneſia 20, Silex 64, Carbonate of Lime 9.3, Alumine 2.7, Oxyd of Iron 4. *Berg.*

LVII. *a* 2. The ſame, in ſmaller aggregated cryſtals, diverging from different centers, without matrix. *Same place.*

LVIII. *b* 1. In long ſtriated priſmatic cryſtals of a yellowiſh green colour (*Schorlaceous Actynolite*) penetrating the ſubſtance of tranſparent cryſtalliſed quartz. *Spain.*

LIX. *b* 2. In ſlender priſms of an olive green colour, truncated at their extremities, and united into diverging faſciculi, on aſh coloured indurated clay. *Dauphiné.*

LX. *b* 3. The ſame, in longer cryſtals, with white ſilky amianthus. *Same place.*

LXI. *b* 4. In flatted priſmatic cryſtals of a ſomewhat lamellar texture and dark green colour, intermixed with aſh coloured felſpar. *Scotland.*

LXII. *b* 5. The ſame, tranſparent, of a graſs green colour, and electric, cut and poliſhed (*Peridot*). *Braſil.*

LXIII. *b* 6. In ſtriated priſms of a greeniſh blue colour and tranſparent, terminated by obtuſe trihedral pyramids, the borders of which are deeply truncated. *R. de L. Pl.* 4. *Fig.* 93. *Ceylon.*

LXIV. *b* 7. In opake octohedral priſms of a yellowiſh green colour, intermixed with white calcareous ſpar. *Sala, Sweden.*

LXV. *b* 8. The ſame, of a dull green colour. *Same place.*

LXVI. *b* 9. The ſame, of a pale greeniſh white colour. *Scotland.*

VARIETY II. *AMORPHOUS.*

a. Lamellated (*Lamellar Actynolite*).

b. Foliated.

Analyſis.—Magneſia 22, Silex 43, Iron 34. *Weiglib.*

LXVII.

LXVII. *c* 1. Compoſed of longitudinal ſtriæ of a greeniſh white colour. *Sweden.*

LXVIII. *c* 2. Compoſed of diverging ſtriæ of a whitiſh green colour. *Saltzbourg, Tyrol.*

LXIX. *c* 3. The ſame, of a pale green colour. *Sweden.*

LXX. *d* 1. Compoſed of long undulating fibres, of a dull green colour, intermixed with ochry yellow. *Iſle of Skye.*

LXXI. *d* 2. Of a pale greeniſh colour, and ſilky luſtre. *Sweden.*

LXXII. *d* 3. Compoſed of long rigid fibres, of a greeniſh white colour, and ſilky luſtre. *Corſica.*

LXXIII. *d* 4. Compoſed of longer fibres, of a leek-green colour. *Sweden.*

LXXIV. *d* 5. The ſame, of a paler colour and ſilky luſtre, with yellow copper ore. *Sweden.*

LXXV. *d* 6. The ſame, of a ſtill lighter colour, and more ſilky appearance, alſo with yellow copper ore. *Sweden.*

SPECIES XIII. *JADE.*

Lapis Nephriticus. Nephrit, Nierenſtein, Germ.

This ſtone is found either in rounded detached maſſes, or as a conſtituent part of certain kinds of granite. Its colour generally is yelloviſh green, inclining ſometimes to blue or white, with more or leſs ſemitranſparency. Its ſurface is uſually ſmooth and unctuous. In its fracture it has alſo ſomewhat of a waxy appearance. It is of great hardneſs, and very tough. Its ſpecific gravity from 2.95 to 3.38. By calcination it becomes white and opake; but when free from foreign admixture, it is infuſible in the ſtrongeſt heat. By *Mr. Hæpfner*'s analyſis it appears to contain Carbonate of Magneſia 38, Silex 47, Carbonate of Lime 2, Alumine 4, Oxyde of Iron 9.

The hatchets and other tools, uſed by the inhabitants of the South-ſea Iſlands before the introduction of iron by the Europeans, were all made of this ſtone. By *Pott, Baumer,* and other authors, it has been confounded with ſerpentine.

VARIETY I. *AMORPHOUS.*

LXXVI. *a* 1. In poliſhed ſlabs, of a compact texture, ſemitranſparent, and of a wheyiſh colour. *China.*

LXXVII.

LXXVII. *a* 2. Two ſpecimens, ſemitranſparent; one of a light greeniſh colour with lighter coloured opake ſpots; the other of a light greeniſh white colour, artificially poliſhed. *Same place.*

LXXVIII. *a* 3. Semitranſparent, and of a greeniſh white colour. *China.*

LXXIX. *a* 4. In rounded nodules more or leſs tranſparent, and of various ſhades of yelloviſh green. *Scotland.*

LXXX. *a* 5. In a thin poliſhed ſlab, ſemitranſparent, and of a pale leek-green colour. *South-Sea Iſlands.*

LXXXI. *a* 6. Poliſhed pieces of the ſame, of a deeper green colour. *Same place.*

SPECIES XIV. *BAIKALITE.*

This ſtone, which has hitherto been found only on the borders of the lake *Baikal*, in *Siberia*, is of an olive green colour. It occurs in ſlightly tranſparent, ſhining, and ſomewhat unctuous tetrahedral, hexhedral, or octohedral priſms, terminated by oblique pyramids. Each cryſtal is from two to ten inches long, and from half to four inches thick. The ſurface is generally ſmooth, ſometimes longitudinally ſtriated. Fracture ſplintery. Nearly of ſufficient hardneſs to give fire with ſteel. Specific gravity 2.20. It does not efferveſce with acids, ſometimes reddens in the fire, and at laſt melts into a dark green glaſs. By the analyſis of *Lowitz* it contains Magneſia 30, Silex 44, Lime 20, Oxyde of Iron 6.

Vide Kirwan's Mineral. Vol. I. P. 509.

SPECIES XV. *BORACITE.*

Chaux Boracique, Fr.

This combination of boracic acid with lime and magneſia is found in ſolitary cubic cryſtals, entire or truncated, imbedded in reddiſh gypſum. They are generally of a white or greyiſh white colour and ſemitranſparent; of a ſhining ſurface, and laminated texture; they are ſo hard as to ſtrike fire with ſteel; ſpecific gravity from 2.07 to 2.56. They neither efferveſce nor diſſolve in acids, unleſs by the aſſiſtance of heat; when moderately heated they become electric like the tourmaline; by calcination they loſe their tranſparency, and under an intenſe heat melt. According to *Mr. Weſtrumb*'s analyſis, they contain Boracic Acid 68, Magneſia 13, Lime 11, Silex 1, Alumine 1, Iron 1. The Alumine, Silex, and Iron, he conſiders as accidental.

VARIETY

VARIETY I. *CRYSTALLISED.*

LXXXII. *a* 1. In ſolitary dodecahedral cryſtals, imbedded in reddiſh grey gypſum. *Luneburg, Hanover.*

LXXXIII. *a* 2. In detached ſemitranſparent cryſtals, of a greeniſh white colour, having the cube variouſly truncated. *Same place.*

GENUS V. *ARGILL.*

Alumine, Fr. *Thonerde*, Germ.

This earth is never found native in a ſtate of perfect purity. To obtain it wholly uncombined, it is neceſſary to precipitate it from a ſolution of ſulphate of alumine by pure ammonia.

The earth thus procured is of a ſnow white colour, ſmooth, unctuous, and eaſily diffuſible in water, with which it becomes plaſtic. In a ſtate of ordinary dryneſs it is capable of abſorbing $2\frac{1}{2}$ times its weight of this fluid, but contracts and ſqueezes out the greater part of it when expoſed to a freezing temperature. Specific gravity according to *Kirw.* 2.

It combines, though difficultly, with moſt of the acids, forming, with the ſulphuric, alum, with the others very deliqueſcent ſalts. When heated in the common fire, it decreaſes in bulk, and may be hardened to ſuch a degree as to give fire with ſteel; but can only be fuſed by the flame of oxygen gas. Microcoſmic ſalt and borax diſſolve it readily, the former with conſiderable effervеſcence, the latter with ſcarcely any. The fixed alkalis fuſe it with more difficulty, but even in the moiſt way when pure they have a very perceptible action on it. By expoſure to the higher degrees of heat it loſes the property of becoming plaſtic with water.

SPECIES I. *CARBONATE OF ARGILL.*

Lac Lunæ. Rein Thonerde, Germ.

Is of a ſnow white colour, ſomewhat harder than chalk, of a meagre but ſoft feel, and on examination by the microſcope, appears compoſed of minute tranſparent cryſtals. Specific gravity 1.669. It adheres but ſlightly to the tongue, and does not readily diffuſe itſelf through water. It effervеſces with acids, and is infuſible at 166° of *Wedgw.* According to the analyſis of *Mr. Schrieber*, by whom it was firſt found near *Halle* in the territory of *Magdebourg*, it conſiſts of Carbonate of Alumine, mixed with a little Carbonate and Sulphate of Lime, and ſome Oxyde of Iron.

VARIETY I. *OF PARTICULAR SHAPES.*

I. *a* 1. Carbonate of Argill, in detached reniform maſſes, white, friable, and compoſed of extremely fine particles. *Halle* near *Magdebourg.*

SPECIES II. *CLAY.*

A mixture of alumine and ſilex in any proportion, ſo that the maſs be ductile on mixture with water and harden in the fire, conſtitutes what is generally underſtood by the term clay. There are few clays however that do not contain a ſmall proportion of magneſia and oxyde of iron. They are found of different degrees of induration, and of various colours, derived from metallic oxyds or vegetable or bituminous matter. The proportion too of alumine and ſilex varies conſiderably, though the ſilex is uſually predominant, and on the different proportion of theſe two ingredients is founded the difference between procelain and potters clay. Such as contain only Alumine and Silex are infuſible in the common furnace. Clay is found uſually in extenſive beds or ſtrata.

VARIETY I. *AMORPHOUS.*

II. *a* 1. Clay of a dull white colour, ſoft, meagre, and ponderous; uſed in the manufacture of porcelain. *Saxony.*

III. *a* 2. The ſame intermixed with ſcales of white ſilvery mica. *Cornwall.*

This clay, according to the analyſis of *Mr. Wedgwood*, contains Alumine 60, Silex 20 per ct.

IV. *a* 3. White porcelain clay of a meagre feel. *St. Yries, Lemonge.*

The ſpecific gravity of this is, according to *Briſſon*, 2,348. By *Mr. Haſſenfraz's* analyſis it contains when dried, Silex 62, Alumine 19, Magneſia 12, and a little Sulphate of Baryte.

V. *a* 4. The ſame, in a pulverulent form. *Saxe-Gotha.*

VI. *b* 1. White porcelain clay, light, ſoft and unctuous. *Saxony.*

VII. *b* 2. The ſame, from *Halberſtadt.*

VIII. *b* 3. Somewhat leſs unctuous, from the neighbourhood of *Ratiſbon.*

IX. *b* 4. Porcelain clay, of a dull white colour with a mixture of red, and of a remarkably fine texture. *Germany.*

X. *b* 5.

X. *b* 5. The ſame, of a dull white colour ſlightly inclining to yellow, ponderous, compact, and ſomewhat unctuous. *Meiſſon.*

XI. *b* 6. The ſame, of a light olive colour, unctuous and compact. *Bologne.*

XII. *b* 7. The ſame, of a pale reddiſh white colour. *Cornwall.*

XIII. *b* 8. White porcelain clay, ſlightly inclining to blue (*pipe clay*). *Pool, Dorſetſhire.*

From the inferior part of the bed from which this clay is taken, and which is of a much whiter colour, the potteries in Staffordſhire and other parts of the kingdom are principally ſupplied.

XIV. *b* 9. Porcelain clay, of a very pale fleſh colour. *Italy.*

XV. *b* 10. Porcelain clay, white and friable. *Cornwall.*

This and Number III. appear to be the produce of the decompoſition of granite, and have been ſucceſsfully employed in the manufactories of *Mr. Wedgwood.*

XVI. *c* 1. Indurated clay, very unctuous, of a pale bluiſh red colour. *Cornwall.*

XVII. *c* 2. The ſame, of a dark brown colour. *Sileſia.*

XVIII. *c* 3. Of an ochre yellow colour. *Shotover-Hill, Oxfordſhire.*

XIX. *c* 4. Of a meagre feel, and dull white colour, and ſo hard as to ſtrike fire with ſteel. *Hornberg, Germany.*

XX. *d* 1. Clay of a flaty texture, and bluiſh grey colour, with vegetable impreſſions. (*Shale.*) *Shropſhire.*

XXI. *d* 2. The ſame, more compact and unctuous. *Same place.*

SPECIES III. *LITHOMARGA.*

Steinmark, Germ.

Of this *Mr. Kirwan* makes two varieties, the friable and the indurated. The friable of a white, or yellowiſh or reddiſh white colour, opake and with little or no luſtre, compoſed of very fine ſcaly particles, adhering ſtrongly to the tongue, of a ſmooth feel, and capable of being poliſhed by the nail. In water it immediately breaks and falls to powder.

The indurated of a grey, red, brown, yellow, or blue, of various ſhades and mixtures. Its ſurface ſmooth and poliſhed, of a fine grain, and generally of a ſoapy feel; ſome

 ſpecimens

ſpecimens ſo hard as ſcarcely to yield to the knife. Its fracture earthy, often conchoidal, ſpecific gravity 2.815. It crumbles more or leſs readily in water, and fuſes in a ſtrong heat into a porous maſs. It is found in the clefts of rocks, and forms a conſtituent part of ſome aggregated ſtones—The indurated lithomarga of *Oſmund*, according to the analyſis of *Bergman*, conſiſts of Alumine 11, Silex 60, Carbonate of Lime 5.7, Carbonate of Magneſia 0.5, Oxyd of Iron 4.7, Air and Water 18.

VARIETY I. *AMORPHOUS.*

a. Friable.

XXII. *b* 1. Indurated lithomarga of a carnation colour, unctuous to the feel and conchoidal in its fracture. *Salzbourg.*

XXIII. *b* 2. Of a violet colour, mottled with lilac and white, (*Terra miraculoſa*). *Planiz* near *Zwikaw, Saxony.*

XXIV. *b* 3. The ſame cut and poliſhed. *Same place.*

XXV. *b* 4. White indurated lithomarga, mixed with ochre yellow and black ſpots. *Siberia.*

XXVI. *b* 5. Of a yellowiſh white colour, cut and poliſhed. *Salzbourg.*

XXVII. *b* 6. Of a pale lavender blue colour, with fleſh coloured and whitiſh ſpots ſlightly ochry on the ſurface. *County of Antrim, Ireland.*

XXVIII. *b* 7. Of a yellow colour, mottled with blue and red. *Montmartre.*

XXIX. *b* 8. Of a violet colour, meagre feel, and porous texture.

SPECIES IV. *FULLERS EARTH.*

Terre à Foulons, Fr. *Walkerde*, Germ.

This occurs in ſtrata of a greeniſh yellow, bluiſh grey, greyiſh brown, greeniſh grey, greeniſh brown colour, &c. When freſh dug it is of moderate hardneſs, of a compact earthy texture, and unctuous feel. It has an earthy ſmell when breathed on, but does not adhere to the tongue, except when dry, and then but ſlightly. It breaks readily into powder in the mouth, and feels ſomewhat gritty between the teeth; immerſed in water it falls readily into a looſe powder. In the fire, it acquires a yellowiſh brown colour and ſtony hardneſs. At 90° *Wedgw.* it is converted into a porous ſlag. When pure

pure it does not effervefce with acids. Heated with microcofmic falt, it effervefces a little at firft, and is fomewhat diffolved, but the remainder is no farther acted on. With borax it is more corroded, and diffolves, though flowly; but with natron it effervefces powerfully. The finer kinds are found near *Reygate* in *Surrey*, *Maidftone* in *Kent*, and *Woburn* in *Bedfordfhire*.

According to *Bergman*'s analyfis of what he calls the *Hampfhire* fullers earth, which appears to be the fame with that found in *Surrey*, it contains Silex 51.8, Carbonate of Lime 3.3, Carbonate of Magnefia 0.7, Alumine 25.0, Oxyd of Iron 3.7, Water and other volatile matter 15.5.

VARIETY I. *AMORPHOUS.*

XXX. *a* 1. Fullers earth, of a greenifh yellow colour. *Reygate, Surrey.*

XXXI. *a* 2. The fame, of a yellowifh grey colour. *Same place.*

XXXII. *a* 3. Of an ochre yellow colour inclining to green. *Same place.*

XXXIII. *a* 4. The fame, of a paler colour. *Hampfhire.*

SPECIES V. *BOLE.*

This fubftance, which appears to differ from friable lithomarga only in the firmnefs of its texture, is defcribed as being moderately coherent, foft, compofed of very fine particles, fmooth to the touch, breaking eafily between the fingers, readily diffufible, and freely fubfiding in water. The *Terra-Lemnia*, ranked amongft the boles by *Mr. Kirwan* and others, contains, according to the analyfis of *Bergman*, Alumine 19, Silex 47, Carbonate of Lime 5.4, Carbonate of Magnefia 6, Oxyde of Iron 5.4, Water and Air 17.

VARIETY I. *AMORPHOUS.*

XXXIV. *a* 1. Bole of a tile-red colour, earthy texture, and friable. (*Armenian bole* of the fhops.) *Armenia?*

XXXV. *a* 2. The fame, of a lighter colour. *Same place.*

XXXVI. *a* 3. Of an orange-red colour, and fomewhat unctuous to the feel. *Blois, France.*

XXXVII. *a* 4. The fame, interfperfed with veins of yellow, and of a coarfer texture. *Stiria.*

XXXVIII.

XXXVIII. *a* 5. The ſame, of a pale pink colour, intermixed with green mica. *Saxony.*

XXXIX. *a* 6. In flatted nodules of a bluiſh colour.

XL. *a* 7. Different ſpecimens of bole artificially rounded, and ſtamped with a variety of impreſſions. (*Terræ Sigillatæ.*) *Hungary, Armenia, Lemnia, &c.*

SPECIES VI. *TRIPOLI.*

Tripel, Germ.

Its colour is yellow, red, or grey, of various ſhades; its texture fine grained, ſometimes looſely earthy, but generally indurated; of an harſh, dry, meagre feel; fracture earthy, flatly conchoidal or ſlaty; ſpecific gravity 1.850. It imbibes a conſiderable proportion of water, upon immerſion, and then, in a longer or ſhorter time, according to its hardneſs, falls to powder. It is not ſoluble in acids. It hardens in the fire, and at length vitrifies. The yellow and grey kinds, when expoſed to heat, become red. According to the analyſis of M. *Haaſſe*, it contains Silex 90, Alumine 7, Oxyde of Iron 3; though the Alumine and Iron are in general in greater proportions. It takes its name from *Tripoli* in *Africa*, where it was originally found.

VARIETY I. *AMORPHOUS.*

XLI. *a* 1. Tripoli of a light brown colour. *Tripoli, Africa.*

XLII. *a* 2. The ſame, of a pale yellow colour. *Bohemia.*

SPECIES VII. *LEPIDOLITE.*

The colour of this in the maſs, the form in which it generally occurs, is violet blue or purple, but in thin laminæ ſilvery white with a pearly luſtre; its texture foliated with fine grained diſtinct concretions; ſpecific gravity 2.816; eaſily ſcratched by the knife; brittle. Before the blow-pipe it melts with moderate ſpumeſcence, into a white ſemi-tranſparent enamel. With mineral alkali it ſlightly effervesces, affording a red and blue ſpotted maſs. Borax readily diſſolves it, microcoſmic ſalt with more difficulty. When expoſed to a red heat, it aſſumes a yellow colour, loſing about 1 per cwt. of its weight. In a melting heat it loſes 25 per cwt. and runs into an opake reddiſh grey enamel. By *Klaproth's* analyſis it conſiſts of Silex 54.5, Alumine 38.25, Oxyde of Iron and Manganeſe 0.075; Water and Air 2.5. Found principally at *Rozena* in *Moravia.*

VARIETY

VARIETY I. *CRYSTALLISED.*

XLIII. *a* 1. Lepidolite in a very compreſſed tatrahedral rhomboidal priſm of a white colour; ſemitranſparent and of a glaſſy luſtre (*Glaſſy Lepidolite*), with a granular calcareous ſubſtance adhering, called by ſome *Calcareous Lepidolite*. *Tyrol.*

XLIV. *a* 2. The ſame, in ſmall cryſtals imbedded in white flaty talk. *Spain.*

XLV. *a* 3. In flatted irregular cryſtals, of a dull white colour and confuſedly aggregated? *Sweden.*

XLVI. *a* 4. The ſame, in leſs diſtinct cryſtals, of a more pearly luſtre, on grey emery? *Turkey.*

VARIETY II. *AMORPHOUS.*

XLVII. *a* 1. Lepidolite in the maſs, of a pale purple colour, intermixed with ſilvery ſcales. *Mabrin, Bohemia.*

SPECIES VIII. *SAPPARE.*

Cyanite, Wern.

The colour of this ſtone is bluiſh, greeniſh or yellowiſh grey, with deep blue ſtreaks and ſpots of ſilvery white, with pearly luſtre; in thin pieces ſemitranſparent. It ſometimes occurs in compreſſed tetrahedral priſms, but its more frequent form is in irregularly lamellated maſſes. It is brittle, gives fire with ſteel, and feels ſomewhat greaſy; ſpecific gravity 3.092 to 3.517. When expoſed to a heat of 157° *Wedw.* it becomes almoſt perfectly white, but ſhews no ſign of fuſion. It is difficultly fuſed by borax, ſcarcely by microcoſmic ſalt, and not at all by fixed alkalis. It contains, according to the analyſis of *Sauſſure Jun.* Alumine 0.6692, Magneſia 0.1325, Silex 0.1281, Lime 0.0171, Oxyde of Iron 0.0548. It is found for the moſt part in mountains of granite.

VARIETY I. *CRYSTALLISED.*

XLVIII. *a* 1. Sappare in compreſſed tetrahedral priſms, of a ſky blue colour, in white ſilvery micaceous quartz. *Zillerthal, Tyrol.*

XLIX. *a* 2. In ſemitranſparent priſmatic columns of the ſame colour, with pale violet coloured felſpar and quartz. *Same place.*

SPECIES IX. *MICA.*

Glimmer, Germ.

Is for the moſt part either of a yellowiſh or greeniſh grey, ſilvery white, browniſh, reddiſh, yellowiſh, greeniſh or blackiſh colour. It has commonly a metallic luſtre, and a conſiderable degree of tranſparency, flexibility, and elaſticity; feels ſmooth, but not greaſy; is readily ſcratched by the knife, and varies in its ſpecific gravity from 2.654 to 2.934. It is fuſible with more or leſs difficulty according to its degree of colour. It is ſometimes found cryſtalliſed in thin hexagonal plates, or in hexhedral priſms compoſed of an accumulation of theſe; but occurs moſt commonly in detached fragments or undulatingly foliated maſſes, entering as a conſtituent part into granite, gneiſs and other primitive ſtones. According to *Kirwan* the common mica contains Silex 38, Alumine 28, Magnenia 20, Oxyde of Iron 20.

VARIETY I. *CRYSTALLISED.*

L. *a* 1. Mica in hexagonal tabular cryſtals of a green colour, cloſely united, and ſet edgeways; with cryſtals of brown ſpathoſe tin ore, imbedded on the ſurface.

Altenberg.

LI. *a* 2. In aggregated hexagonal cryſtals of a bright browniſh white colour, with tranſparent quartz. *Tyrol.*

LII. *a* 3. Of a darker colour with white quartz, and ſmall cryſtals of cubic fluor of a dark purple colour, truncated at their ſolid angles. *Same place.*

LIII. *a* 4. In ſmall irregularly aggregated cryſtals of a ſhining green colour, intermixed with oxyd of iron. *Ehrenfriederſdorf.*

LIV. *a* 5. Forming a large hexagonal plate of a ſmoky grey colour. *South America.*

LV. *a* 6. In ſmall greeniſh brown cryſtals intermixed with ſhattery quartz.

Tyrol.

LVI. *b* 1. In ſmall indeterminate aggregated laminæ of a dark reddiſh brown colour, interſperſed with a ſmall proportion of fleſh-coloured decompoſed felſpar.

Auvergne.

LVII. *b* 2. In irregular aggregated laminæ of a dark brown colour, intermixed with white quartz. *Tyrol.*

LVII. *b* 3.

LVIII. *b* 3. In ſmall rhomboidal plates of a ſilvery white colour, interſperſed through reddiſh feltſpar. *South America.*

VARIETY II. *AMORPHOUS.*

LIX. *a* 1. Mica in broad flat laminæ, of a bright ſilvery white colour, imbedded in white quartz. *Bohemia.*

LX. *a* 2. In large aggregated undulating laminæ, of a tarniſhed ſilvery white colour, with blende and galena. *Bannat.*

LXI. *a* 3. The ſame, of a darker colour, imbedded in pale red feltſpar, intermixed with white quartz. *Scotland.*

LXII. *a* 4. In ſmall ſilvery ſcales with a greeniſh tinge, intermixed with white quartz. (*Star Stone.*) *Sweden.*

LXIII. *a* 5. In broad laminæ of a dark brown colour, aggregated into an irregular maſs, and interſperſed with greeniſh feltſpar. *Cornwall.*

LXIV. *a* 6. In irregular plates, compoſed of large ſhining laminæ of a browniſh black colour. *Ruſſia.*

LXV. *a* 7. Forming a detached portion, compoſed of broad laminæ of a greeniſh brown colour. *Bohemia.*

LXVI. *a* 8. The ſame, compoſed of large ſhining laminæ, cloſely compacted, and of a ſilvery grey colour. *Scotland.*

LXVII. *a* 9. Forming a vein, compoſed of cloſely compacted ſhining laminæ of a dark brown colour, in red hematite. *Altenberg.*

LXVIII. *a* 10. In ſmall laminæ of a golden colour, imbedded in brown ſand ſtone. *Bohemia.*

LXIX. *a* 11. In ſmall cloſely compacted ſcales, of a golden colour inclining to brown. *France.*

LXX. *a* 12. Forming parallel ſtriæ, of a ſilvery white colour, in white ſand ſtone. *Same place.*

LXXI. *a* 13. In ſmooth and ſhining laminæ, of a ſmoky grey colour. *Muſcovy.*

LXXII. *a* 14. In minute ſcales ſlightly cohering, of a light ſilver colour with an admixture of red. *France.*

LXXIII. *a* 15. In looſe ſcales (*Chaffy Mica*) of the following colours, white, yellowiſh white, reddiſh white, brown, reddiſh brown, and light green.

The laſt from *Scotland*, the others from *France*.

SPECIES X. *MICARELLE.*

(So called by *Kirwan.*)

Found in granite, of a browniſh black colour, and metallic luſtre; opake, of a foliated texture and moderate hardneſs; ſpecific gravity 2.980; melts at 153, *Wedgw.* into a black compact glaſs. According to the analyſis of *Klaproth*, conſiſts of Alumine 63, Silex 29, Oxyde of Iron 7; but by that of *Bergman* it agrees preciſely with the ſilvery mica of *Altenberg*.

VARIETY I. *AMORPHOUS.*

a. Interſperſed.

SPECIES XI. *HORNBLENDE.*

Under this ſpecies are comprehended the *Cryſtalliſed or Baſaltic Hornblende*, the *common Hornblende*, and the *Schiſtoſe Hornblende*.

The colour of the *baſaltic* is black, greeniſh black, or dark or yellowiſh green; in very thin pieces ſemitranſparent; texture laminated; gives fire readily with ſteel; ſpecific gravity 3.333. It cryſtalliſes in hexhedral priſms with trihedral pyramids having rhombic faces, or in tetrahedral priſms, with dihedral ſummits, or in compreſſed hexhedral priſms with oblique dihedral ſummits, or in rhomboidal decahedrons. At 119 *Wedgw.* it melts into a greyiſh or greeniſh black glaſs. According to *Bergman*'s analyſis, it contains Silex 58, Alumine 27, Lime 4, Magneſia 1, Oxyde of Iron 9. Found in *Lava*, *Baſalt*, *Wacken*, and *Granite*.

The *common Hornblende* is of a black, greyiſh black or dark green colour; opake, tough, and of a foliated fracture; may be ſcratched by the knife, and gives a greeniſh ſtreak; ſpecific gravity from 2.660 to 3.880; melts *per ſe* at 89 *Wedgw.* into a black glaſs with grey ſpots. According to the analyſis of *Kirwan*, it contains Silex 37, Alumine 22, Carbonate of Magneſia 16, Carbonate of Lime 2, and Oxyde of Iron 23.

The *Schiſtoſe Hornblende* is of a greyiſh black, greyiſh green, or greyiſh blue colour; frequently

frequently of a ſilky luſtre; opake; texture ſtriated; gives a greeniſh grey ſtreak; and breaks with difficulty; ſpecific gravity from 2.909 to 3.155. When heated it acquires a reddiſh tinge, and fuſes at 80, *Wedgw.* into a black compact glaſs. Found in large maſſes.

VARIETY I. *CRYSTALLISED.*

a. In hexhedral priſms with trihedral pyramids having rhombic faces.

b. In tetrahedral priſms with dihedral ſummits.

LXXIV. *c* 1. Hornblende in ſmall compreſſed hexhedral priſms, terminated by oblique dihedral ſummits, of a ſhining black colour, imbedded in white friable quartz, with greeniſh yellow mica. *Veſuvius.*

LXXV. *d* 1. In rhomboidal decahedrons, having the acute edges of the baſes of the pyramids truncated, imbedded in an ochry indurated clay. *Scotland.*

R. de L. Pl. 5. *Fig.* 10.

LXXVI. *d* 2. The ſame, in detached cryſtals. *Bohemia.*

LXXVII. *d* 3. The ſame, in more ſplendid cryſtals, of a darker colour, with cryſtalliſed mica and quartz. *Veſuvius.*

LXXVIII. *d* 4. The ſame, imbedded in a brown argillaceous cement. *Same place.*

LXXIX. *e* 1. Hornblende, forming a confuſedly cryſtalliſed maſs. *Sweden.*

LXXX. *e* 2. In irregular cryſtals with olivin, imbedded in dark grey trap. *Ireland.*

LXXXI. *e* 3. Of a dull colour, and compact texture. *Johngeorgenſtadt.*

VARIETY II. *AMORPHOUS.*

LXXXII. *a* 1. Hornblende, compoſed of ſmall compacted laminæ of a dark greeniſh grey colour. *Sweden.*

LXXXIII. *a* 2. In an irregular maſs, compoſed of broad ſhining laminæ, intermixed with ochre of iron. *Salzbourg.*

LXXXIV. *a* 3. Compoſed of very broad laminæ of a dark blackiſh brown colour. *Ebrenfridersdorf.*

LXXXV. *a* 4. Of a dark blackiſh brown colour, intermixed with green feltſpar. *Norway.*

LXXXVI. *a* 5. In ſmall black ſhining ſcales, intimately intermixed and ſtratified with white quartz. *Norway.*

b. Striated.

LXXXVII. *c* 1. Hornblende of a dark grey colour and ſlaty texture, compoſed of folia aggregated into broom-like faſciculi *(Schiſtoſe Hornblende).* *Scotland.*

LXXXVIII. *c* 2. Of a lighter brown colour and duller aſpect. *Altenberg.*

SPECIES XII. *RESPLENDENT HORNBLENDE.*

Of this there are two varieties, the *Labrador Hornblende* and *Schiller Spar.* The colour of the former is greyiſh black, reflecting a ſtrong iron grey, mixed with dark copper red. It is opake; of a curved foliated fracture, gives fire plentifully with ſteel; ſpecific gravity from 3.35, to 3.434.

The colour of the latter is yelloviſh, greeniſh, or golden yellow, reflecting a white, grey, or yellow; of a metallic luſtre, and in thin pieces ſlightly ſemitranſparent; its fracture foliated; its hardneſs uſually inferior to that of the former variety; ſpecific gravity 2.882. At 141, *Wedgw.* forms a porcelain maſs. According to the analyſis of *Gmelin*, contains Silex 4.37, Alumine 1 79, Magneſia 1.12. Oxyde of Iron 2.37. Found uſually in *Serpentine.*

VARIETY I. *AMORPHOUS.*

LXXXIX. *a, aa* 1. Reſplendent hornblende of a greyiſh copper red colour, and foliated texture. *Labrador.*

XC. *a, bb* 1. Of a light greeniſh grey colour, in dark green ſerpentine *(Schiller ſpar).* *Baſta, Hartz.*

XCI. *a, bb* 2. The ſame, cut and poliſhed. *Same place.*

SPECIES XIII. *BASALT.*

Its colour is greyiſh black, bluiſh or browniſh black, on expoſure to air acquiring a reddiſh brown, from the oxydation of its iron. It is opake; of a fine ſplintery fracture; gives fire difficultly with ſteel; ſpecific gravity from 2.864 to 3.000. It occurs in columns of different ſizes, the number of ſides varying from three to nine; ſometimes articulated, ſometimes with ſimple tranſverſe ſections or joints, and frequently entire.

entire. At 100° *Wedgw.* it melts into a black compact glaſs. According to the analyſis of *Bergman*, it contains Silex 50, Alumine 15, Carbonate of Lime 8, Oxyde of Iron 25, Magneſia 2. Its chief varieties are *Baſalt* properly ſo called, *Trap*, *Wacken*, *Mullen*, *Kragg*, &c. differing from each other in form, texture, ſpecific gravity, and fuſibility. Baſalt is found no where in more numerous and perfect columns than at the Giant's Cauſeway on the north coaſt of *Ireland*, and the correſponding coaſt of *Scotland*.

VARIETY I. *OF PARTICULAR SHAPES.*

XCII. *a* 1. Portion of a trihedral baſaltic column internally of a bluiſh black colour, externally of a browniſh ochry appearance. *Coaſt of Antrim, Ireland.*

XCIII. *a* 2. The ſame, with irregular faces. *Vicentine Territories.*

XCIV. *a* 3. The ſame, cut and poliſhed on one ſide. *Monte Bolca, Veroneſe.*

XCV. *a* 4. In a rounded fragment of the ſame colour and texture, cut and poliſhed. Near *Caſſel.*

b. Tabular.

c. Lenticular.

VARIETY II. *AMORPHOUS.*

XCVI. *a* 1. Baſalt of a dark liver brown colour mixed with green, with a vein of greeniſh grey lime-ſtone. *Fahlun, Sweden.*

XCVII. *a* 2. Of a bluiſh black colour and fine grain. *Coaſt of Antrim, Ireland.*

XCVIII. *a* 3. Of a blackiſh grey colour, and coarſer grain. *Arthur's Seat* near *Edinburgh.*

XCIX. *b* 1. Of a bluiſh black colour, and coarſe grain; (*Rowley Rag.*) *Staffordſh.*

Found by Dr. *Withering* to conſiſt of Silex 47½, Alumine 32½, Oxyde of Iron 20. *Phil. Tranſ.* 1782.

C. *b* 2. Of a reddiſh brown colour, extremely hard and compact. Near *Edinburgh.*

CI. *b* 3. Of a coarſer texture and greeniſh grey colour. *Iſle of Bute.*

CII. *b* 4. Of a blackiſh grey colour, coarſe grain, and extremely hard. *Derbyſhire.*

CIII. *b* 5. Of a bluiſh grey colour, and coarſe earthy texture, incloſing irregular nodules of white calcareous ſpar. (*Toadſtone.*) *Same place.*

CIV. *b* 6.

CIV. *b* 6. The ſame, of a chocolate brown colour, cut and poliſhed. *Same place.*

CV. *b* 7. Of a reddiſh grey colour (*Kragg*) incloſing rounded maſſes of zeolite. *Antrim.*

CVI. *b* 8. The ſame, of a redder colour. *Same place.*

SPECIES XIV. *CALP.*

Quarry Stone of Dublin.

This ſtone is deſcribed by *Mr. Kirwan* as follows: its colour dark greyiſh blue, interſected with veins of white calcareous ſpar; opake; of a fine ſplintery fracture, ſplitting eaſily into large flags; yields with difficulty to the knife; ſpecific gravity from 2.646 to 2.70. It gives a white ſtreak, effervesces with mineral acids, and, when breathed on, has an earthy ſmell. At 130 *Wedgw.* melts into a black compact glaſs, and contains 50 per cwt. of Carbonate of Lime, the remainder Alumine, Silex, and Iron.

VARIETY I. *AMORPHOUS.*

CVII. *a* 1. Calp of a bluiſh black colour, having its ſurface covered with minute brilliant cryſtals of cubic pyrites. *County of Dublin, Ireland.*

SPECIES XV. *ARGILLACEOUS SCHISTUS.*

Slate, Ardoiſe, Fr. *Thon Schiefer*, Germ.

Its uſual colours are bluiſh, greeniſh, greyiſh or reddiſh purple, ſometimes in ſtripes or ſpots. It has frequently a ſmall degree of luſtre, ariſing from interſperſed glimmering particles, with a very ſlight ſemitranſparency. Its texture is flaty, compoſed of laminæ of various degrees of thickneſs, ſtrait, curved or undulating. It generally yields eaſily to the knife, and is never ſo hard as to give fire with ſteel. Its ſpecific gravity varies from 2.67 to 2.88. Moſt varieties imbibe water, but in very different proportions. The chief are *Argillite, Killas, Grapholite*; all which are found in conſiderable ſtrata.

VARIETY I. *AMORPHOUS.*

CVIII. *a, b, c.* Argillaceous ſchiſtus in ſlabs of different colours.

CIX. *d* 1. Of a bluiſh black colour and ſoft texture. *Saxony.*

CX. *d* 2.

CX. *d* 2. Of a black colour and ſofter texture (*Grappolite*). *Saxony.*
The hardneſs of this variety ſcarcely exceeds that of chalk; ſpecific gravity 2.70; when powdered it effervefces with acids.

CXI. *d* 3. Of a greeniſh grey colour, micaceous, and incloſing cubic pyrites. *Scotland.*

CXII. *d* 4. In a poliſhed ſlab of a greyiſh blue colour. *Weſtmoreland.*

CXIII. *d* 5. Of a bluiſh black colour, impregnated with alum (*Aluminous Schiſtus*). *Redechambach.*

CXIV. *d* 6. The ſame, of a fleſh red colour. *Whitby.*

SPECIES XVI. *NOVACULITE.*

Turkey Hone. Pierre à raſoir, Fr. *Wetzſtein*, Germ.

Its colour is greeniſh grey, or pale greyiſh yellow, of a ſlight degree of luſtre and ſemitranſparency; texture in large maſſes ſlaty; occaſionally hard enough to afford a few ſparks with ſteel. It has generally a ſlightly unctuous feel, and ſometimes effervefces with acids. Specific gravity from 2.609 to 2.955. At 120 *Wedgw.* it either hardens or melts into a porous enamel. Found in large maſſes.

VARIETY I. *AMORPHOUS.*

CXV. *a* 1. Novaculite of a pale greyiſh yellow colour and fine grain. *Turkey.*

SPECIES XVII. *SULPHATE OF ARGILL.*

Native Alum. Sulphate d'Alumine, Fr.

Is found either cryſtalliſed, or in delicately white or yellowiſh white capillary filaments of a ſilky luſtre, or forming incruſtations on lava, or in ſoft amorphous maſſes with a ſomewhat greaſy feel, or diſperſed through marſhy ſoils or ſands, or impregnating argillaceous ſchiſtus or foſſil wood, or in ſolution. It is characteriſed, when pure, by its aſtringent taſte, ready ſolubility in water, and the regular octohedral form of its cryſtals. Its contains Alumine 18, Sulphuric Acid 19, Water 63.

VARIETY I. *CRYSTALLISED.*

a. In regular octohedrons.

CXVI. *b* 1.

CXVI. *b* 1. In capillary filaments of a white colour and silky lustre, on grey aluminous schistus. *Stahlberg.*

CXVII. *b* 2. In long detached silky filaments. (*Haarsalz*, Germ.) *Sicily.*

VARIETY II. *AMORPHOUS.*

Mountain Butter.

VARIETY III. *IN SOLUTION.*

GENUS VI. *SILEX.*

Kieselerde, Germ.

This earth is never found naturally in a state of perfect purity. It may however be procured so artificially by fusing powdered quartz with three or four times its weight of either of the fixed alkalies, dissolving the mass in water, and precipitating the earth by adding any of the mineral acids in excess, and afterwards washing the precipitate in distilled water. It may also be procured by digesting quartz, or any other natural form of silex in the nitric acid, by which all heterogenous substances are taken up and the pure silex left undissolved. In this state it is white, insipid, of a dry harsh feel, and does not become plastic on mixture with water. Though commonly supposed to be insoluble in water, it dissolves, according to *Kirwan*, in 1000 times its quantity of this fluid after precipitation from alkaline solutions. It is not acted on by any of the acids but the fluoric. In the humid way it dissolves in six times its quantity of either of the fixed alkalies, and in the dry way is capable of combining with them in any proportion. It melts with soda with effervescence, with borax slowly and without effervescence, more difficultly with microcosmic salt. It combines also by fusion with most of the metallic oxydes, especially those of lead. By itself it is incapable of being fused even in the most intense degree of heat. Many of the compounds of this earth are remarkable for their hardness, transparency, and lustre.

SPECIES I. *DIAMOND.*

The diamond is the hardest, most transparent, and brilliant of all mineral substances. It is usually without colour, but is found occasionally, black, yellow, green, blue, brown, or grey; its medium specific gravity 3.521. It occurs either in flatted or rounded grains, or regular octohedrons or dodecahedrons, with their varieties, and

and ſometimes in cubes. Its texture generally laminated, but ſometimes irregularly fibrous. Like the other gems, it becomes electric on being rubbed, and phoſphoric on expoſure to the rays of the ſun. It differs, however, according to modern experiments from the other precious ſtones, in being wholly inflammable, and convertible, by union with oxygen, into carbonic acid. It is found in the provinces of *Golconda* and *Viſapour* in the *Eaſt-Indies*, and in *Braſil*, either in the beds of torrents, or in yellow ferruginous earth, under quartzoſe or ſandſtone rocks.

VARIETY I. *CRYSTALLISED.*

I. *a* 1. In a tranſparent colourleſs rectangular octohedron. *Golconda.*

II. *a* 2. In detached 24 ſided cryſtals of different ſizes and colours.
R. de L. Pl. 3. *Fig.* 17, 18. *Golconda* and *Braſil.*

b. In dodecahedrons and their varieties.

c. Indeterminate.

SPECIES II. *SAPPHIRE.*

The uſual colour of this gem is ſome ſhade of blue, but it occurs alſo of a yellow and red colour, and ſometimes, though rarely, green. Its figure lengthened hexhedral pyramids applied baſe to baſe; its fracture foliated; hardneſs 17, the diamond being eſtimated at 20; ſpecific gravity about 3.991. It produces a ſingle refraction like the diamond. It is infuſible, and commonly preſerves its colour in the moſt intenſe furnace heat, but by means of oxygen gas is reducible to an enamel. It is found in various parts of the *Eaſt-Indies*, but principally in the iſland of *Ceylon*, and contains, according to *Bergman*, Alumine 0.58, Silex 0.35, Carbonate of Lime 0.5, and Oxyde of Iron 0.2.

VARIETY I. *CRYSTALLISED.*

a. In lengthened hexhedral pyramids joined baſe to baſe.
R. de L. Pl. 6. *Fig.* 39.

III. *b* 1. In poliſhed ſpecimens of different colours. *Perſia* and *Ceylon.*

SPECIES III. *TOPAZ OF BRASIL.*

The colour of this ſtone is golden yellow inclining to orange, ſometimes however much paler, and even almoſt white. Its figure the tetrahedral rhomboidal priſm termi-

nated by tetrahedral pyramids; its fracture foliated; refraction double; hardneſs 16; ſpecific gravity 3.536. When heated it becomes red. At 160 *Wedgw.* it is fuſible *per ſe*. It is vitrifiable by borax, and by oxygen gas convertible into an enamel. It is procured from *Braſil*, but has not yet been analyſed.

VARIETY I. *CRYSTALLISED.*

IV. *a* 1. In tetrahedral rhomboidal priſms terminated by tetrahedral pyramids, of different ſhades of colour and ſize. *Braſil.*

R. de L. Pl. 5. *Fig.* 20.

V. *a* 2. Fragments of large cryſtals of the ſame. *Same place.*

b. Indeterminate.

SPECIES IV. *TOPAZ OF SAXONY.*

The colour of this is paler than that of the former, being generally of a wine yellow; its fracture alſo foliated; its hardneſs 14; ſpecific gravity 3.564. It occurs in tetrahedral rhomboidal priſms terminated by dihedral ſummits. When heated it becomes white. At 160 *Wedgw.* it cracks, and by oxygen gas is converted into an enamel. It is found generally with cryſtalliſed quartz at *Schnekenſtein* in *Saxony*, and, according to the analyſis of *Weigleb*, contains Silex 52, Alumine 44, Lime 2, Oxyde of Iron .03.

VARIETY I. *CRYSTALLISED.*

VI. *a* 1. In tetrahedral rhomboidal priſms with dihedral ſummits, and their modifications. *Schnekenſtein Voigtland.*

R. de L. Pl. 3. *Fig.* 77.

VII. *a* 2. Portion of an unuſually large priſm of the ſame, of a pale yellow colour, having the apex of the pyramid deeply truncated. *Same place.*

VIII. *a* 3. In ſmall cryſtals, with cryſtalliſed quartz, on amorphous grey quartz. *Same place.*

IX. *b* 1. In rounded detached portions, ſome poliſhed on the ſurface. *Same place.*

X. *b* 2. The ſame, of a lighter colour, cut and poliſhed. *Same place.*

SPECIES

SPECIES V. *BERYL OF SIBERIA.*

Agrees with the preceding in figure, texture, hardneſs, and, in ſhort, in every reſpect, except with regard to colour, which is a pale ſea green, inclining to blue. It is found in *Siberia*, ſometimes in cryſtals of much greater magnitude than thoſe of the Saxon topaz. It has not yet been analyſed.

VARIETY I. *CRYSTALLISED.*

XI. *a* 1. Portion of a tetrahedral rhomboidal priſm, having its dihedral ſummit deeply truncated. *Salthſen Eybenſtock.*

R. de L. Pl. 5. *Fig.* 79.

XII. *b* 1. Portions of the ſame, cut and poliſhed. *Same place.*

SPECIES VI. *RUBY.*

Of this ſtone there are two varieties, the *Spinelle* and the *Balais*, both differing from the oriental ruby of authors, which, from its form and hardneſs, appears to be only a ſapphire of a ruby colour. The *Spinelle* is of a bright red colour; its ſpecific gravity according to *Briſſon* 3.7600; its hardneſs 13. The *Balais* is of a pale roſe colour; ſpecific gravity 3.5311; hardneſs alſo 13. The texture of both is laminated; their figure the aluminiform octohedron with its modifications. On expoſure to the moſt violent heat, even that of the focus of a lens, the ruby undergoes no alteration; but it is fuſible both with microcoſmic ſalt and borax, with the latter without efferveſcence.

According to *Bergman's* analyſis, it contains Alumine 0.40. Silex 0.39, Lime 0.09, Oxyde of Iron 0.10; by *Klaproth's*, Alumine 76, Silex 16, Lime 1, Oxyde of Iron 3. Found in *Perſia*, *Ceylon*, and the *Braſils*.

VARIETY I. *CRYSTALLISED.*

XIII. *a* 1. In detached octohedrons of different ſizes and their varieties. *Ceylon.*

R. de L. Pl. 3. *Fig.* 1.

XIV. *b* 1. Indeterminate portions of the ſame. *Braſil.*

SPECIES VII. *EMERALD.*

Smaragd, Germ.

The colour of the emerald is graſs green of different ſhades; its hardneſs 12; ſpecific gravity 2.775; its fracture conchoidal; refraction double. Its cryſtals aſſume the form

of truncated hexhedral prifms, with their modifications. It melts at 150 *Wedgw.* into an opake colourlefs mafs. The mineral alkali fufes it with difficulty, but it yields more eafily to microcofmic falt or borax. It contains, according to the analyfis of *Bergman*, Alumine 60, Silex 24, Lime 8, Oxyde of Iron, 6. Found chiefly in *Peru*.

VARIETY I. *CRYSTALLISED.*

XV. *a* 1. In truncated hexhedral prifms, with white calcareous fpar, imbedded in a browniſh calcareous cement. *Peru.*

R. de L. Pl. 4. *Fig.* 18.

XVI. *a* 2. A detached portion of the fame. *Same place.*

XVII. *b* 1. Smaller pieces of the fame cut and polifhed. *Same place.*

SPECIES VIII. *AQUA MARINE.*

Under this fpecies are included the *Emerald*, *Aqua Marine* and *Cryfolite* of *Siberia*. Its colour is green, greyifh green or yellow; its hardnefs 11; fpecific gravity from 2.65 to 2.722; fracture foliated; refraction fingle. Like the emerald, it occurs in truncated hexhedral prifms with their varieties, which differ however from thofe of that gem in being longitudinally ftriated. When heated it decrepitates, but does not melt in a heat of 150 *Wedgw.* The mineral alkali acts moft ftrongly upon it, borax very little, and microcofmic falt fcarcely at all. According to Mr. *Bindheim*'s analyfis its conftituent parts are Silex 6.4, Alumine 2.4, Lime 0.8, Oxyde of Iron 0.1½

Found in the high mountains near *Schlangenberg* in *Siberia*.

VARIETY I. *CRYSTALLISED.*

XVIII. *a* 1. Portion of a truncated hexhedral prifm, of a pale greenifh blue colour, longitudinally ftriated. *Siberia.*

* XVIII. A large cryftal of the fame. *Same place.*

XIX. *a* 2. Portions of the fame cut and polifhed. *Same place.*

SPECIES IX. *CRYSOLITE.*

The colour of this is moft ufually yellowifh green, mixed with brown; its hardnefs according to *M. Quift* 10; its fpecific gravity from 3.34 to 4.41; fracture conchoidal; refraction double. It occurs in hexhedral ptifms, terminated by hexhedral pyramids, differing

differing however from thoſe of quartz in the meaſurement of their angles. It is infuſible at 150 *Wedgw.* but by oxygen gas is converted into an enamel. Borax and microcoſmic ſalt facilitate its fuſion, but alkalis have little or no action on it. According to *M. Archard*'s analyſis it contains, Silex 0.15, Alumine 0.64, Lime 0.17, Oxyde of Iron 0.01.

Found in the *Eaſt-Indies*, the *Braſils*, and various parts of *Europe*.

VARIETY I. *CRYSTALLISED.*

XX. *a* 1. In detached compreſſed hexhedral priſms with correſponding pyramids and their modifications. *Red Sea.*

R. de L. Pl. 6. *Fig.* 17, 18.

XXI. *a* 2. The ſame, in ſmaller cryſtals of a light yellow colour. *Braſils.*

XXII. *a* 3. In detached rounded nodules. *Same place.*

XXIII. *a* 4. In portions, cut and poliſhed. *Eaſt-Indies.*

SPECIES X. *HYACINTH.*

The colour of this ſtone is red, with various proportions of brown; it is ſometimes alſo found colourleſs; its hardneſs 12 or 13; ſpecific gravity according to *Delametherie* 4.385; but according to *Briſſon* 3.6873; its ſurface ſmooth; its fracture foliated; refraction double. It is found cryſtalliſed in dodecahedrons with unequal rhombic faces, conſidered by *Delametherie* as derived from the octohedron. Some ſpecimens melt at about 160 *Wedgw.* Alkalis have no effect on it, but it yields to borax and microcoſmic ſalt.

According to the analyſis of *Bergman*, it contains Alumine 40, Silex 25, Carbonate of Lime 20, Oxyde of Iron 13. According to *Klaproth* Jargon Earth 70, Silex 27, Oxyde of Iron, .5, Loſs 4.5. Found in *Ceylon* and the brook *Eſpailly* in the South of *France*.

VARIETY I. *CRYSTALLISED.*

XXIV. *a* 1. In dodecahedrons with unequal rhombic faces, of a dull greeniſh colour.

R. de L. Pl. 4. *Fig.* 106. *Ebinſtock.*

XXV. *a* 2. In lengthened tetrahedral priſms with tetrahedral pyramids, of a browniſh red colour. *Ceylon.*

R. de L. Pl. 4. *Fig.* 114, 115.

XXVI. *a* 3. Irregular fragments of the ſame. *Same place.*

XXVII.

XXVII. *a* 4. Portion of a large cryſtal, cut and poliſhed. *Same place.*

XXVIII. *a* 5. Portions cut and poliſhed. *Bohemia.*

XXIX. *b* 1. In ſmall granular portions. *Same place.*

XXX. *b* 2. In rounded portions of a pale browniſh yellow colour. *Ceylon.*

SPECIES XI. *HYACINTH OF VESUVIUS.*

The colour of the hyacinth of *Veſuvius* is generally a deep brown, or greeniſh yellow; its ſpecific gravity 3.409; hardneſs 9; fracture laminated. It occurs in tetrahedral priſms truncated at their edges, terminated by tetrahedral pyramids truncated at their ſummits. It fuſes into a greeniſh ſpongy glaſs. Its analyſis according to *Mr. Stucke* is Silex 26, Magneſia 40, Lime 16. Oxyde of Iron 16. Found imbedded in the erupted matter of volcanos, particularly thoſe of *Veſuvius, Sileſia*, and *China*.

VARIETY I. *CRYSTALLISED.*

XXXI. *a* 1. In tetrahedral priſms truncated at their angles, terminated by tetrahedral pyramids truncated at their ſummits, of a reddiſh brown colour, ſemitranſparent and ſplendid on the ſurface, on a volcanic calcareous matrix intermixed with greeniſh grey mica. *Neighbourhood of Naples.*

R. de L. Pl. 4. *Fig.* 125.

XXXII. *a* 2. The ſame, in ſmall cryſtals, of a yellowiſh brown colour, having the priſms very ſhort, on a ſimilar matrix. *Same place.*

R. de L. Pl. 4. *Fig.* 121.

XXXIII. *a* 3. In large aggregated cryſtals, of a browniſh olive green colour, with deeper truncations, on a white calcareous matrix without mica. *Same place.*

R. de L. Pl. 4. *Fig.* 126.

XXXIV. *a* 4. In ſplendid cryſtals, of a yellowiſh brown colour, in a greeniſh grey micaceous matrix. *Same place.*

XXXV. *a* 5. In larger and more ſplendid cryſtals, with thoſe of the mica remarkably perfect. *Same place.*

XXXVI. *a* 6. The ſame, in long priſmatic cryſtals, very ſplendid and ſtriated on the ſurface, on a micaceous matrix. *Same place.*

XXXVII. *a* 7. In numerous cryſtals, nearly of the ſame colour and configuration with the former, but more confuſedly aggregated, and the mica of the matrix diſtinctly cryſtalliſed. *Same place.*

XXXVIII. *a* 8. The ſame, with greeniſh brown cryſtalliſed ſchorl, in yellowiſh volcanic limeſtone, intermixed with white quartz. *Same place.*

XXXIX. *a* 9. In tranſparent colourleſs quadrilateral cryſtals, with greeniſh mica, on an aſh coloured volcanic limeſtone. *Same place.*

XL. *a* 10. The ſame, in more numerous and perfect cryſtals. *Same place.*
R. de L. Pl. 4. *Fig.* 114.

XLI. *a* 11. In large cryſtals of a dark brown colour, the mica of the matrix of a green colour and ſplendid. *Same place.*

XLII. *a* 12. In flatted polyhedral cryſtals, of a yellowiſh brown colour, with greeniſh mica, on white calcareous ſpar. *Same place.*

XLIII. *a* 13. In a ſolitary quadrilateral cryſtal, of a reddiſh brown colour, truncated at all its longitudinal borders, and without pyramid, implanted in a whitiſh granular calcareous matrix, intermixed with grey mica. *Same place.*

XLIV. *a* 14. The ſame, in larger priſms with their pyramids deeply truncated, on a ſimilar matrix. *Same place.*

XLV. *a* 15. In larger priſms of the ſame colour, with brown cryſtalliſed mica, in greyiſh limeſtone. *Same place.*

XLVI. *a* 16. In ſmall tranſparent cryſtals, of a topaz-yellow colour, lining irregular cavities in a brown ſparkling volcanic micaceous matrix. *Same place.*

XLVII. *a* 17. In ſplendid ſuboctohedral cryſtals, of a greeniſh yellow colour, and truncated obliquely, on a greyiſh calcareous matrix mixed with quartz and greeniſh mica. *Same place.*

VARIETY II. *AMORPHOUS.*

XLVIII. *a* 1. In irregular maſſes, of a dark yellowiſh brown colour, interſperſed through a dull aſh-coloured calcareous matrix. *Same place.*

SPECIES

SPECIES XII. *OLIVIN.*

The colour of this ſtone is browniſh or reddiſh green inclining to yellow, or greyiſh green, becoming, when withered, of a browniſh yellow; its hardneſs 9; ſpecific gravity 3.225. It aſſumes when cryſtalliſed the form of hexagonal priſms, but is more commonly found in roundiſh grains in *Baſalt* or *Trap*; ſometimes in large maſſes. It decompoſes readily on expoſure to the air, and at 160 *Wedgw.* is fuſible into a greeniſh enamel. It may be diſtinguiſhed from the cryſolite by its being acted on by nitric acid. According to the analyſis of *Gmelin*, it conſiſts of Alumine 40, Silex 54.1, Oxyde of Iron 4; but according to *Klaproth*, it contains Silex 48—52, Magneſia 37, Lime 2, Oxyde of Iron 10—12.

VARIETY I. *CRYSTALLISED.*

a. In hexagonal priſms.

VARIETY II. *AMORPHOUS.*

a aa. In large maſſes.

XLIX. *a bb* 1. Of a pale yellowiſh green colour mixed with olive brown, in an irregular cryſtalline ſhattery maſs. *Heſſe.*

L. *a bb* 2. In ſmall ſpecks or grains of the ſame colour, interſperſed through dark grey baſalt. *North Coaſt of Ireland.*

SPECIES XIII. *GARNET.*

The colour of the garnet is generally of a deep red verging to violet, but frequently alſo olive green, brown or black, ſeldom yellow. Its hardneſs from 9 to 14; ſpecific gravity from 3.63 to 4.18; fracture foliated; refraction double. It occurs in dodecahedral cryſtals with rhombic faces, and their varieties. It is fuſible *per ſe* at 136 *Wedgw.* into an opake dark grey fine grained porcelain. Alkalis fuſe it with difficulty, borax and microcoſmic ſalt convert it into a green or black glaſs. The component parts of this ſtone are Silex, Alumine, Lime and Iron, the proportions varying in different ſpecimens. According to *Archard*'s analyſis it contains Silex 48, Alumine 30, Lime 11, Oxyde of Iron 1; according to *Weigleb*, Silex 364, Lime 308, Oxyde of Iron 287.

It is commonly found in *Schiſtoſe Mica* or *Gneiſs*, more rarely in *Argillites* or *Granite*. The brighteſt coloured garnet comes from *Bohemia*.

VARIETY

VARIETY I. *CRYSTALLISED.*

LI. *a* 1. In a detached dodecahedron with rhombic faces, of a browniſh red colour. *R. de L. Pl.* 4. *Fig.* 106. *Siberia.*

LII. *a* 2. The ſame, in ſmaller cryſtals. *Tyrol.*

LIII. *a* 3. In numerous ſmall cryſtals, of the ſame colour and figure, imbedded in ſilvery ſchiſtoſe mica. *Italy.*

LIV. *a* 4. The ſame, imbedded in a greeniſh ſchiſtoſe mica. *Hungary.*

LV. *a* 5. The ſame, in a green micaceous matrix, leſs ſplendid than the former. *Norway.*

LVI. *a* 6. In very aggregated ſemitranſparent dodecahedral cryſtals, cemented together by white indurated talc. *Salzbourg.*

LVII. *a* 7. In ſmall ſemitranſparent dodecahedral cryſtals, of a pale reddiſh brown colour, aggregated into an irregular maſs. *Bohemia.*

LVIII. *a* 8. In detached irregular cryſtals. *Tyrol.*

LIX. *a* 9. In aggregated dodecahedral cryſtals, of a pale green colour. *Ehrenfriederſdorf.*

LX. *a* 10. In a detached dodecahedral cryſtal, truncated at all its borders, and covered with ſilvery mica. *Stiria.*
R. de L. Pl. 4. *Fig.* 107.

LXI. *a* 11. The ſame, in numerous ſmall cryſtals, imbedded in dark green indurated talc. *Stenbruek.*

LXII. *b* 1. In ſmall looſe cryſtals, red and tranſparent, with 24 trapezoidal faces. *R. de L. Pl.* 4. *Fig.* 110. *Saxony.*

LXIII. *b* 2. The ſame, in ſmall opake cryſtals, imbedded in a ſhining bronze-yellow micaceous matrix. *Italy.*

LXIV. *b* 3. In ſmall opake detached polyhedral cryſtals, of a dull reddiſh brown colour. *Sileſia.*

LXV. *c* 1. In ſmall tranſparent rounded cryſtals of a bright red colour. *Augſberg.*

LXVI. *c* 2. The ſame. *Bohemia.*

LXVII. *c* 3. In detached irregularly rounded cryſtals, opake and having a coating of gold-coloured mica. *Scotland.*

LXVIII. *c* 4. The ſame, imbedded in a matrix ſimilar to the coating of the former. *Same place.*

LXIX. *c* 5. In irregular cryſtals, of a reddiſh brown colour, imbedded in ſilvery micaceous ſchiſtus. *Tranſylvania.*

LXX. *c* 6. The ſame, in looſe fragments. *Bohemia.*

VARIETY II. *AMORPHOUS.*

LXXI. *a* 1. In a compact poliſhed ſlab, of a yellowiſh red colour, ſemitranſparent and ſpotted with mica. *Bohemia.*

LXXII. *a* 2. In ſmall ſemitranſparent cryſtals, of a bright red colour, imbedded in a thin plate of dark green ſerpentine, cut and poliſhed. *Sileſia.*

LXXIII. *a* 3. The ſame, imbedded in praſe. *Sweden.*

LXXIV. *a* 4. In tranſparent portions, of a red colour inclining to violet, cut and poliſhed; (*Syrian Garnet.*) *Syria.*

LXXV. *a* 5. The ſame, of a deep red colour. *Bohemia.*

LXXVI. *a* 6. The ſame, of a browniſh red. *Same place.*

b. Foliated.

c. Slaty.

SPECIES XIV. *WHITE GARNET.*

Veſuvian, Kirw. *Leucite*, Wern.

This occurs in ſmall white, or greyiſh white, opake, and generally friable cryſtals, from the ſize of a pin's head to that of a ſmall nutmeg, with 24 trapezoidal faces; its hardneſs from 8 to 9; ſpecific gravity 2.464. It is fuſible *per ſe* by the blow-pipe, difficultly with alkali, borax, or microcoſmic ſalt. It contains, according to the analyſis of *Bergman*,

Silex

Silex 55, Alumine 39, Lime 6; but according to *Klaproth*, Silex 54, Alumine 23, Potash 20 to 23. By some it has been considered as a variety of zeolite. Found in the lava of *Vesuvius* and other volcanos, also in the gold ores of *Peru*, and in some granites of the *Pyrenees*.

VARIETY I. *CRYSTALLISED.*

LXXVII. *a* 1. In friable crystals of a dull white colour, imbedded in a purplish indurated argillaceous cement. *Vesuvius.*

LXXVIII. *a* 2. The same, in larger crystals, in a more ponderous and indurated cement of a greenish colour. *Same place.*

SPECIES XV. *TOURMALINE.*

The colour of this stone is generally dark brown, but often nearly of a hyacinth red, sometimes verging to the olive green or dark green, or even blue. It occurs in transparent prisms, with three, six, or nine sides, terminated by trihedral summits; its fracture laminated; refraction double; hardness from 9 to 11; specific gravity from 3.05 to 3.15. When heated to about 200 *Farenh.* it becomes electric. It is fusible *per se* with intumescence, forming a whitish spongy enamel. Mineral alkali, borax and microcosmic salt fuse it, though with difficulty. By *Bergman*'s analysis it yields, Silex 34—40, Alumine 38.5—42, Lime 10—15, Oxyde of Iron 5—9. Found in granite and other rocks in *Ceylon*, *Brasil*, and the *Alps*. Those from *Zillerthal* are imbedded in steatite.

VARIETY I. *CRYSTALLISED.*

a. In striated prisms with 3, 6, or 9 sides, and trihedral summits.

LXXIX. *b* 1. In detached portions of striated prisms, of a dark brown colour, semitransparent and electric. *Tyrol.*

LXXX. *b* 2. The same, smaller and more transparent. *Same place.*

LXXXI. *b* 3. In detached transparent portions of a brown colour and electric. *Ceylon.*

SPECIES XVI. *SCHORL.*

This differs principally from the former in being of a black colour, opake and less electric when heated. The figure of its crystals is the same. Heated to redness it acquires

quires by cooling a browniſh red colour. At 127° *Wedgw.* it is converted into a browniſh black enamel, and becomes redder on increaſing the heat. Found chiefly in quartz and granite.

VARIETY I. *CRYSTALLISED.*

LXXXII. *a* 1. In portions of large trihedral priſms, ſtriated and opake, of a black colour, with convex planes, imbedded in a tranſparent cryſtal of quartz. *Marienberg.*

LXXXIII. *a* 2. In large ſtriated trihedral priſms, of a black colour, croſſing each other in various directions and cemented by white quartz. *Bohemia.*

LXXXIV *a* 3. In long ſtriated trihedral priſms, black, opake and ſhining, truncated at their extremities and imbedded in green talc. *Tyrol.*

LXXXV. *a* 4. In ſlender trihedral priſms, of a black colour, and truncated at their ſummits, with yellowiſh indurated talc, on grey quartz. *Spain.*

LXXXVI. *b* 1. In ſlender indeterminate priſms, diverging from different centers, and intermixed with brown ſpathoſe tin ore. *Cornwall.*

LXXXVII. *b* 2. In detached portions of large ſtriated irregular priſms, of a ſhining black colour. *Madagaſcar.*

LXXXVIII. *b* 3. In ſlender ſtriated rhomboidal needle-like cryſtals, truncated at their extremities, implanted in various directions on dark grey quartz. *Saxony.*

LXXXIX. *b* 4. Black, ſhining, of a ſtriated texture, imbedded in white quartz. *Cornwall.*

XC. *b* 5. In ſmaller ſtriæ, in a ſimilar matrix. *Saxony.*

XCI. *b* 6. Of a dark brown colour, compoſed of diverging ſtriæ, aggregated into an irregular maſs. *Bohemia.*

XCII. *b* 7. The ſame, in ſmall needle-like diverging priſms intermixed with quartz. *Same place.*

XCIII *b* 8. In aggregated priſms, of a dark reddiſh brown colour, intermixed with ſilvery mica. *Same place.*

XCIV. *b* 9. In flatted diverging priſms, of a dark greeniſh colour, with a ſlight degree of ſemitranſparency, imbedded in a greeniſh micaceous matrix. *Veſuvius.*

XCV.

XCV. *b* 10. In large, opake, ſtriated priſms, of a browniſh red colour and metallic luſtre, with white opake quartz and greeniſh mica. (*Titanite.*)
Bonitz, in Lower Hungary.

XCVI. *c* 1. In ſmooth trihedral priſms of a black colour, bevilled at their edges, and imbedded in greeniſh grey talc. *Salzbourg.*

XCVII. *c* 2. In long ſmooth hexhedral priſms of a black colour, imbedded in compact dark bronze-coloured mica. *Sweden.*

XCVIII. *c* 3. Portion of a large hexhedral priſm truncated at all the edges, of a dark brown colour, imperfectly ſtriated on the ſurface. *Same place.*

XCIX. *c* 4. In detached portions of a black colour. *Tyrol.*
R. de L. Pl. 4. *Fig.* 97.

The four laſt ſpecimens, being ſmooth on the ſurface, ought perhaps, in ſtrictneſs of arrangement, rather to be conſidered as Hornblendes, but in no other reſpect do they appear to differ from Schorls.

C. *c* 5. In detached compreſſed hexhedral priſms, ſome ſingle, others united tranſverſely, opake and of a dark brown colour. (*Croſs Stone.*) *Brittany.*
R. de L. Pl. 7. *Fig.* 40, 41.

CI. *c* 6. The ſame, in numerous cryſtals, imbedded in bluiſh indurated ochry ſchiſtus. *Same place.*

SPECIES XVII. *THUMERSTEIN.*

Schorl Violet, Fr.

Its colour is generally violet, but when coated or impregnated with chlorite, greeniſh or pearl grey. It occurs in compreſſed rhomboidal parrallelopepids, of a laminated texture, and ſtriated on the ſurface. Hardneſs from 9 to 10; ſpecific gravity 3.295. When heated a little above redneſs it ſwells and foams like zeolite, and at laſt melts into a hard black enamel. It contains, according to *Klaproth*, Silex 52, Alumine 25, Lime 9, Oxyde of Iron 9, Magneſia 1.

Found in moſt primitive mountains, particularly the *Alps*, *Pyrenees*, and *Mount Atlas*.

VARIETY

VARIETY I. *CRYSTALLISED.*

CII. *a* 1. In violet coloured ſemitranſparent compreſſed rhomboidal parallelopepids, with ſtriated faces, and having one edge on each face ſlightly truncated. *Dauphiné.* *R. de L. Pl.* 4. *Fig.* 96.

CIII. *a* 2. The ſame, more deeply truncated and rather paler. *Same place.*

CIV. *a* 3. In larger cryſtals, having a double truncation on one ſide, with tranſparent feltſpar, on greeniſh hornblende. *Same place.*

CV. *a* 4. The ſame, incruſted with green chlorite. *Same place.*

CVI. *a* 5. The ſame, of a paler colour. *Same place.*

b. Indeterminate.

VARIETY II. *AMORPHOUS.*

SPECIES XVIII. *SCHORLITE.*

Schorlartiger Beryll, Wern.

The colour of which is greeniſh white, ſometimes inclining to yellow, with a ſlight degree of tranſparency; its fracture ſomewhat foliated; hardneſs from 9 to 10; ſpecific gravity 3.530. Infuſible at 168 *Wedgw.* and unalterable by heat. According to *Klaproth* it contains, Silex 50, Alumine 50. Found generally in irregular oblong maſſes or columns, in a mixture of quartz and mica.

VARIETY I. *CRYSTALLISED.*

CVII *a* 1. In ſtriated columns, of a purpliſh white colour, imbedded in a mixed maſs of cryſtalliſed mica and quartz. Found in a tin mine at *Altenberg, Saxony.*

CVIII. *a* 2. A ſmaller ſpecimen of the ſame, of a whiter colour. *Same place.*

SPECIES XIX. *RUBELLITE.*

The colour of this ſtone is crimſon or peach-red. It occurs in ſemitranſparent aggregated hexhedral priſms, terminated by trihedral rhomboidal pyramids, with a rough ſurface,

face, and fibrous texture. Its hardneſs 10; ſpecific gravity 3.1. It is infuſible *per ſe*, and reſiſts alkalis, borax, and microcoſmic ſalt. When heated to redneſs it becomes ſnow white. According to *Bindheim*'s analyſis it contains, Silex 57, Alumine 35, Oxyde of Iron and Manganeſe 5. Found in *Siberia*.

VARIETY I. *CRYSTALLISED.*

a. In diverging ſtriated priſms with trihedral ſummits.

SPECIES XX. *AMETHYST.*

The colour of the amethyſt, which is by ſeveral authors conſidered as a variety of rock cryſtal, is violet blue of different degrees of intenſity. When cryſtalliſed it uſually occurs in hexhedral priſms with correſponding pyramids. It is more or leſs tranſparent, and cauſes a double refraction. Its fracture generally conchoidal, ſometimes ſplintry or coarſely fibrous. It gives ſparks very plentifully with ſteel. Its ſpecific gravity from 2.651 to 2.657. It is infuſible at 160 *Wedgw.* but loſes its colour and becomes ſhivery, and by the aſſiſtance of oxygen gas may be converted into an enamel. According to *Achard* it contains, Alumine 60, Silex 30, Lime 8.22, Oxyde of Iron 1.66.

Found principally in *Hungary*, *Germany*, *Sweden*, *Mexico*, and *Ceylon*.

VARIETY I. *CRYSTALLISED.*

CIX. *a* 1. In ſhort tranſparent hexhedral priſms with correſponding pyramids, partially froſted with minute cryſtals of yellow pearl ſpar, on the ſurface of an amorphous maſs of the ſame. *Hungary.*

R. de L. Pl. 6. *Fig.* 22, 23.

CX. *a* 2. In hexhedral pyramids of a deeper colour, with very ſhort correſponding priſms, lining the hollow of a flinty nodule. *Oberſtein.*

CXI. *a* 3. The ſame in ſmaller cryſtals. *Same place.*

CXII. *a* 4. In large aggregated hexhedral pyramids. *Same place.*

CXIII. *b* 1. A poliſhed ſlab of white quartz, on the ſurface of which appear the inverted pyramids of amethyſtine cryſtals. *Hungary.*

CXIV. *b* 2. In a confuſed cryſtalline maſs, filling the hollow of a portion of a flinty nodule cut and poliſhed. *Oberſtein.*

VARIETY II. *AMORPHOUS.*

CXV. *a* 1. Amethyſt forming veins in a ſlab of white quartz, cut and poliſhed. *Saxony.*

CXVI. *b* 1. In an irregular maſs cut and poliſhed on one ſide.

CXVII. *b* 2. In detached portions cut and poliſhed.

SPECIES XXI. *QUARTZ.*

Under this head are comprehended the mountain or rock cryſtal, and quartz commonly ſo called. It occurs either without colour, or of a white, greyiſh, reddiſh, yellowiſh, greeniſh, browniſh, or blackiſh colour, with more or leſs tranſparency. Its form when cryſtalliſed the dodecahedron with triangular faces, or double hexhedral pyramid with or without an intermediate priſm; its fracture vitreous, often ſplintery; refraction double; ſpecific gravity from 2.64 to 2.67. It is brittle, and gives fire plentifully with ſteel. It is not acted upon by any acid except the fluoric. It is infuſible *per ſe*, and by the aſſiſtance of oxygen gas is merely ſoftened; but yields to alkalis with effervescence, to borax ſlowly and without effervescence. According to the analyſis of *Bergman* it contains, Silex 93, Alumine 6, Lime 1. It is found every where in great abundance, being a principal conſtituent part in the compoſition of primitive rocks.

VARIETY I. *CRYSTALLISED.*

CXVIII. *a* 1. In tranſparent double hexhedral pyramids, covering the ſurface of red hematite. *Lancaſhire.*

R. de L. Pl. 6. *Fig.* 19.

CXIX. *a* 2. The ſame, in ſmaller cryſtals, opake and of a red cornelian colour, ſome of the cryſtals having ſhort intermediate priſms, imbedded in red gypſum.

R. de L. Pl. 6. *Fig.* 19, 21, 22. *Compoſtella, Spain.*

CXX. *a* 3. In opake detached cryſtals of the ſame figure, of a browniſh and white colour. *Hungary.*

R. de L. Pl. 6. *Fig.* 19, 20.

CXXI. *a* 4. In ſmall brilliant and tranſparent cryſtals of the ſame figure. *Marmaroch, Hungary.*

CXXII. *a* 5. In detached tranſparent cryſtals with longer intermediate priſms. *Briſtol.*

CXXIII.

CXXIII. *a* 6. The ſame, ſemitranſparent, ſcabrous and of a whitiſh colour, forming a ſmall irregular group, interſperſed with grey antimonial ore. *Hungary.*

CXXIV. *a* 7. In ſmall tranſparent cryſtals of a reddiſh colour, with red hematite, in ferruginous petroſilex. *Briſtol.*

CXXV. *a* 8. In larger detached cryſtals, ſemitranſparent, having a violet tinge. *Buxton, Derbyſhire.*

CXXVI. *a* 9. In ſtill larger detached cryſtals of a whitiſh colour. *Hungary.*

CXXVII. *a* 10. In ſmall opake cryſtals of a browniſh yellow colour, on an aggregated maſs of the ſame. *Briſtol.*

CXXVIII. *a* 11. In longer priſmatic cryſtals aggregated into an irregular group, and incruſted on the ſurface with white calcareous ſpar. *Hungary.*

CXXIX. *a* 12. In a ſolitary cryſtal with a long intermediate priſm, opake and of a black colour. *Bohemia.*

CXXX. *a* 13. In detached tranſparent hexhedral priſms, with oblique trihedral ſummits. *Cornwall.*

CXXXI. *a* 14. The ſame, in ſmaller cryſtals, forming a group on grey quartz, intermixed with yellow pyrites. *Cornwall.*

CXXXII. *a* 15. In a detached tranſparent hexhedral priſm, terminated by an hexhedral pyramid, and enclofing numerous needle-like cryſtals of green tranſparent ſchorl. *Bareges, Pyrenees.*

CXXXIII. *a* 16. The ſame, of a ſmaller ſize, ſhattery internally, and ſlightly impregnated with chlorite. *Dauphiné.*

CXXXIV. *a* 17. In tranſparent detached hexhedral priſms, terminated by trihedral pyramids with pentagonal faces, internally cellular and containing ſmall drops of water. *Hungary.*

CXXXV. *a* 18. In tranſparent hexhedral priſms with irregular pentagonal pyramids, forming a group on white quartz, the cryſtals adhering laterally. *Hartz.*

CXXXVI. *a* 19. The ſame, in ſmaller cryſtals, variouſly inclined and tinged of a topaz colour near their extremities. *Bohemia.*

CXXXVII. *a* 20. In aggregated pyramidal hexhedral cryſtals, corroded on their ſurface and incruſted with yellow pyrites. *Hungary.*

CXXXVIII. *a* 21. In tranſparent priſmatic hexhedral cryſtals, impregnated with chlorite and projecting from ochry quartz. *Dauphiné.*

CXXXIX. *a* 22. In larger flatted cryſtals, alſo impregnated with chlorite and irregularly attached to and mortiſed into each other. *Same place.*

CXL. *a* 23. In ſhort aggregated hexhedral priſms of a whitiſh colour, with regular hexhedral pyramids. *Cornwall.*

CXLI. *a* 24. Portion of a large tranſparent hexhedral pyramidal cryſtal penetrated by priſmatic ſchorl. *Savoy.*

CXLII. *a* 25. In long hexhedral priſms with oblique hexhedral ſummits, tranſparent and projecting in different directions from a matrix of ochry quartz. *Dauphiné.*

CXLIII. *a* 26. Forming an aſſemblage of ſemitranſparent hexhedral priſmatic cryſtals with hexhedral ſummits, impregnated with green chlorite. *Same place.*

CXLIV. *a* 27. Compoſed of minute cryſtals of a paler green colour than the former. *Hungary.*

CXLV. *a* 28. In long tranſparent diverging priſms, terminated by oblique irregular ſummits, and having their ſurfaces covered by numerous ſmaller cryſtals applied in a parallel direction, with ſolitary rhombic cryſtals of brown pearl ſpar. *Hungary.*

CXLVI. *a* 29. In hexhedral pyramidal cryſtals of a reddiſh tinge, incruſted by minutely cryſtalliſed yellowiſh brown calcareous ſpar. *Schemnitz.*

CXLVII. *a* 30. In ſhort diverging priſmatic cryſtals, ſemitranſparent and of a reddiſh colour with yellow pyrites, on galena. *Hungary.*

CXLVIII. *a* 31. In hexhedral priſmatic cryſtals incruſted with minutely cryſtalliſed quartz, on a matrix of white quartz. *Saxony.*

CXLIX. *a* 32. In irregular tranſparent flatted hexhedral cryſtals, many of them hollow and compoſed of ſucceſſive layers, forming a diverging group. *Schemnitz.*

CL. *a* 33. Semitranſparent, and of a white colour, forming a lengthened irregular pyramid, on the ſurface and parallel to the axis of which are implanted numerous ſhort hexhedral priſmatic cryſtals of quartz. *Hungary.*

CLI.

CLI. *a* 34. In ſemitranſparent ſhort hexhedral priſms with hexhedral ſummits, incruſted by cryſtalliſed calcareous ſpar, on white quartz intermixed with brown blende. *Hungary.*

CLII. *a* 35. Opake and of a milk white colour, forming a thick incruſtation on rhomboidal calcareous ſpar, the external ſurface irregularly cryſtalliſed in pyramids. *Same place.*

CLIII. *a* 36. In irregular priſmatic cryſtals, capped on their ſummits by a thick quartzy incruſtation, and coated by ſmall cryſtals of tranſparent hexhedral truncated ponderous ſpar, on whitiſh indurated clay. *Same place.*

CLIV. *a* 37. In tranſparent cryſtals, grouped with black blende, large cryſtals of galena, covered with yellow pyrites and minutely cryſtalliſed cream coloured pearl ſpar, on indurated talc. *Same place.*

CLV. *a* 38. In a tranſparent hexhedral priſm and pyramid, encloſing a ſmaller cryſtal of the ſame figure, rendered opake by a coating of white talcite. *Schemnitz.*

CLVI. *a* 39. In a ſolitary cryſtal of a browniſh colour, having the pyramids applied to each other obliquely, with a ſhort intermediate priſm. *Bohemia.*

CLVII. *a* 40. In numerous priſmatic cryſtals, incruſted on the ſurface with minute ſhining cryſtals of grey iron ore. *Alſace.*

CLVIII. *a* 41. Forming a tranſparent cavernous maſs, having the ſepta covered by ſmall hexhedral pyramidal cryſtals of the ſame, with yellow pyrites. *Fürſtenberg.*

CLIX. *a* 42. In lengthened tubercles of a pale roſe colour, compoſed of ſmall pyramidal tranſparent cryſtals, on ſemitranſparent quartz intermixed with white ponderous ſpar. *Saxony.*

CLX. *a* 43. In hexhedral pyramids, coated with very minute cryſtals of quartz, forming a thick ſemitranſparent incruſtation on cubic galena. *Cumberland.*

CLXI. *a* 44. In ſemitranſparent hexhedral priſmatic cryſtals of a yellowiſh white colour, terminated at one or both extremities by hexhedral pyramids, very irregularly aggregated and intermixed with minute cryſtals of white pearl ſpar, on white quartz. *Schemnitz.*

CLXII. *a* 45. Portion of a hollow flinty nodule internally cryſtalliſed in hexhedral pyramids of an amethyſtine colour. *Olerſtein.*

CLXIII. *a* 46. In ſemitranſparent tabulets ſet edgeways in various directions on amorphous white quartz, the ſurfaces of the tables covered with minutely cryſtalliſed quartz, and partially incruſted with yellowiſh pearl ſpar, bearing alſo on their edges cryſtalliſed variegated copper ore, and ſmall hexhedral cryſtals of calcareous ſpar having trihedral ſummits with pentagonal faces. Near *Fribourg in Briſgaw.*

CLXIV. *a* 47. Minutely cryſtalliſed, on the ſurface of irregular tuberous ſtalactites of the ſame, of a pale blue colour. *Hungary.*

CLXV. *a* 48. In aggregated ſhort priſmatic cryſtals of a whitiſh colour, forming an incruſtation on larger cryſtals of the ſame. *Schemnitz.*

CLXVI. *a* 49. In colourleſs double hexhedral pyramids obliquely oppoſed to each other and having ſhort intermediate priſms, in a nodule of argillaceous iron ore. *Colebrook Dale.*

CLXVII. *a* 50. In double hexhedral pyramids with ſhort intermediate priſms of a ſmoke grey colour, aggregated on the ſurface of ochry quartz. *Oberſtein.*

CLXVIII. *a* 51. In ſhort pyramidal aggregated amethyſtine cryſtals externally of a dull red colour, grouped on impure quartz. *Hungary.*

CLXIX. *a* 52. In tranſparent priſms with correſponding pyramids, on the ſurface of a tabular quartzy incruſtation coated with cream coloured pearl ſpar. *Same place.*

CLXX. *a* 53. In a rounded hollow ſpherule, covered externally by aggregated pyramidal cryſtals of the ſame incruſted with light brown pearl ſpar. *Cumberland.*

CLXXI. *a* 54. A triangular hollow funnel-ſhaped incruſtation, lined internally by hexhedral pyramidal cryſtals of a reddiſh colour on the ſurface. *Saxony.*

CLXXII. *a* 55. In long hexhedral priſmatic cryſtals variouſly inclined, on the ſurface of amorphous quartz impregnated with green chlorite. *Cornwall.*

CLXXIII. *a* 56. In irregular priſmatic cryſtals of a pale fleſh colour, incruſted with white opake calcareous ſpar, on fleſh coloured amorphous pearl ſpar. *Hungary.*

CLXXIV. *a* 57. In a cavernous ſhattery maſs, having on the ſurface minutely cryſtalliſed quartz with ſpecks of brown blende. *Same place.*

CLXXV. *a* 58. In tranſparent tubular cryſtals doubly bevilled at their edges, ſet edgeways

edgeways on indurated clay impregnated with green chlorite and covered by numerous cryſtals of adularia. *Dauphiné.*

R. de L. Pl. 6. Fig. 30.

CLXXVI. *a* 59. In a large tranſparent double pyramidal cryſtal, of a light ſmoke colour, with a ſhort intermediate priſm on which the pyramids are placed obliquely, internally of a ſhattery appearance. *Switzerland.*

CLXXVII. *a* 60. In aggregated portions of large hexhedral priſms with correſponding pyramids, ſemitranſparent and of a dark ſmoke colour. *Schemnitz.*

CLXXVIII. *a* 61. A detached pyramid of a large tranſparent cryſtal, covered on the ſurface and impregnated by green chlorite. *Dauphiné.*

CLXXIX. *a* 62. In an irregular maſs of a white colour, formed by accumulated hexhedral pyramids. *Cumberland.*

CLXXX. *a* 63. In lengthened irregular aggregated hexhedral priſms, impregnated with green chlorite and incruſted with talcite. *Dauphiné.*

CLXXXI. *a* 64. Portion of a large tranſparent cryſtal alſo impregnated with chlorite and poliſhed externally. *Same place.*

CLXXXII. *a* 65. In tranſparent hexhedral priſms with correſponding pyramids, tinged artificially of a browniſh red colour. *Hungary.*

CLXXXIII. *a* 66. In long tranſparent hexhedral priſms with correſponding pyramids both having irregular and uneven faces, artificially tinged of a light blue, yellow, and browniſh red colour. *Same place.*

CLXXXIV. *b* 1. In a flatted portion confuſedly cryſtalliſed, of a white colour and ſemitranſparent, with white pearl ſpar. *Dauphiné.*

CLXXXV. *b* 2. In a tranſparent rounded priſmatic portion encloſing browniſh capillary ſchorl. *Same place.*

CLXXXVI. *b* 3. In minute indeterminate tranſparent cryſtals, on white quartz with opake baroſelenite. *Saxony.*

VARIETY II. *OF PARTICULAR SHAPES.*

CLXXXVII. *a* 1. In ſmall detached cubes of a browniſh white colour, ſemitranſparent and ſomewhat ſpongy. *Buxton.*

CLXXXVIII.

CLXXXVIII. *b* 1. In large lenticular cryſtals of a light brown colour, ſemitranſparent and irregularly aggregated, with whitiſh indurated clay. *France.*

Theſe and the former are cryſtals of ſecondary formation.

CLXXXIX. *c* 1. Portion of an irregularly branched incruſtation of a bluiſh grey colour, very minutely cryſtalliſed on the ſurface and incruſted with brown pearl ſpar. *Hungary.*

CXC. *d* 1. In an irregular cavernous maſs of a yellowiſh brown colour, ſemitranſparent, and minutely cryſtalliſed on the ſurface. *Briſtol.*

CXCI. *d* 2. In minute indeterminate cryſtals of a reddiſh brown colour, incruſting the ſurface of hollow pyramidal portions of indurated ferruginous clay. *Hungary.*

CXCII. *d* 3. Of a cellular texture and browniſh yellow colour, ſplit on one ſide into thin laminæ, interſecting each other in various directions, and giving the ſurface a very irregular appearance. *Same place.*

CXCIII. *d* 4. In a rounded irregular maſs of a white colour, hollow internally and minutely cryſtalliſed, detached from a portion of flint. *France.*

VARIETY III. *AMORPHOUS.*

CXCIV. *a* 1. In an amorphous portion apparently of a foliated texture, ſemitranſparent and of a water colour. *Hartz.*

CXCV. *a* 2. In a quadrangular ſemitranſparent maſs alſo apparently foliated, and of a reddiſh brown colour. *Hungary.*

b. Fibrous.

c. Granular.

CXCVI. *d* 1. In an irregular perfectly tranſparent piece, having a partial brown opake coating. *Madagaſcar.*

CXCVII. *d* 2. Of a ſhattery texture and tranſparent. *Norway.*

CXCVIII. *d* 3. The ſame, of a pale roſe red colour. *Rabenſtein, Bavaria.*

CXCIX. *d* 4. In tranſparent irregular pieces. *Norway.*

CC. *d* 5. In a poliſhed tablet of a light brown colour encloſing black priſmatic ſchorl. *Bohemia.*

CCI. *d* 6. An irregular poliſhed piece of the ſame, of a purpliſh tinge. *Same place.*

CCII. *d* 7. An irregular tranſparent poliſhed piece, ſhattery on one ſide, exhibiting priſmatic colours and impregnated with green chlorite. *Dauphiné.*

CCIII. *d* 8. A ſmaller ſpecimen of the ſame. *Same place.*

CCIV. *d* 9. Thin ſlabs of white ſemitranſparent quartz, cut and poliſhed. *Sweden.*

CCV. *d* 10. An opake quartzy depoſit of a ſpongy texture and whitiſh colour. *Reecum, Iceland.*

CCVI. *d* 11. In detached portions tinged green by carbonate of copper. *Japan.*

SPECIES XXII. *PRASE.*

Praſem, Germ.

Is of a browniſh or yelloviſh green colour, ſemitranſparent and of a coarſe ſplintery fracture; ſpecific gravity 2.58. When cryſtalliſed its form is the ſame with that of quartz. It gives fire plentifully with ſteel, and is capable of a fine poliſh. It has not as yet been analyſed, but ſeems to conſiſt of common quartz impregnated with ſchorlaceous actynolite.

Found principally in *Sileſia, Bohemia, Saxony*, and *Franconia.*

VARIETY I. *CRYSTALLISED.*

a. In double hexhedral pyramids with or without an intermediate priſm.

b. In needle-like cryſtals.

c. Indeterminate.

VARIETY II. *AMORPHOUS.*

CCVII. *a* 1. In an irregular maſs of an olive green colour and divergingly ſtriated texture. *Saxony.*

SPECIES XXIII. *ELASTIC QUARTZ.*

Flexible Sandſtone.

Of a greyiſh white colour, covered with thin ſcales of grey or browniſh mica, and having a ſmall degree of ſemitranſparency. Specific gravity according to *Kirwan* 2.624.

It

It is moderately flexible and elaſtic, and phoſphoreſces when ſcraped with a knife. It is not alterable *per ſe* at 140 *Wedgw.* but fuſes readily with either of the fixed alkalis. By *Klaproth's* analyſis it contains Silex 0.965, Alumine 0.025, Oxyde of Iron 0.01.

Found hitherto only in the *Braſils* near the diamond mines, and in *Thuringia.*

VARIETY I. *AMORPHOUS.*

CCVIII. *a* 1. In a thin plate of a granular ſandy texture, internally of a dull white colour, externally brown and micaceous. *Braſil.*

SPECIES XXIV. *OBSIDIAN.*

Iceland Agate. Verre Volcanique, Fr.

This is of a black or greyiſh or greeniſh black colour; in thin pieces ſemitranſparent, but in the maſs opake, and of a gloſſy luſtre; its fracture conchoidal; ſpecific gravity 2.348; hardneſs ſuch as to give fire with ſteel. It melts eaſily into a dark grey maſs, and according to the analyſis of *Bergman* contains Silex 69, Alumine 22, Oxyde of Iron 0.09.

Found in *Iceland, Hungary,* and other parts, either in detached maſſes, or inherent in gneiſs, granite, or porphery.

VARIETY I. *AMORPHOUS.*

CCIX. *a* 1. In an irregular piece, black, opake, ſhining, and of a conchoidal fracture. *Iceland.*

CCX. *a* 2. The ſame, ſomewhat tranſparent at the edges. *Iſles of Lipari.*

SPECIES XXV. *CALCEDONY.*

The colour of this ſtone is very various, and on its different tints, ſhades, and figures, are founded ſeveral varieties, of which the chief are, 1ſt, *Common Calcedony,* the colour of which is generally greyiſh or bluiſh: 2d, *Cornelian,* of a wine yellow, fleſh red or blood red colour: 3d, *Mocboa* with arboriſations: 4th, *Onyx* or *Sardonyx,* of a fleſh colour and in zones: 5th, *Agate,* zoned and banded, of various colours, and compoſed of calcedony and jaſper: 6th, *Cacholong,* opake and of a milk white colour.

It generally occurs in mamillated, reniform, ſtalactitical, botroidal or ſpherical maſſes, of moderate ſize; ſometimes alſo encruſting cryſtals of quartz or calcareous ſpar; its external luſtre caſual; fracture conchoidal, ſometimes ſplintery; ſpecific gravity from 2.606

to

to 2,628; ſomewhat harder than flint and capable of a high poliſh. It is infuſible *per ſe* except by the aſſiſtance of oxygen gas. At about 150 *Wedgw.* it loſes its colour. *The fixed alkalies* act on it with effervescence, borax readily and without effervescence.

According to *Bergman* the calcedony of *Ferroe* contains Silex 84, Alumine 16, with a ſmall quantity of Oxyde of Iron.

Found in *Iceland, Ferroe, Norway, Scotland, &c.*

VARIETY I. *OF PARTICULAR SHAPES.*

CCXI. *a* 1. In numerous tranſlucid cylindrical ſtalactites, depending in a parallel direction from the ſurface of grey flint. *Iceland.*

CCXII. *a* 2. In ſemitranſparent irregular branches, minutely cryſtalliſed on the ſurface. *Cornwall.*

CCXIII. *a* 3. An irregular portion of the ſame, more compacted and without cryſtalliſation. *Same place.*

CCXIV. *a* 4. In an irregular ſemitranſparent piece of a horny appearance, having the internal ſurface ſmooth and mamillated. *Iceland.*

CCXV. *a* 5. The ſame, in a ſmaller portion more diſtinctly mamillated on the ſurface. *Iceland.*

CCXVI. *a* 6. The ſame, with the mamillæ ſtill more rounded and projecting. *Same place.*

CCXVII. *a* 7. In ſemitranſparent ſpherical globules, having the appearance of frog's ſpawn, on a brown bituminous argillite. *Auvergne.*

CCXVIII. *a* 8. In numerous aggregated tubercles of a bluiſh white colour, forming an incruſtation on coarſe opake quartz. *France.*

CCXIX. *a* 9. In numerous ſmaller tubercles with arboriſations on the ſurface, forming a white opake incruſtation (*Cacholong*) on a vein of white ſemitranſparent quartz. *Huttenberg, Carinthia.*

CCXX. *a* 10. In an irregular ſemitranſparent piece, encloſing a large mamillary ſtalactite of the ſame, opake and of a whitiſh colour near the ſurface. *Iceland.*

CCXXI. *a* 11. Mamillary, ſemitranſparent and of a browniſh yellow colour, covering the internal ſurface of a portion of a hollow flinty nodule. *Eaſt Indies.*

CCXXII. *a* 12. In an irregular piece, ſemitranſparent and of a wheyiſh colour, ſomewhat mamellated on one ſurface and angular on the other. *Coaſt of Antrim.*

b. Filiform.

c. Tubular.

d. Cellular.

VARIETY II. *AMORPHOUS.*

CCXXIII. *a* 1. Portion of a thick ſlab of calcedony, compoſed of layers of different degrees of tranſparency and colour, black, white, red, and wheyiſh. *Iceland.*

CCXXIV. *a* 2. In a ſlab compoſed of three layers, the two exterior ſemitranſparent, the interior white and opake *(Cacholong.)* *Iceland.*

CCXXV. *a* 3. In a thin poliſhed ſlab, ſemitranſparent and of a milky colour, with veins of yellow and red cornelian. *Eaſt Indies.*

CCXXVI. *a* 4. Portion of a nodule of ſemitranſparent red cornelian, with a brown opake cruſt, poliſhed on its internal ſurface. *Same place.*

CCXXVII. *a* 5. A cornelian of a deeper colour and leſs tranſparent, approaching to the nature of jaſper, in a thin ſlab poliſhed on one ſide. *Same place.*

CCXXVIII. *a* 6. The ſame altogether opake, lining the internal ſurface of a ſection of a hollow nodule of calcedony. *Same place.*

CCXXIX. *a* 7. In tranſlucid artificially poliſhed portions, ſomewhat effulgent, one yellowiſh, the other of a wheyiſh colour, *Ceylon.*

CCXXX. *a* 8. In an irregular piece, ſemitranſparent and of a reddiſh colour, with golden mica on the ſurface. *(Avanturine.)* *Arragon.*

CCXXXI. *a* 9. The ſame, in a ſmall bead of remarkable luſtre. *Same place.*

CCXXXII. *a* 10. In an oval ſlab of a reddiſh yellow colour, poliſhed on both ſurfaces. *Arragon.*

CCXXXIII.

CCXXXIII. *a* 11. In a thin flatted piece of a filvery micaceous luftre, polifhed on one fide. *Cap de Gute, Spain.*

CCXXXIV. *a* 12. The fame, in a rounded nodule of a whiter colour. *Same place.*

CCXXXV. *a* 13. In a fmall circular flab of a brown colour. *Bohemia.*

CCXXXVI. *a* 14. In a thin femitranfparent flab with dark brown arborifations. *(Mochoa Stone.)* *Deux Ponts.*

CCXXXVII. *a* 15. Section of a nodule of brown femitranfparent calcedony, filled internally with red jafper. *Bohemia.*

CCXXXVIII. *a* 16. Agate, compofed of ftalactites of calcedony mixed with red jafper. *Same place.*

CCXXXIX. *a* 17. Section of a nodule of calcedony intermixed with cornelian, and having a brown opake incruftation. *Eaft Indies.*

CCXL. *a* 18. The fame, compofed of concentric veins of calcedony and white and brown jafper, with cryftallifed tranfparent quartz in the centre. *(Fortification Agate.)* *Saxony.*

CCXLI. *a* 19. Portion of a nodule of red cornelian, encloling a nucleus of white opake calcedony. *Eaft Indies.*

CCXLII. *a* 20. In a flatted portion, compofed of thin undulating layers of jafper and calcedony of a grey, red, and brown colour, with cryftallifed quartz at the edge. *Deux Ponts.*

CCXLIII. *a* 21. Portion of an agate nodule incrufted with yellow and red jafper, filled internally with white quartz. *Oberftein.*

CCXLIV. *a* 22. A flatted portion of a mixt mafs of amethyft, quartz, calcedony, and jafper. *(Jumble Agate.)* *Saxony.*

CCXLV. *a* 23. In a thin flab compofed of browniih red jafper cemented by femitranfparent calcedony. *Deux Ponts.*

CCXLVI. *a* 24. Thin flabs of femitranfparent calcedony, impregnated with arborefcent green chlorite. *Deux Ponts.*

CCXLVII. *a* 25. In an irregular piece, compoſed of brown calcedony intermixed with red jaſper. *Bohemia.*

CCXLVIII. *a* 26. In a flatted portion, containing veins of red jaſper and calcedony in tranſparent quartz impregnated with black ſchorl. *Same place.*

CCXLIX. *a* 27. In a thin ſlab compoſed of veins of quartz, red jaſper, and cacholong. *Same place.*

CCL. *a* 28. In thin ſlabs of ſemitranſparent calcedony, veined with browniſh jaſper. *Saxony.*

CCLI. *a* 29. In an irregular maſs, made up of yellow jaſper, brown and red cornelian, calcedony and quartz. *Same place.*

CCLII. *a* 30. Thirty-ſix varieties of the foregoing, principally from *Oberſtein*, *Deux Ponts*, and *Bohemia*.

SPECIES XXVI. *CHRYSOPRASE.*

Kriſopbras, Germ.

Commonly of a beautiful apple-green colour, changing into greeniſh white or greeniſh grey, with a moderate degree of tranſparency and weak luſtre; its fracture even, paſſing into the ſplintery; ſpecific gravity from 2.479 to 3.258. It gives fire plentifully with ſteel. On expoſure to the blow-pipe it loſes its colour and becomes opake. At 168 *Wedgw.* it is infuſible, but melts by oxygen gas into a whitiſh compact enamel. With pot-aſh it gives a violet-coloured glaſs, with ſoda or borax a brown, and with microcoſmic ſalt one of a honey yellow colour. By *Klaproth*'s analyſis it contains, Silex 0.96, Oxyde of Nickel 0.01, Lime 0.008, Alumine 0.008, Oxyde of Iron 0.008.

Found at *Koſemutz* in *Upper Sileſia*, forming veins in ſerpentine.

VARIETY I. *AMORPHOUS.*

CCLIII. *a* 1. In a flatted irregular ſemitranſparent maſs of an apple green colour. *Koſemutz.*

CCLIV. *a* 2. The ſame, of a pale yellowiſh green colour. *Same place.*

CCLV. *a* 3. The ſame, in rounded poliſhed portions of different ſhades of green. *Same place.*

SPECIES

SPECIES XXVII. *HYALITE.*

Muller's Glaſs.

Of a pure white colour and ſemitranſparent, or without colour; its fracture even, inclining to conchoidal; ſpecific gravity 2.110; ſcarcely ſo hard as to give fire with ſteel. It is infuſible *per ſe* at 150° *Wedgw.* but yields to mineral alkali. According to *Link*'s analyſis it contains, Silex 57, Alumine 18, Lime 15, and a little Oxyde of Iron.

Found commonly in rounded maſſes or grains in baſalt and trap. It has lately been found alſo in ſerpentine near *Swentuck* in *Sileſia.*

VARIETY I. *AMORPHOUS.*

CCLVI. *a* 1. In aggregated tranſparent drops, on the ſurface of liver-brown toad-ſtone. *Franckfort* on the *Maine.*

b. Compact.

SPECIES XXVIII. *OPAL.*

Of this may be reckoned two varieties, the effulgent (*Edler Opal*, Germ.) and the dull, (*Gemeiner Opal*, Germ.) The effulgent generally of a pale bluiſh white colour, ſometimes yellow or green; the white often emitting a yellowiſh, greeniſh, or reddiſh ſplendour, the yellow a fiery, and the green a purple, red, or yellow. The dull is alſo of various colours, as whitiſh, bluiſh, greyiſh, yellowiſh, reddiſh, browniſh, or greeniſh. They are both more or leſs tranſparent, and of a conchoidal fracture, but ſeldom ſo hard as to ſtrike fire with ſteel. The ſpecific gravity of the effulgent is, according to *Klaproth*, 2.114; of the common from 1.985 to 2.076. Such ſpecimens as become tranſparent by immerſion in water have received the name of *Hydrophanes.*

The opal is infuſible *per ſe*, but yields readily to mineral alkali, with ſome difficulty to borax, and ſcarcely at all to microcoſmic ſalt. By *Klaproth*'s analyſis the common opal contains, Silex 98.75, Alumine 0.01, Oxyde of Iron 0.01.

The finer kinds are found on a yellowiſh grey argillite at Mount *Czernizeka* in *Upper Hungary.*

VARIETY I. *AMORPHOUS.*

CCLVII. *a* 1. Of a whitiſh colour, with a green and purpliſh effulgence, on the ſurface of yellowiſh grey indurated clay intermixed with ſand. *Czernizeka, Upper Hungary.*

CCLVIII.

CCLVIII. *a* 2. Small detached poliſhed portions of the ſame. *Same place.*

CCLIX. *b* 1. In an irregular piece, without effulgence, partly ſemitranſparent, partly opake *(ſemi-opal)*. *Pecklin, Upper Hungary.*

The opake, part of this ſpecimen on its being immerſed in water becomes tranſparent, and is therefore ſaid to be hydrophanous.

CCLX. *b* 2. Detached portions of the ſame. *Eaſt Indies.*

CCLXI. *b* 3. Semitranſparent and of a horny appearance, forming a vein in yellowiſh white indurated clay. *Koſwatz, Sileſia.*

SPECIES XXIX. *PITCH-STONE.*

Pechſtein, Germ. *Pierre de Poix*, Fr.

Its colour is olive, mountain, leek or blackiſh green; greyiſh black; tile, blood or browniſh red; yellowiſh brown; greyiſh white, &c. It ſometimes alſo occurs ſtriped, ſpotted, or marbled. It is generally found amorphous, in a few inſtances cryſtalliſed in hexhedral priſms terminated by trihedral pyramids. In the maſs it is opake, but in thin pieces ſemitranſparent; its fracture imperfectly conchoidal, approaching to the ſplintery; very brittle; difficult to be ſcratched, but gives very feeble ſparks with ſteel; ſpecific gravity from 2.049 to 2.39. Of different ſpecimens the analyſis varies conſiderably; they all, however, conſiſt eſſentially of Silex with from $\frac{1}{10}$ to $\frac{1}{2}$ of Alumine, ſome water, inflammable matter, and oxyde of iron. It may be diſtinguiſhed from opal by the greaſineſs of its luſtre, and from jaſper by its ſemitranſparency and brittleneſs. The moſt ſtriking ſpecimens of this ſtone are from *Hungary*, *Saxony*, *Elba*, and *Siberia*.

VARIETY I. *CRYSTALLISED.*

a. In hexhedral priſms, with trihedral pyramids.

VARIETY II. *AMORPHOUS.*

CCLXII. *a* 1. Of a dull greeniſh colour intermixed with brown, and having one ſurface poliſhed. *Braunsdorf, Saxony.*

CCLXIII. *a* 2. Of a browniſh black colour intermixed with white opake ſpecks, ſemitranſparent at the edges, and of a conchoidal fracture. *Same place.*

This probably the ſame with the dull brown pitchſtone of Saxony, which Mr. *Weigleb*

Weigleb found to contain, Silex 73, Alumine 18, Oxyde of Iron 5.8, with ſome Water and Air.

CCLXIV. *a* 3. Of a greeniſh colour intermixed with dull red, ſemitranſparent, and of a vitreous fracture. *Meiſſen, Saxony.*

CCLXV. *a* 4. Of a browniſh red colour. *Telkobanya, Upper Hungary.*

CCLXVI. *a* 5. Of a pale yellowiſh brown colour, ſemitranſparent throughout. *Meiſſen, Saxony.*

CCLXVII. *a* 6. Of a browniſh yellow colour opake and of a conchoidal fracture. *Upper Hungary.*

CCLXVIII. *a* 7. Of a dull browniſh yellow colour inclining to green and opake, with reddiſh brown ſpots. *Meiſſen.*

CCLXIX. *a* 8. Of a browniſh green colour intermixed with black ſpots, ſemi-tranſparent and of a vitreous fracture. *Same place.*

CCLXX. *a* 9. In irregular opake nodules of a brown colour, tinged blue on the ſurface and imbedded in dull white indurated clay. *Meſnilmontant.*

b. Slaty.

CCLXXI. *c* 1. Compoſed of thin, opake, compacted or parallel layers, ſome whitiſh, but moſtly of a browniſh red colour. (*Ligniform* or *Holz Opal.*) *Telkobanya.*

SPECIES XXX. *CATS-EYE.*

L'œil de Chat, Fr.

This ſtone occurs in rounded fragments of various colours, as whitiſh reflecting a blue effulgence, brown reflecting a whitiſh effulgence, violet and ſmoke yellow reflecting a ſplendid white. It reſembles the eye of the animal from which it takes its name, in exhibiting a number of concentric coloured circles ſurrounding a luminous point. In ſome directions its fracture is foliated, in others fibrous, but generally conchoidal. It gives fire readily with ſteel; ſpecific gravity from 2.56 to 2.66. It fuſes, though with difficulty, into a white enamel. By *Klaproth*'s analyſis the variety from *Ceylon* conſiſts of, Silex 95, Alumine 1.75, Lime 1.5, Oxyde of Iron 0.25. That from *Malabar* of, Silex 94.5, Alumine 2, Lime 1.5, Oxyde of Iron 0.25.

VARIETY

VARIETY I. *AMORPHOUS.*

CCLXXII. *a* 1. In an irregular portion, of a yellowiſh red colour, conchoidal fracture, and refulgent ſurface. *Perſia.*

CCLXXIII. *a* 2. In poliſhed detached portions of different colours and ſizes. *Egypt*, *Perſia*, and *Ceylon.*

SPECIES XXXI. *FLINT.*

Caillou, Fr. *Feuerſtein*, Germ.

This ſtone, ſaid to be ſometimes cryſtalliſed in double trihedral pyramids, occurs generally in amorphous maſſes or nodules of a ſmoaky or yellowiſh grey, reddiſh, brown, or black colour, and often ſeveral of theſe in the ſame ſpecimen forming veins, ſtripes, clouds, or dots. Its ſurface is uſually covered with an argillaceous or calcareous cruſt; internally for the moſt part ſemitranſparent, with little luſtre. Fracture conchoidal, fragments very angular; ſpecific gravity from 2.58 to 2.63; gives fire plentifully with ſteel. When heated it decrepitates, and becomes white and brittle. It is infuſible at 168 *Wedgw.* and barely ſoftened by a ſtream of oxygen gas. The alkaline fluxes convert it into glaſs. According to *Weigleb*'s analyſis it conſiſts of, Silex 80, Alumine 18, Lime 2. The black flint *Klaproth* has found to contain, Silex 98, Lime $\frac{1}{100}$, Alumine $\frac{1}{100}$, Oxyde of Iron $\frac{1}{100}$.

Flint is moſt commonly found in chalk hills, either in ſolitary maſſes, or in beds alternating with the chalk.

VARIETY I. *CRYSTALLISED.*

a. In double trihedral pyramids.

VARIETY II. *OF PARTICULAR SHAPES.*

CCLXXIV. *a* 1. In irregular ſtalactites formed on a nodule of flint, of a ſmoke grey colour, and ochry on the ſurface. *Kent.*

VARIETY III. *AMORPHOUS.*

CCLXXV. *a* 1. In a round hollow nodule of a ſmoke grey colour, with a white opake incruſtation. *Kent.*

CCLXXVI.

CCLXXVI. *a* 2. Section of a ſemitranſparent nodule of a browniſh grey colour, with opake white ſpecks, poliſhed on both ſides. *Hampſhire.*

CCLXXVII. *a* 3. Portions of the ſame, in a rough ſtate, covered by a white cruſt. *Same place.*

CCLXXVIII. *a* 4. In a thin poliſhed ſlab, of a whitiſh grey colour intermixed with red. *Hampſtead.*

CCLXXIX. *a* 5. Portion of a ſpherical nodule of a pale brown colour, with cryſtalliſed white quartz in the centre. *Surry.*

CCLXXX. *a* 6. Section of a ſpherical nodule of a dark brown colour, with a ſemilunar white vein, and thickly incruſted with white indurated clay. *Same place.*

CCLXXXI. *a* 7. In an irregular piece, approaching to the nature of Pitchſtone, compoſed of veins of a dull white colour imbedded in white indurated clay. *Brittany.*

CCLXXXII. *a* 8. Of a bluiſh grey colour, dendritical on the ſurface. *Kent.*

b. Interſperſed.

SPECIES XXXII. *HORNSTONE.*

Petro-Silex, Chert. Hornſtein, Germ.

Is of a blue, yellow, grey, red, brown or green colour of various ſhades and always amorphous, the cryſtalliſed hornſtone found lately in certain parts of *Saxony* being moſt probably only ſecondary cryſtals, taking their form from calcareous ſpar or fluor. Its tranſparency, luſtre and hardneſs are inferior to thoſe of flint. It is alſo of a coarſer grain; its fracture ſplintery, rarely conchoidal; ſpecific gravity from 2.532 to 2.653. It is generally infuſible *per ſe*, but with borax or microcoſmic ſalt gives a black glaſs. A fuſible greeniſh white hornſtone from *Lorraine* afforded Mr. *Kirwan* Silex 72, Alumine 22, Carbonate of Lime 6.

Found only in primitive mountains.

VARIETY I. *CRYSTALLISED?*

a. In hexhedral priſms with or without pyramids?

b. In double trihedral pyramids?

c. In cubes?

VARIETY II. *AMORPHOUS.*

CCLXXXIII. *a* 1. In an irregular portion, compact and of a browniſh white colour. *Deva, Tranſylvania.*

CCLXXXIV. *a* 2. The ſame of a coarſer texture, and of a grey colour intermixed with red. *France.*

CCLXXXV. *a* 3. In a flatted piece, compoſed of ſemitranſparent layers of a browniſh red colour, partaking of the nature of flint.

CCLXXXVI. *a* 4. Portion of an opake nodule, of a dull white colour, encloſing a nucleus the ſurface of which is minutely cryſtallifed. *Hampſhire.*

CCLXXXVII. *a* 5. Five other varieties of hornſtone, poliſhed on the ſurface.

CCLXXXVIII. *a* 6. In a tabular portion of a very fine grain and compact texture, of a bluiſh black colour (*Lydian Stone*). *Saxony.*

This reckoned by *Baron Born* as a variety of Baſalt. *Catal. de Raab.* X. B. 3.

b. Slaty. (*Siliceous Schiſtus. Baſanite.*) *Anal.* Silex 75, Lime 10, Magneſia 0.046, Iron 3, Coal 5. *Weigl.*

Hornſlate. Anal. Silex 73, Alumine 24, Iron 3. *Weigl.*

SPECIES XXXIII. *JASPER.*

The colours of this ſtone are various, as white, grey, yellow, brown, red, and green of different ſhades, and frequently ſeveral of theſe mixed in ſpots, clouds, veins, or ſtripes. It is of conſiderable ſplendour; its fracture generally conchoidal, paſſing into the ſplintery or earthy. It breaks into irregular ſharp angular pieces. It is in the maſs opake, but in thin fragments ſometimes ſemitranſparent. Though inferior in hardneſs to flint, it gives fire with ſteel. Its ſpecific gravity from 2.58 to 2.7. In the fire it changes colour, but does not decrepitate nor harden, neither at 156 *Wedgw.* does it ſhew any ſigns of fuſion: even by oxygen gas it is very imperfectly melted. Alkalis and microcoſmic ſalt flux it difficultly, borax more eaſily, and without efferveſcence. According to the analyſis of *Delamethrie*, the Egyptian pebble, which is a variety of jaſper, contains, Silex 54, Alumine 30, Iron 16.

Jaſper

Jaſper is met with in various parts of the world, in large eliptical maſſes connected by veins, or in detached nodules, or forming entire rocks.

VARIETY I. *CRYSTALLISED?*

a In irregular hexhedral priſms?

Moſt probably ſecondary cryſtals formed on calcareous ſpar.

VARIETY II. *AMORPHOUS.*

CCLXXXIX. *a* 1. In an uniform maſs of a dull red colour. *Calveriberg, Hungary.*

CCXC. *a* 2. In a poliſhed portion of a dull clouded green colour. *Egypt.*

CCXCI. *a* 3. Of a fleſh red colour, interſected with whitiſh veins and mixed with angular fragments of cryſtalliſed quartz. *Bohemia.*

CCXCII. *a* 4. Compoſed of chocolate brown and leek green parallel veins. *(Ribban Jaſper.)* *Siberia.*

CCXCIII. *a* 5. Exhibiting irregular veins or clouds of red and olive green of various ſhades. *Same place.*

CCXCIV. *a* 6. Of a purpliſh colour, intermixed with brown and white ſpots, and having ſomewhat of a granular texture, intermediate between Jaſper and Quartz. *Bohemia.*

CCXCV. *a* 7. Of a cloudy blood red colour, and intermixed with ſmall portions of white quartz. *Same place.*

CCXCVI. *a* 8. Of an uniform blood red colour. *Same place.*

CCXCVII. *a* 9. Of a pale yellowiſh cloudy green colour, with ſtreaks of grey iron ore. *Same place.*

CCXCVIII. *a* 10. Of an uniform yellowiſh green colour. *Berna.*

CCXCIX. *a* 11. In green and yellow veins with a reddiſh cloud. *Bohemia.*

CCC. *a* 12. Compoſed of reddiſh brown and light greeniſh yellow parallel veins. *St. Kolm Kilm, Scotland.*

CCCI. *a* 13. Of a light liver brown colour. *Saxony.*

CCCII. *b* 1. Egyptian Pebble in thin ſlabs, cut and poliſhed.

CCCIII. *b* 2. Seventeen other varieties of the ſame, of various colours and ſizes. Principally from *Bohemia*, one from *Otaheite*.

SPECIES XXXIV. *PORCELANITE.*

Porzellan Jaſpis, Germ.

Its colours are yellowiſh or pearl grey, lavender blue, ochre yellow, ſtraw or Iſabella yellow, tile or fleſh red, reddiſh brown or greyiſh black; many of theſe occurring in diſtinct ſpots in the ſame ſpecimen. It is opake, and of a moderate ſplendour; fracture conchoidal inclining to even, with ſharp angular fragments and diſpoſition to ſplit into layers; brittle; hardneſs nearly the ſame with that of jaſper; ſpecific gravity 2.33. At 151 *Wedgw.* it melts into a ſpongy ſemitranſparent maſs. It has not as yet been analyſed.

Found in large maſſes in various parts of *Germany*.

VARIETY I. *AMORPHOUS.*

CCCIV. *a* 1. In a flatted piece of a lilach colour having one ſide poliſhed. *Germany.*

CCCV. *a* 2. Compoſed of layers of a light olive green colour, ſuperficially of a browniſh red. *Hungary.*

SPECIES XXXV. *HELIOTROPIUM.*

Jaſp Sanguin, Fr.

It occurs in amorphous maſſes of a green colour of various ſhades, with ſpots of blood red or ochre yellow, has little luſtre, and may be diſtinguiſhed from jaſper by its faint degree of tranſparency. Its fracture flatly conchoidal paſſing into the ſplintery. It gives fire very plentifully with ſteel; ſpecific gravity from 2.62 to 2.7. At 114° *Wedgw.* it aſſumes a reddiſh brown tinge, and, according to *Lavoiſier*, is ſcarcely fuſible by the aid of oxygen gas. It is found in *Egypt*, *Siberia*, *Iceland*, &c.

Born conſiders the heliotrope as a variety of agate.

VARIETY

VARIETY I. *AMORPHOUS.*

CCCVI. *a* 1. In a poliſhed piece, of a dark green colour, intermixed with brown veins and red ſpots. *Aſia.*

CCCVII. *a* 2. Three poliſhed ſlabs of the ſame.

SPECIES XXXVI. *WOODSTONE.*

Bois Petrifié, Fr. *Holzſtein*, Germ. *Lithoxylon.*

This ſtone differs in its colour, ſhape, magnitude, texture, tranſparency, &c. according to the kind of wood from which it has originated. It is generally of a grey, brown, yellow, reddiſh, whitiſh, or black colour; but ſlightly tranſparent and with little luſtre; ſo hard as to give fire plentifully with ſteel; fracture conchoidal; ſpecific gravity from 2.045 to 2.675. It has not been analyſed, but appears to be of the nature of quartz.

It is found in great variety in the iſland of *Martinico*, *Hungary*, and various other parts.

VARIETY I. *AMORPHOUS.*

CCCVIII. *a* 1. In an oblong piece, of a pale brown colour with black and white clouds, having one ſide poliſhed. *Bohemia.*

CCCIX. *a* 2. Of a darker brown and more uniform colour, alſo poliſhed. *Upper Hungary.*

CCCX. *a* 3. Of a browniſh white colour. *Same place.*

SPECIES XXXVII. *FELSPAR.*

Its moſt common colour is fleſh red, ſometimes bluiſh grey, not unfrequently yellowiſh, greeniſh, or milk white, or browniſh yellow, rarely blue or green, only in one inſtance black, and ſometimes altogether without colour. Its tranſparency is of different degrees from perfectly tranſparent to opake; luſtre conſiderable, ſometimes unctuous, in the more tranſparent, pearly and irrideſcent; its fracture generally foliated; fragments rhomboidal; ſpecific gravity from 2.437 to 2.600. When cryſtalliſed it occurs in rhomboids or tetrahedral priſms, truncated obliquely, and their varieties. It gives ſparks feebly

feebly with ſteel, and may in many inſtances be ſcratched by a hard knife. Its different varieties are fuſible at from 119 to 130 *Wedgw.* Alkalis flux it with difficulty, microcoſmic ſalt and borax more eaſily. From the analyſis of *Gerhard, Weigleb, Heyer, Sauſſure, Kirwan,* and others, it contains, Silex 43—79, Alumine 12—37, in ſome inſtances Magneſia 4—9, Baryte 2—11, Lime 2—17, Oxyde of Iron 1—3. According to *Kirwan* any compound of ſilex and alumine in which the former predominates, with a ſufficient proportion of lime and magneſia, or lime, magneſia and baryte to render the mixture fuſible at 140 *Wedgw.* may conſtitute felſpar. It is found in great abundance, as it forms a principal conſtituent part of granite and porphyry, and is alſo ſometimes met with in neſts and veins in ſecondary mountains. By long expoſure to the atmoſphere it often ſuffers decompoſition, and is thereby productive of a whitiſh infuſible clay.

VARIETY I. *CRYSTALLISED.*

CCCXI. *a. aa* 1. In ſemitranſparent flatted aggregated tetrahedral priſms obliquely truncated at each extremity, and covered with capillary amianthus. *(Adularia.)*
Mount St. Gothard.

CCCXII. *a. aa* 2. In white tranſparent flatted hexhedral priſms terminated by tetrahedral ſummits, implanted on opake micaceous quartz. *Pyrennées.*
R. de L. Pl. 5. *Fig.* 14.

CCCXIII. *a. aa* 3. The ſame, with brown lenticular ſpathoſe iron ore and cryſtalliſed quartz. *Dauphiné.*

CCCXIV. *a. aa* 4. The ſame, in very numerous cryſtals of a reddiſh yellow colour, on reddiſh ferruginous quartz. *Same place.*

CCCXV. *a. aa* 5. In minute tranſparent cryſtals with white ſilky amianthus.
Pyrennées.

CCCXVI. *a. aa* 6. In larger polyhedral cryſtals on an ochry calcareous incruſtation.
Same place.

CCCXVII. *a. aa* 7. The ſame, in larger cryſtals. *Same place.*

CCCXVIII. *a. aa* 8. Fragment of a large ſemitranſparent cryſtal.
Mont St. Gothard.

CCCXIX. *a. aa* 9. Detached tranſparent poliſhed portions of the ſame.
Same place

CCCXX. *a. aa* 10. In a compact ſemitranſparent and effulgent maſs, of a white colour and foliated texture. *Pyrennèes.*

CCCXXI. *a. bb* 1. In tetrahedral priſms of a pale fleſh red colour, truncated obliquely at their extremities, *(Common Felſpar.)* *Lago de Corno.*

CCCXXII. *a bb* 2. In ſmaller cryſtals of a dull white colour, truncated both at the edges and extremities, and imbedded in coarſe decompoſing granite. *Auvergne.*

CCCXXIII. *a. bb* 3. The ſame, in detached cryſtals of different ſizes, ſome truncated, others entire. *Same place.*

CCCXXIV. *a. bb* 4. In aggregated rhombs of a ſcaly texture and light yellow colour, with ſmoaky cryſtalliſed quartz and ſilvery mica. *Dauphinè.*

VARIETY II. *AMORPHOUS.*

CCCXXV. *a* 1. Of a foliated texture and browniſh red colour, with veins of quartz.

CCCXXVI. *a* 2. Of a pale reddiſh white colour and ſhining ſurface. *Alps.*

CCCXXVII. *a* 3. The ſame, of a milk white colour, with a reddiſh tinge and angular fracture. *Savoy.*

CCCXXVIII. *a* 4. In an irregular foliated maſs, partly of a light brown colour and partly white, much of the latter in a powdery or decompoſing ſtate.
Said to be rich in ſilver. *Johngeorgenſtadt.*

CCCXXIX. *a* 5. Of a pale verdigris green colour, ſplendid on the ſurface, and interſected tranſverſely with ſmall white veins. *Siberia.*

CCCXXX. *b* 1. Of a yellowiſh white colour and granular texture, approaching to the nature of quartz. *Scotland.*

CCCXXXI. *b* 2. Of a cloſe granular texture and yellowiſh red colour *(Red Petuntſe.)* *Pentland-Hill* near *Edinburgh.*

CCCXXXII. *c* 1. Of an angular fracture and light reddiſh yellow colour.
This uſed in making china. *Same place.*

CCCXXXIII. *c* 2. Of a very pale purpliſh fleſh colour, compact, and of a ſomewhat ſlaty texture and angular fracture. *China.*

SPECIES

SPECIES XXXVIII. *LABRADOR FELSPAR.*

Its colour is of a light bluiſh or blackiſh grey or green, reflecting in different poſitions blue, purple, red, green, &c. Its form amorphous; texture foliated; fragments rhomboidal; ſpecific gravity from 2.67 to 2.69; tranſparency and hardneſs nearly the ſame with thoſe of common felſpar. It fuſes with difficulty at 155 *Wedgw.* ſeparating into a white and brown maſs, the latter leſs fuſible than the former. According to *Bindheim's* analyſis, the green felſpar of *Siberia*, which is of this ſpecies, conſiſts of Silex 69, Alumine 13, Sulphate of Lime 12, Oxyde of Copper 0.7, Oxyde of Iron 0.04.

Found principally in *St. Paul's Iſland, Coaſt of Labrador, North America*, where it occurs in rounded maſſes, and is thought to form a conſtituent part of granite.

VARIETY I. *AMORPHOUS.*

CCCXXXIV. *a* 1. Of a foliated texture, ſemitranſparent and exhibiting a red and blue effulgence. *Coaſt of Labrador.*

CCCXXXV. *a* 2. The ſame, with a blue effulgence. *Same place.*

CCCXXXVI. *a* 3. In thin poliſhed ſlabs, one exhibiting a blue, the other a green effulgence. *Same place.*

CCCXXXVII. *a* 4. The ſame, in larger ſlabs. *Same place.*

CCCXXXVIII. *a* 5. The ſame, in ſmaller portions with blue ſtripes. *Same place.*

CCCXXXIX. *a* 6. The ſame, with green ſtripes. *Same place.*

SPECIES XXXIX. *PETRILITE.*

Cubic Felſpar, Karſten.

Deſcribed by *Kirwan* as being of a reddiſh brown or browniſh red colour, of a weak luſtre and little tranſparency; amorphous; fracture ſplintery or foliated; fragments cubic; hardneſs equal to that of the ſofter felſpars; brittle; ſpecific gravity 3.081. At 160 *Wedgw.* becomes white, barely concreting without fuſion.

VARIETY I. *AMORPHOUS.*

a. With cubic fragments.

SPECIES

SPECIES XL. *ARGENTINE FELSPAR.*

Oculus Piſcis.

This ſtone appears to be little elſe than a variety of felſpar in a ſtate of decompoſition. It occurs either amorphous, or in rounded fragments, or cryſtalliſed as common felſpar; its colour either common, dead, or ſilvery white, or, according to the degree of decompoſition, irrideſcent or ochry yellow, and alſo, according to the directions of its fracture, of a foliated or ſtriated texture, with but little tranſparency; generally ſofter than common felſpar; ſpecific gravity from 2.212 to 2.500. It fuſes without much difficulty into a clear compact maſs; and, by the analyſis of *Dodun*, who firſt diſcovered it in the black mountains of *Languedoc*, contains Silex 46, Alumine 36, Oxyde of Iron 16.

VARIETY I. *CRYSTALLISED.*

a. As common felſpar.

VARIETY II. *AMORPHOUS.*

a. Foliated.

SPECIES XLI. *FELSITE.*

Differs principally from common felſpar in being of a compact texture and extremely difficult of fuſion. Its colour is for the moſt part azure blue, or green, and ſometimes, as it is ſaid, browniſh. When expoſed to the blowpipe it whitens and becomes ſplintery, but has not yet been analyſed. It was firſt diſcovered in the mountains of *Styria* intermixed with quartz and mica. The green kind enters alſo into the compoſition of a particular ſpecies of porphyry.

VARIETY I. *AMORPHOUS.*

CCCXL. *a* 1. Of a light ſky blue colour and compact texture, with white quartz, and ſilvery mica. *Dauphiné.*

SPECIES LXII. *STAUROLITE.*

Andreaſbergolite, Wern. *Kreutz Cryſtal.*

This occurs in ſemitranſparent cryſtals generally of a milk white colour, and having a conſiderable degree of luſtre. Its form flatted tetrahedral priſms terminated by tetrahedral pyramids, its cryſtals either ſingle or croſſing each other at right angles; texture foliated; brittle, but of ſufficient hardneſs to give a few feeble ſparks with ſteel; ſpecific gravity from 2.355 to 2.361. It is ſlightly acted on by acids. On being gradually heated it decrepitates and loſes from 15 to 16 parts of its weight. It is infuſible at 150° *Wedgw.* but by the aſſiſtance of oxygen gas may be converted into a white enamel; by borax or microcoſmic ſalt it is reduced with difficulty into a porous opake and greeniſh maſs, and by ſoda into a frothy one of a white purpliſh or yellowiſh colour. According to the analyſis of *Weſtrumbe* it contains, Silex 44, Alumine 20, Baryt 20, Water 16.

Found at *Andreaſberg* in the *Hartz*, near *St. Brieux* in *France*, and *Compoſtella* in *Spain*. By many it is conſidered as only a variety of zeolite.

VARIETY I. *CRYSTALLISED.*

CCCXLI. *a* 1. In tetrahedral priſms with tetrahedral pyramids, ſome ſingle, others croſſing each other at right angles, ſemitranſparent and irregularly aggregated on the ſurface of an amorphous maſs of the ſame. *Hartz.*

CCCXLII. *a* 2. The ſame, in milky coloured cryſtals, covering the ſurface of a portion of an internally cryſtalliſed geod. *Oberſtein.*

CCCXLIII. *a* 3. In larger cryſtals, on the ſurface of a maſs of calcareous ſpar. *Scotland.*

SPECIES XLIII. *LAPIS LAZULI.*

A ſtone which exhibits various ſhades of azure blue mixed with ſpots of white, and veins or ſpecks of yellow pyrites, which have been occaſionally miſtaken for native gold. Its form amorphous; ſurface dull; fracture almoſt earthy; opake; ſpecific gravity from 2.76 to 2.94. It gives fire feebly with ſteel, and is capable of a fine poliſh. It retains its colour at 100° *Wedgw.* but in higher degrees of heat melts with intumeſcence into a yellowiſh black maſs, and afterwards into a whitiſh enamel. When previouſly calcined it is converted by the mineral acids into a gelatinous ſubſtance.

It

It appears to derive its colour from Oxyde of Iron, as it contains, according to the analyſis of *Margraff*, Silex, Lime, Sulphate of Lime, and Iron; and according to *Klaproth*, Silex 46, Alumine 14.5, Carbonate of Lime 28, Sulphate of Lime 6.5, Oxyde of Iron 3, Water 2.

Found on the frontiers of *Siberia*, *Tartary*, and *China*, and lately, as is reported, in *America*.

VARIETY I. *AMORPHOUS.*

CCCXLIV. *a* 1. In a poliſhed fragment of a Pruſſian blue colour, intermixed with white quartz and ſilvery mica. *Aſia.*

CCCXLV. *a* 2. Two fragments, one of a lavender, the other of a ſkyblue colour, both intermixed with quartz. *Same place.*

CCCXLVI. *a* 3. Five poliſhed portions of the ſame, of various ſhades.

SPECIES XLIV. *PREHNITE.*

This ſtone occurs either amorphous, or cryſtalliſed in compreſſed tetrahedral priſms; its colour apple green or greeniſh grey; ſemitranſparent and internally of a ſlight pearly luſtre; texture foliated; brittle; hardneſs ſuch as to give fire with ſteel; ſpecific gravity 2.942. When heated to redneſs it ſwells even more than zeolite, and under the blow-pipe melts into a brown ſpongy enamel. With alkalis it forms alſo an enamel; with microcoſmic ſalt an opaleſcent, and with borax a clear glaſs. According to the analyſis of *Klaproth* it contains, Silex 44, Alumine 30, Lime 18, Oxyde of Iron 5, Water and Air 2.

Firſt found at the *Cape of Good Hope* by *Col. Prehn:* found alſo near *Dumbarton* in *Scotland* and *Dauphiné* in *France.*

VARIETY I. *CRYSTALLISED.*

CCCXLVII. *a* 1. In compreſſed tranſparent tetrahedral priſms of a pale green colour, with cryſtals of violet ſhorl and ponderous ſpar, on dark green argillaceous ſchiſtus. *Dauphiné.*

CCCXLVIII. *a* 2. The ſame, in ſmaller aggregated cryſtals, ſuperficially impregnated with greeniſh actynolite, on a ſimilar matrix. *Same place.*

b. Indeterminate.

VARIETY II. *AMORPHOUS.*

CCCXLIX. *a* 1. In a ſemitranſparent tuberous maſs of an apple green colour and foliated texture, indiſtinctly cryſtalliſed on the ſurface. *Cape of Good Hope.*

SPECIES XLV. *ÆDELITE.*

Siliceous Zeolite.

A ſtone of a light grey colour, ſometimes with a ſlight tinge of red, brown, green, or yellowiſh green; of a tuberoſe or knotty form, with little luſtre, and of a ſtriated and ſometimes ſplintery fracture. Specific gravity 2.515. It gives fire readily with ſteel, melts with intumeſcence under the blow-pipe into a frothy maſs, and according to the analyſis of *Bergman* contains Silex from 62 to 69, Alumine from 18 to 20, Lime from 8 to 16, Water from 3 to 4.

Hitherto found only at *Adlefors* and *Meſſenberg* in *Sweden*. On account of its hardneſs and ſpecific gravity, it is denied by *Kirwan* to be a variety of zeolite.

VARIETY I. *OF PARTICULAR SHAPES.*

a. Tuberoſe.

SPECIES XLVI. *ZEOLITE.*

Occurs moſt commonly in cryſtals, rounded maſſes, or grains, either encloſed in amygdaloid (*Toadſtone* as it is generally called) or in the fiſſures of rocks. Its moſt uſual colour is pure, yellowiſh, or greeniſh white, ſometimes reddiſh white, and more rarely greeniſh grey, honey, or orange yellow, or fleſh red. When cryſtalliſed, its forms are either cubes and their varieties, truncated hexhedral priſms, or hexagonal lamellæ; the external ſurface of its cryſtals ſmooth, with a conſiderable degree of ſplendour, which varies internally from mother-of-pearl to vitreous; its fracture fibrous and radiated, or curvedly foliated, ſometimes coarſely granular; fragments irregularly angular and not remarkably ſharp; tranſparency varying from clear to ſemitranſparent at the edges only; ſpecific gravity from 2.07 to 2.21; readily ſcratched by the knife. By the mineral acids it is, in moſt inſtances, converted into a kind of jelly. Under the blow-pipe it becomes white, opake and intumeſcent. Before fuſion it emits a blue phoſphoric light, and when melted forms a white ſemitranſparent frothy enamel, not ſufficiently hard to cut glaſs, and ſoluble in acids. Its fuſion is promoted by ſoda, borax,

rax, and microcoſmic ſalt; by the firſt more readily, than by either of the others. The zeolite of *Iceland*, according to *Bergman's* analyſis, contains Silex 48, Alumine 22, Lime 14, Water 16. That of *Ferroe*, according to *Pelletier*, Silex 50, Alumine 20, Lime 8, Water 22.

Moſt zeolites are obſerved to be ſubject to decompoſition on expoſure to air, and ſaid to be often found paſſing into calcedony.

VARIETY I. *CRYSTALLISED.*

CCCL. *a* 1. In ſmall rhomboidal cryſtals of a white colour and ſemitranſparent, on brown baſalt. *Scotland.*

CCCLI. *a* 2. In ſemitranſparent rhomboids of a white colour, ſome perfect, others variouſly truncated, on the ſurface of greyiſh toadſtone. *Same place.*

CCCLII. *a* 3. The ſame, in cryſtals of a whiter colour. *Same place.*

CCCLIII. *a* 4. The ſame, of a light browniſh yellow colour, on the ſurface of greeniſh black baſalt. *Same place.*

b. In truncated hexhedral priſms.

CCCLIV. *c* 1. In lengthened hexagonal lamellæ, tranſparent and of a white colour; ſome of the cryſtals perfect, others doubly bevilled at the edges, with cubic cryſtals and ſmall ſpherules of the ſame, on browniſh yellow toadſtone. *Ferroe.*

CCCLV. *c* 2. In ſmall tranſparent hexagonal plates, on a flatted incruſtation of the ſame. *Same place.*

CCCLVI. *c* 3. In flatted tetrahedral priſms terminated by tetrahedral pyramids, ſemitranſparent, and of a mother-of-pearl luſtre, compoſed of hexagonal lamellæ accumulated one on the other, on a yellowiſh brown argillite. *Iceland.*

CCCLVII. *c* 4. The ſame, in ſmaller cryſtals, more confuſedly aggregated. *Same place.*

CCCLVIII. *c* 5. The ſame, forming concave aggregated faſciculi, on a browniſh zeolitic incruſtation. *Same place.*

CCCLIX. *c* 6. In ſmaller hexagonal cryſtals, aggregated on the ſurface of a rhomboidal fragment of tranſparent double refracting calcareous ſpar. *Iceland.*

CCCLX.

CCCLX. *c* 7. In more confuſedly aggregated cryſtals. *Iceland.*

CCCLXI. *c* 8. The ſame, in rather larger cryſtals. *Same place.*

CCCLXII. *c* 9. In tetrahedral priſmatic cryſtals, ſemitranſparent and of a white colour, diverging from different centres. *Same place.*

CCCLXIII. *c* 10. In ſmall hollow internally cryſtalliſed nodules, in light liver brown toadſtone. *Iſle of Sky.*

CCCLXIV. *c* 11. The ſame, in more compact nodules, in deep brown toadſtone. *Same place.*

CCCLXV. *c* 12. In aggregated hexagonal laminæ, lining the cavity of a rounded nodule of the ſame. *Ferroe.*

CCCLXVI. *d* 1. Compoſed of aggregated diverging laminæ of a white colour and pearly luſtre, with diſtinct projecting ſummits. *Norway.*

CCCLXVII. *d* 2. A ſmaller ſpecimen of the ſame, compoſed of broader laminæ. *Same place.*

CCCLXVIII. *d* 3. In an irregular piece of an opake white colour, ſilky luſtre and delicate fibrous texture, compoſed of priſmatic cryſtals diverging from different centres and decuſſating each other at the ſurface, intermixed with ochry quartz. *Iceland.*

CCCLXIX. *d* 4. In delicate white filaments, producing a velvety appearance and lining the hollow of an irregular piece of the ſame. *Giant's Cauſeway.*

CCCLXX. *d* 5. The ſame, in whiter, finer, and more brilliant filaments. *Same place.*

CCCLXXI. *d* 6. The ſame, in a more irregular nodule. *Same place.*

CCCLXXII. *d* 7. In delicate ſilky fibres, forming a downy covering on the ſurface of a greeniſh toadſtone. *Iſle of Sky.*

CCCLXXIII. *d* 8. The ſame, forming a thicker covering on a ſimilar matrix. *Same place.*

CCCLXXIV. *d* 9. The ſame, in longer capillary cryſtals. *Same place.*

VARIETY

VARIETY II. *AMORPHOUS.*

CCCLXXV. *a* 1. Of a white colour and compacted fibrous texture, the fibres on the ſurface decuſſating each other in the ſame manner with thoſe of No. 368. *Norway.*

CCCLXXVI. *a* 2. Of a fibrous texture, forming ſmall ſtellæ on the ſurface of a greeniſh hornblende ſchiſtus. *Sweden.*

CCCLXXVII. *a* 3. In diverging aggregated fibres of an ochry yellow colour, on decompoſing yellow pyrites. *Norway.*

CCCLXXVIII. *a* 4. In an irregular flatted nodule, internally of a diverging fibrous texture and ſnow white colour. *Iceland.*

CCCLXXIX. *b* 1. Compoſed of long diverging laminæ, ſemitranſparent and of a white colour, having a cock's comb appearance on the ſurface. *Same place.*

CCCLXXX. *b* 2. A ſmaller portion of the ſame, with greeniſh toadſtone. *Same place.*

CCCLXXXI. *b* 3. In layers, compoſed of looſely aggregated laminæ, lying in different directions on a nucleus of minutely cryſtalliſed quartz. *Norway.*

CCCLXXXII. *b* 4. Portion of a rounded ſemitranſparent nodule, of a foliated texture and white colour. *Iceland.*

CCCLXXXIII. *c* 1. Of a compact texture and light greeniſh yellow colour, tuberoſe on the ſurface. *Scotland.*

CCCLXXXIV. *c* 2. In a compact maſs of a yellowiſh white colour, ſilky luſtre, and opake, forming a broad vein in ſemitranſparent calcedony. *Norway.*

CCCLXXXV. *c* 3. In a rounded maſs, hard, ſemitranſparent, and of a yellowiſh green colour, intermixed with white zeolite, having one ſurface poliſhed. *Scotland.*

CCCLXXXVI. *c* 4. In ſmall white opake ſpherules, in a reddiſh brown toadſtone. *Norway.*

CCCLXXXVII. *c* 5. In ſmall ſemitranſparent ſpherules, imbedded in a dark fliceous cement; the ſpecimen cut and poliſhed.

CCCLXXXVIII. *c* 6. In an irregular compact ſemitranſparent maſs of a pure white colour. *Giant's Cauſeway.*

CCCLXXXIX. *c* 7. Of a tile red colour, intermixed with white quartz. *Neighbourhood of Upſal, Sweden.*

d. Looſe.

SPECIES XLVII. *SILICEOUS SPAR.*

Saulin Spath, Bindheim.

Conſidered by *Bergman* as a variety of zeolite; but by *Kirwan* as a ſtone of a diſtinct ſpecies, principally on account of its containing ſo ſmall a proportion of water. It is deſcribed as of a white, ſtraw yellow, ſea green, mountain green, or light blue colour; its cryſtals tetrahedral or hexhedral priſms, tranſverſely ſtreaked, of a fibrous or ſtriated fracture and ſilky luſtre, and generally accumulated on each other. It effervesces with acids, and, according to the analyſis of *Bindheim,* contains Silex 61.1, Lime 21.7, Alumine 6.6, Magneſia 5, Oxyde of Iron 1.3, Water 3.3.

VARIETY I. *CRYSTALLISED.*

a. In tetrahedral priſms.

b. In hexhedral priſms.

SPECIES XLVIII. *ROSE SPAR.*

Red Stone of Rawenſtein.

This ſtone, though ſaid to be found amorphous and in large maſſes, is ſometimes cryſtalliſed. Its colour by reflected light is roſe red, by refracted blue; its luſtre pearly and ſomewhat irrideſcent; tranſparency of different degrees from ſemitranſparent to clear; fracture foliated; fragments rectangular; hardneſs generally ſufficient to give fire with ſteel; brittle; ſpecific gravity about 4.00. It does not effervesce with acids. When ſuddenly heated it decrepitates and fuſes with great difficulty. The uſual fluxes are found to affect it but little.

It is conſidered by *Mr. Kirwan* as being nearly allied to petrilite.

VARIETY

VARIETY I. *CRYSTALLISED?*

CCCXC. *a* 1. In an irregularly aggregated cryſtalline maſs, tranſparent, of a pale roſe red colour, pearly luſtre, foliated texture, very friable and producing rectangular fragments. *Rawenſtein.*

VARIETY II. *AMORPHOUS.*

a. Thick foliated.

To the foregoing ſpecies may be added *Tremolite*, a ſtone diſcovered by father *Pini*, at *Mount Tremola* in the neighbourhood of *Mount St. Gothard.* This occurs, for the moſt part, in maſſes of a fibrous texture, the fibres ſometimes parallel, ſometimes diverging. Its colour white, greyiſh or blackiſh, with a pearly luſtre and ſlight tranſparency; hardneſs ſcarcely ſuch as to give fire with ſteel; ſpecific gravity, 2.65. It is partly ſoluble in the nitric acid with effervеſcence; becomes phoſphoreſcent on ſlight friction; melts by an intenſe heat into a tranſparent glaſs; and is ſaid to conſiſt of Silex and Lime, with a little Magneſia, Carbonic Acid, and Water.

GENUS VII. *ADAMANTINE EARTH.*

A new ſpecies of earth which *Klaproth* thought he had diſcovered in combination with Silex, Oxyde of Iron, and of Nickel, in the analyſis of Adamantine Spar, and remarkable for the properties of being inſoluble in acids, and infuſible with either of the fixed alkalis.

SPECIES I. *ADAMANTINE SPAR.*

This generally occurs in cryſtals, more or leſs regular, of a greyiſh colour, with various ſhades of green, brown, or black, the greyiſh being, for the moſt part, ſemi-tranſparent, and having ſomewhat of a pearly luſtre; its texture laminated; hardneſs equal to that of the topaz; ſpecific gravity from 3.71 to 3.87. It is infuſible even with the aſſiſtance of oxygen gas, and is very difficultly acted on by alkalis.

According to the firſt analyſis of *Mr. Klaproth*, it was ſaid to conſiſt of Adamantine Earth 68, Silex 31.5, Iron and Nickel 00.05; but by ſubſequent experiments it has been found to contain Alumine from 84 to 89, Silex from 5.5 to 6.5, Oxyde of Iron

from 1.2 to 7.5, and no new earth of any kind. The chief varieties of this ſpar come from *India* and *China*, the firſt generally of a greyiſh, the latter of a blackiſh colour, and known by the name of *Corrindon*, or *Corundum*.

VARIETY I. *CRYSTALLISED.*

I. *a* 1. In a large hexhedral priſm, obliquely truncated at both extremities, of a dull yellowiſh green colour, and changeable luſtre, being ſuperficially coated with mica.
Neighbourhood of *Bombay*.

VARIETY II. *AMORPHOUS.*

II. *a* 1. In ſmall irregular portions intermixed with purpliſh micaceous quartz.
Same place.

GENUS VIII. *JARGON EARTH.*

Firſt obtained by *Klaproth* in the analyſis of the *Jargon* or *Circon*, in which he found it in combination with Silex, and Oxyde of Iron and of Nickel. Its colour is white; its ſpecific gravity eſtimated at 4.000. With the ſulphuric acid it forms an aſtringent ſalt with ſtelliform cryſtals; with the acetous acid, a ſalt incapable of cryſtallization. It is inſoluble even in a boiling ſolution of potaſh. It melts with borax without effervescence, but is infuſible with either of the fixed alkalis, or with microcoſmic ſalt. The order of attraction of this earth has not as yet been ſufficiently aſcertained.

SPECIES I. *JARGON.*

Zirkon, Germ.

The colour of this ſtone is grey, or greeniſh white, or yellowiſh green, or yellowiſh or reddiſh brown, or violet; it is ſometimes alſo without colour. Its external luſtre caſual, its internal inclining to the metallic; its fracture laminated; fragments indeterminate; tranſparency conſiderable; refraction double; form double tetrahedral pyramids with or without an intermediate priſm; ſpecific gravity from 4.416 to 4.700; hardneſs next to that of the ſapphire.

It is difficultly acted on by acids. When heated to redneſs and ſuddenly quenched in water it becomes ſhattery, but is ſcarcely fuſible even by the help of oxygen gas.

According to *Klaproth*, it contains, Jargon Earth 68, Silex 31.5, Oxyde of Iron and of Nickel 0.05. Brought principally from *Ceylon*.

VARIETY

VARIETY I. *CRYSTALLISED.*

I. *a* 1. In ſmall octahedral cryſtals of various ſhades from colourleſs to pale ſea-green. *Ceylon.*

II. *a* 2. Indeterminate fragments of the ſame. *Same place.*

b. Indeterminate.

GENUS IX. *SIDNEIAN EARTH.*

The ſubſtance ſo called by *Mr. Wedgwood*, and on his authority thought to be a new ſpecies of earth, appears by the late experiments of *Mr. Hatchett* to be only a mixture of Silex, Alumine, and Oxyde of Iron. Vide *Phil. Tranſ. Vol. lxxx. Part ii. P.* 306. and *Vol. lxxxviii. Part i. P.* 1.

ORDER II. *MIXED.*

Compounds of the foregoing earths or ſtones, having their integrant parts ſo blended as not to be viſibly diſtinct.

GENUS I. *CALCAREOUS.*

SPECIES I. *MARL.*

Argillo-calcite.

This generally occurs in ſtrata more or leſs extenſive, and of different degrees of induration. It is of various colours, without luſtre or tranſparency; when dry has a rough harſh feel; ſpecific gravity from 1.6 to 2.4. It is eaſily diffuſible in water, moulders on expoſure to air, effervesces ſtrongly with acids, and is found fuſible from 130 to 140 *Wedgw.* By analyſis it appears to conſiſt of Carbonate of Lime 60—80, the remainder clay, with a little Oxyde of Iron and other accidental admixtures.

VARIETY I. *SEMI-INDURATED.*

I. In an irregular piece of a dead white colour, light and of an earthy texture. *Berne.*

II. The ſame, rather more compact and ponderous. *Italy.*

III. The ſame, of a yelloviſh white colour, ſtill more compact and very ponderous. *Yorkſhire.*

IV. In a thick ſlab of a yelloviſh white colour and cloſe earthy texture. *Mont Martre.*

V. The ſame, of a light grey colour. *Same place.*

VARIETY II. *INDURATED.*

VI. In an irregular piece of a yelloviſh colour, partly indurated and partly earthy and friable. *Stourbridge.*

VII. In a flatted piece of a light brown colour, compoſed of aggregated ſpherules. *Alps.*

VIII. Indurated and of a greyiſh colour, ſeparated by fiſſures into irregular polyhedral columns, the ſurface being covered and fiſſures filled with yellow calcareous ſpar (*Septarium*). *Iſle of Sheppey, Kent.*

IX. An irregular detached portion of the ſame with ſtellated gypſum on the ſurface. *Same place.*

X. Septarium in a large ſlab of a dark bluiſh grey colour, having its fiſſures filled with yellow calcareous ſpar. *Same place.*

XI. In a long ſlab of an aſh colour, very compact and indurated, with dark brown dendritic figures on the ſurface. *Cottam* near *Briſtol.*

VARIETY III. *SLATY.*

XII. Of a yelloviſh colour, indurated and of a flaty texture, with dendritic figures on the ſurface. *Pappenheim.*

SPECIES

SPECIES II. *LIMESTONE with ARGILLITE.*

Diſtinguiſhable from marble or common limeſtone, by being of a duller aſpect and having an earthy ſmell when breathed on.

XIII. Of an earthy texture and dull white colour. *Piedmont.*

XIV. Of a browniſh yellow colour, compoſed of layers and containing foliated manganeſe. *Obermoſchel.*

SPECIES III. *SILICEOUS LIMESTONE.*

Of ſuperior hardneſs to common limeſtone, giving fire occaſionally with ſteel, and under the higher degrees of heat melting into an enamel.

XV. Of a compact texture, internally of a light brown colour, externally of a yellowiſh white.

XVI. Of an earthy texture and greyiſh white colour. *Purbeck.*

SPECIES IV. *FERRUGINOUS LIMESTONE.*

Limeſtone largely impregnated with oxyde of Iron, and thereby acquiring a red or yellow colour, and a diſpoſition to become ochry on expoſure to air.

XVII. Of a granular texture and reddiſh grey colour, ochry on the ſurface. *Somerſetſhire.*

SPECIES V. *GYPSUM with CALCAREOUS SPAR.*

Generally harder and more ponderous than common gypſum, and though but partially ſoluble, always effervеſcing with acids.

XVIII. Of a ſnow white colour and granular texture. *Zykfels.*

SPECIES VI. *GYPSUM with SWINESTONE.*

Eaſily diſtinguiſhable from common gypſum by its offenſive odour on being ſcraped or powdered.

SPECIES

SPECIES VII. *GYPSUM with MARL.*

Generally of a greyiſh, browniſh, bluiſh, or yellowiſh colour, of different degrees of induration, dull, of an earthy fracture and more or leſs effervescent.

GENUS II. *MAGNESIAN.*

SPECIES I. *CALCIFEROUS ASBESTINITE.*

Vide *Kirw. Elem. Mineral. Vol. I. P. 377.*

SPECIES II. *STEATITE with ARGILL.*

Harder and leſs unctuous than common ſteatite, and having an earthy ſmell when breathed on.

I. Of a dark olive green colour and ſlaty texture. *Cornwall.*

SPECIES III. *SERPENTINE with HORNBLENDE.*

Uſually of a blackiſh colour, and of a ſomewhat foliated or ſtriated fracture.

II. Of a greeniſh black colour. *Portſoy.*

SPECIES IV. *SILICIFEROUS POTSTONE.*

Conſiderably harder and rather lighter than the Potſtone of *Como*. Vide *Kirw. Elem. Mineral. Vol.* I. *P. 376.*

SPECIES V. *FERRUGINOUS STEATITE.*

Generally of a bluiſh colour and of an increaſed ſpecific gravity, becoming ochry by calcination or long expoſure to air.

III. Of a reddiſh yellow colour, *China.*

GENUS III. *ARGILLACEOUS.*

SPECIES I. *CALCIFEROUS ARGILLITE.*

Containing a larger proportion of Carbonate of Lime than common Argillite, and conſequently effervеſcing more readily with acids.

I. Of a light greeniſh grey colour and cloſe texture.

SPECIES II. *TALCOSE ARGILLITE.*

Its colour whitiſh, bluiſh, or greeniſh grey; luſtre conſiderable; ſofter than common argillite; ſpecific gravity 2.717. Found in great abundance at *Holyhead.*

SPECIES III. *SILICIFEROUS ARGILLITE.*

Argillite intermixed with ſand, jaſper, or other forms of ſilex. Its colour generally grey of various tints; having ſome luſtre, and ſlight tranſparency; hardneſs ſometimes ſufficient to give fire with ſteel; ſpecific gravity from 2.61 to 2.67.

II. Of a bluiſh black colour and ſlaty texture.

SPECIES IV. *FERRUGINOUS ARGILLITE.*

Argillite impregnated with oxyde of Iron, becoming thereby more ponderous and leſs ſlaty in its texture.

III. Of a dark aſh colour and ſlaty texture, ochry on the ſurface. *Jura, Orkneys.*

IV. Of a yellowiſh red colour, ſlaty texture, and earthy fracture.

SPECIES V. *HORNBLENDE with GARNET.*

Acquiring from the garnet more or leſs of a reddiſh colour, and a greater degree of luſtre, hardneſs, and ſpecific gravity.

SPECIES

SPECIES VI. *HORNBLENDE SLATE with TALC or MICA.*

Of a greeniſh grey colour, with ſome luſtre, and often of ſufficient hardneſs to give fire with ſteel; ſpecific gravity about 2.815.

Found in great plenty in the *Iſle* of *Angleſea*.

SPECIES VII. *HORNBLENDE SLATE with QUARTZ.*

Generally more or leſs of an ochre yellow colour, and of ſufficient hardneſs to give fire with ſteel.

SPECIES VIII. *TRAP with HORNBLENDE.*

May be diſtinguiſhed from common trap, by being for the moſt part of a greeniſh colour, and exhibiting glimmering particles.

SPECIES IX. *TRAP with MULLEN.*

SPECIES X. *TRAP with KRAG.*

Vide *Kirw. Elem. Mineral. Vol. I. P.* 380.

SPECIES XI. *SILICIFEROUS TRAP.*

Trap impregnated with different forms of ſilex, from which it acquires a cloſer texture and a greater degree of hardneſs.

SPECIES XII. *FERRUGINOUS CLAYS.*

Colorific Earths.

Clays receiving different ſhades of colour from the admixture of iron in various proportions, and in different degrees of oxydation. They ſtain the fingers, and generally change their colour on being expoſed to heat.

V. Of a blue colour, ochry on the ſurface, compoſed of ſerrated columnar concretions. *Colebrook Dale.*

VI. Of a yellowiſh colour, approaching to the nature of bole. *Saxony.*

VII. The ſame, of a lighter colour, more uniform in its texture, and of a harſher feel. *Mendip Hills.*

VIII. The ſame, of a ſtill paler yellow colour. *Same place.*

IX. Of a verdigris green colour intermixed with red ſpots. *Verona.*

SPECIES XIII. *MULLEN with ASBESTINITE.*

Vide *Kirw. Elem. Mineral. Vol. I. P.* 384.

GENUS IV. *SILICEOUS.*

SPECIES I. *EARTHY QUARTZ.*

Quartz in mixture with a ſmall portion of Alumine or Lime, having more or leſs of an earthy texture with but little luſtre or tranſparency, often brittle, and ſometimes very light.

I. Of a white colour and earthy texture, reſembling burnt alum both in appearance and feel. *Mont Martre.*

SPECIES II. *FERRUGINOUS QUARTZ.*

Quartz receiving different ſhades of colour from admixture with Oxyde of Iron, by which its texture, tranſparency, hardneſs &c. are alſo often materially affected.

II. Of an ochre yellow colour. *Cornwall.*

SPECIES III. *EARTHY QUARTZ with ACTYNOLITE.*

Vide *Kirw. Mineral. Vol. I. P.* 388.

SPECIES IV. *EARTHY HORNSTONE.*

Containing a larger proportion of alumine than common hornſtone, and exhibiting therefore a more earthy appearance.

SPECIES V. *FERRUGINOUS HORNSTONE.*

Generally of a reddiſh or yellowiſh colour, and for the moſt part more fuſible than the common hornſtone.

III. *a* 1. Of a reddiſh brown colour and conchoidal fracture. *Sweden.*

IV. *a* 2. Of a dull white colour, ochry on the ſurface, and penetrated with black dendritic figures. *Iſle of Elba.*

SPECIES VI. *SILICEOUS SCHISTUS with LIMESTONE.*

Vide *Kirwan. Elem. Mineral. Vol. I. P.* 392.

SPECIES VII. *SILICEOUS SCHISTUS with ARGILLITE.*

Vide *Kirwan. Elem. Mineral. Vol. I. P.* 391.

SPECIES VIII. *SILICEOUS SCHISTUS with MULLEN.*

Vide *Kirwan. Elem. Mineral. Vol. I. P.* 391.

SPECIES IX. *PITCHSTONE with OPAL.*

Vide *Kirwan. Elem. Min. Vol. I.* 392.

ORDER

ORDER III. *AGGREGATED.*

Earths or Stones of different kinds in a ſtate of viſible mixture.

GENUS I. *CALCAREOUS.*

SPECIES I. *CALCAREOUS SANDSTONE.*

Sand agglutinated by a calcareous cement. Generally of a whitiſh, greyiſh, or browniſh colour with a rough ſurface and earthy fracture. It is ſometimes found cryſtalliſed, and of ſufficient hardneſs to give fire with ſteel; ſpecific gravity from 2.5 to 2.6. When free from alumine it hardens on expoſure to air. The moſt perfect cryſtals of this ſtone are found at *Fountainbleau*.

VARIETY I. *CRYSTALLISED.*

I. *a* 1. In large rhomboids of a dull white colour and rough ſurface variouſly mortiſed into each other. *Fontainbleau.*

R. de L. Pl. 4. *Fig.* 45.

VARIETY II. *AMORPHOUS.*

II. *a* 1. Compoſed of layers of a fleſh red and dull white colour. *Norway.*

III. *a* 2. In a flatted piece of a browniſh red colour, interſperſed with ſilvery mica. Neighbourhood of *Mayence.*

The town of *Mayence* is built of this ſtone.

SPECIES II. *CALCAREOUS BRECCIA.*

Fragments of different kinds of Marble or of other ſtones imbedded in a calcareous cement.

IV. *a* 1. In a thin rounded ſlab compoſed of whitiſh marble in a dark coloured calcareous cement.

V. *a* 2. Fragments of reddiſh brown jaſper in a calcareous cement.

GENUS II. *MAGNESIAN.*

SPECIES I. *POTSTONE-PORPHYRY.*

Felſpar imbedded in a baſis of Potſtone, and generally of a greeniſh, reddiſh, or yellowiſh grey colour, with but little luſtre or tranſparency; fracture foliated; ſpecific gravity about 2.75.

VARIETY I. *AMORPHOUS.*

a. Undulatingly foliated.

SPECIES II. *SERPENTINE-PORPHRY.*

Felſpar imbedded in Serpentine; of various colours; without luſtre; ſlightly tranſparent; eaſily ſcratched by the knife; ſpecific gravity not exceeding 2.7.

VARIETY I. *AMORPHOUS.*

I. *a* 1. Compoſed of greeniſh white felſpar, in dark green ſerpentine. *Florence.*

II. *a* 2. The ſame, having one ſurface poliſhed. *Same place.*

GENUS III. *ARGILLACEOUS.*

SPECIES I. *ARGILLACEOUS SANDSTONE.*

Coarſe ſand, or minute fragments of Quartz, Flint, or Felſpar, in an argillaceous cement, and often intermixed with Mica.

VARIETY I. *AMORPHOUS.*

a. Slaty.

I. *b* 1. Of a dull white colour and coarſe ſandy texture, having an earthy ſmell when breathed on.

SPECIES

SPECIES II. *RUBBLE STONE.*

Gres Gris, Fr. *Grauwacke*, Germ.

Argillaceous cement with Quartz, Siliceous Schiſtus or Hornſtone, and Argillite. Its colour generally of different ſhades of grey; its texture ſlaty or compact; hardneſs various; ſpecific gravity from 2.64 to 2.68.

VARIETY I. *AMORPHOUS.*

a. Slaty.

b. Compact.

SPECIES III. *ARGILLACEOUS PORPHYRY.*

Felſpar contained in indurated Clay, Hornblende, Baſalt or Argillite, having an earthy ſmell when breathed on, and ſeldom of ſufficient hardneſs to give fire freely with ſteel.

VARIETY I. *AMORPHOUS.*

II. Compoſed of ſmall cryſtals of felſpar in a brown argillaceous cement. *Edinburgh.*

III. Dark coloured felſpar in a dark grey argillaceous cement.

SPECIES IV. *AMYGDALOID.*

Toadſtone.—Mandelſtein, Germ. *Variolite.*

Rounded maſſes of Calcedony, Agate, Zeolite, Calcareous Spar, Lithomarga, Steatite &c. in an argillaceous baſis.

VARIETY I. *AMORPHOUS.*

IV. Rounded portions of calcareous ſpar in an argillaceous cement. *Derbyſhire.*

V. Portion of a large nodule, compoſed of white calcareous ſpar in a blackiſh brown argillaceous cement. *Same place.*

VI. Portion of a nodule, compoſed of whitiſh ſteatite, in a brown argillaceous cement. *Wales.*

VII. Nodules of pure white cryſtalliſed zeolite in blackiſh Baſalt. *Giant's Cauſeway.*

VIII. Numerous ſpherules of zeolite imbedded in a reddiſh brown argillaceous cement. *Germany.*

IX. The ſame, in which the zeolite appears to have been decompoſed. *Franckfort.*

X. Twelve other varieties of Amygdaloid. *Scotland, Derbyſhire, Tyrol, Oberſtein, &c.*

SPECIES V. *SCHISTOSE MICA.*

An aggregate of Mica and Quartz, of a flaty texture, and ſplendid appearance; and often containing Garnets, Shorl, Actynolite, or Sappari.

VARIETY I. *AMORPHOUS.*

XI. *a* 1. Reddiſh white quartz intermixed with ſilvery mica, and of a flaty texture.

XII. *a* 2. White quartz with veins of browniſh mica. *Cornwall.*

XIII. *a* 3. Compoſed of blackiſh grey quartz and ſilvery mica. *Saxony.*

XIV. *a* 4. ——— of white quartz and greeniſh mica. *Cordona, Levant.*

XV. *a* 5. Eight ſlabs of ſchiſtoſe mica of various colours, from different places in the *Levant.*

GENUS IV. *SILICEOUS.*

SPECIES I. *GRANITE.*

Quartz, Felſpar and Mica intermixed in different proportions. In its texture and colour, various; hardneſs always ſufficient to give fire with ſteel; ſometimes brittle; ſpecific gravity uſually from 2.56 to 2.76. Of all the mineral ſubſtances the moſt abundant, as it conſtitutes the baſis of the higheſt and moſt extenſive primitive mountains.

VARIETY

VARIETY I. *AMORPHOUS.*

I. *a* 1. Compoſed of large diſtinct portions of white quartz, reddiſh white felſpar and brown mica. *Cornwall.*

II. *a* 2. ——— of browniſh quartz, reddiſh white felſpar and black mica. *Sweden.*

III. *a*. 3. ——— of ſemitranſparent quartz, dull white felſpar and black mica. In a bog near *Peterſburgh.*

On a pedeſtal of this granite ſtands the ſtatue of *Peter the Great.*

IV. *a* 4. Compoſed of white quartz, white felſpar, and ſilvery mica. *Bernborm.*

V. *a* 5. ——— of coarſe grains of ſemitranſparent quartz, browniſh red felſpar, and blackiſh brown mica. *Wales.*

VI. *a* 6. ——— of ſemitranſparent quartz, dull white cryſtals of felſpar and brown mica. *Cornwall.*

VII. *a* 7. ——— of ſemitranſparent quartz, fleſh red felſpar and blackiſh mica. *Egypt.*

VIII. *a* 8. ——— of ſemitranſparent quartz, white mica, and decompoſing white felſpar. *Cornwall.*

IX. *a* 9. Eight poliſhed ſpecimens of Granite. *Calabria, Blankenbourgh, &c.*

b. Slaty.

SPECIES II. *SIENITE.*

Quartz, Felſpar and Hornblende with or without mica, aggregated in different proportions: ſuppoſed to be poſterior in formation to Granite, and found to be fuſible in a moderate heat.

VARIETY I. *AMORPHOUS.*

X. *a* 1. Compoſed of white quartz, pale fleſh coloured felſpar and black hornblende.

XI. *a* 2. ——— of white quartz, browniſh white felſpar and blackiſh hornblende. From a mountain near the *Lake Sonico, Volcamonica.*

XII. *a* 3. The ſame, having a ſmaller proportion of Hornblende. *Same place.*

XIII. *a* 4. Compoſed of white quartz, browniſh red felſpar, and black hornblende. *Iſle of Elba.*

b. Slaty.

SPECIES III. *GRANATINE.*

Quartz, Felſpar and Jade; Quartz, Felſpar and Schorl; Garnet, Mica and Hornblende, &c.; aggregated into triple compounds. Vide *Kirw. Elem. Min. Vol. I. P.* 342.

VARIETY I. *AMORPHOUS.*

XIV. *a* 1. Compoſed of black ſchorl, red quartz, and ſilvery mica. *Scotland.*

XV. *a* 2. ——— of white quartz, ſilvery mica, and garnets.

XVI. *a* 3. ——— of white quartz, large fragments of black hornblende and ſilvery mica.

XVII. *a* 4. ——— of white quartz, black hornblende and black mica. *Norway.*

XVIII. *a* 5. ——— of white quartz, white ſilvery mica and garnets.

XIX. *a* 6. Three other varieties of Granatine.

SPECIES IV. *GRANITELL.*

Quartz and Felſpar; Mica and Hornblende; Jade and Garnet, &c. aggregated into binary compounds. Vide *Kirw. Elem. Min. Vol. I. P.* 343.

VARIETY I. *AMORPHOUS.*

XX. *a* 1. Compoſed of white quartz, and black hornblende.

XXI. *a* 2. The ſame, of a finer grain. *Val Sabia del Breſciano.*

XXII. *a* 3. In a poliſhed ſlab of a ſtill finer grain. *Bagolino* in *Val Sabia.*

XXIII. *a* 4. Compoſed of dull white quartz and black hornblende. *(Whin Stone.) Scotland.*

XXIV.

XXIV. *a* 5. Eight other varieties of granitell; fix of them cut and poliſhed. *Scotland, Blanckenburg*, and *Italy*.

XXV. *a* 6. Compoſed of white quartz and reddiſh white felſpar. *Cornwall*.

XXVI. *a* 7. ——— of white quartz and browniſh red felſpar. *Arthur's Seat, Scotland*.

XXVII. *a* 8. Two varieties of granitell. *Wales* and *Germany*.

XXVIII. *a* 9. Compoſed of browniſh red felſpar and black hornblende. *Leipzig*.

XXIX. *a* 10. ——— of reddiſh white felſpar and black hornblende. *Hartz*.

SPECIES V. *GRANALITE.*

Quartz, Felſpar, Mica, Schorl, Garnet, Hornblende, &c. forming aggregated compounds of four or more ingredients.

VARIETY I. *AMORPHOUS.*

XXX. *a* 1. Compoſed of white quartz, yellowiſh felſpar, dark brown mica, and black hornblende. *Cornwall*.

XXXI. *a* 2. ——— of white quartz, browniſh white felſpar, black mica, and black hornblende. *Monti ſopra Edolo Valcamonica*.

XXXII. *a* 3. ——— of white quartz, white ſilvery mica, large cryſtals of priſmatic ſtriated ſchorl, and garnets.

XXXIII. *a* 4. ——— of white quartz, reddiſh felſpar, green actynolite and black hornblende. *Hartz*.

SPECIES VI. *GNEISS.*

A mixture of Quartz, Felſpar, and Mica, diſtinguiſhable from Granite by being always more or leſs of a ſlaty texture.

VARIETY I. *AMORPHOUS.*

XXXIV. *a* 1. Compoſed of white quartz, reddiſh white felſpar, and ſilvery mica, having a laminated texture. *Scotland*.

XXXV. *a* 2. ——— of a white quartz, reddiſh felſpar, and browniſh mica. *Saxony*.

b. Fibrous.

SPECIES VII. *SILICEOUS PORPHYRY.*

Cryſtals of Felſpar imbedded in Jaſper, Hornſtone, Pitchſtone, Obſidian, Siliceous Schiſtus, Schiſtoſe Hornſtone or Amorphous Felſpar; of a compact or flaty texture, and ſo hard as to give fire with ſteel. Often found, like the foregoing, to conſtitute entire mountains.

VARIETY I. *AMORPHOUS.*

XXXVI. *a* 1. Compoſed of eliptical cryſtals of felſpar, of a yellowiſh white colour, imbedded in purpliſh coarſe jaſper.

XXXVII. *a* 2. ——— of numerous ſmall cryſtals of felſpar of a yellowiſh white colour, in a browniſh black ſiliceous cement. *Sweden.*

XXXVIII. *a* 3. A large nodule of the ſame. *Same place.*

XXXIX. *a* 4. In a thin ſlab compoſed of cryſtals of reddiſh white felſpar in a brown ſiliceous cement.

XL. *a* 5. Compoſed of numerous ſmall cryſtals of greeniſh white felſpar in black jaſper. (*Antique Porphyry.*) *Egypt.*

XLI. *a* 6. The ſame, with ſmall fragments of felſpar. *Pizzo, Calabria.*

XLII. *a* 7. Compoſed of white felſpar, in a greeniſh ſiliceous cement approaching to the nature of ſerpentine. *Egypt.*

XLIII. *a* 8. ——— of dull white felſpar, in browniſh red hornſtone. (*Common Porphyry.*) *Germany.*

XLIV. *a* 9. ——— of numerous ſmall cryſtals of reddiſh white felſpar, in browniſh red hornſtone. *Egypt.*

XLV. *a* 10. A thin poliſhed ſlab, compoſed of cryſtals of yellowiſh white felſpar in red jaſper.

XLV*. *a* 11. Nine other varieties of porphyry, cut and poliſhed. *Dreſden, Blankenburgh, &c.*

b. Slaty.

SPECIES

SPECIES VIII. *PUDDING-STONE.*

Rounded pebbles of Quartz or Flint imbedded in a ſiliceous cement.

VARIETY I. *AMORPHOUS.*

XLVI. *a* 1. Rounded pebbles of quartz and flint of different ſizes, agglutinated by a ſiliceous cement. *Hertfordſhire.*

XLVII. *a* 2. Sixteen other varieties of pudding-ſtone cut and poliſhed.

SPECIES IX. *SILICEOUS SANDSTONE.*

Sand or ſiliceous particles in a ſtate of coheſion more or leſs perfect.

VARIETY I. *AMORPHOUS.*

XLVIII. *a* 1. Of a dull white colour and fine granular texture. *Windſor.*

XLIX. *a* 2. Of a browniſh red colour, and compoſed of thin parallel layers. *Franckfort.*

L. *a*. 3. Compoſed of white and brown parallel veins. *Mayence.*

LI. *a* 4. Of an ochry white colour, encloſing cryſtals of cubic pyrites. *Bengal.*

SPECIES X. *SILICEOUS BRECCIA.*

Angular fragments of ſiliceous ſtones in a ſiliceous cement.

VARIETY I. *AMORPHOUS.*

LII. *a* 1. Angular fragments of white quartz, in browniſh red jaſper. *Aberdeenſhire.*

LIII. *a* 2. Three other varieties of Siliceous Breccia.

CLASS III. *METALS.*

The characteriſtic properties of theſe when pure, or unalloyed, are their opacity, ſplendour, and power of conducting the electric fluid. Their colour is different ſhades of white, grey, red or yellow; texture ſpicular or hackly, granular, granularly foliated or ſtriated; hardneſs from that which yields to the nail, as lead, to that which gives fire with ſteel; ſpecific gravity from 6.343 to 23.000.

Some metals are malleable and ductile to a great extent, as platina, gold, ſilver, &c. others fragile, as biſmuth, nickel, arſenic, &c.; hence their diviſion into *Metals* and *Semi-Metals*.

On expoſure to the combined action of air and moiſture, ſome remain unchanged; others, by uniting with carbonic acid or with oxygen, loſe their ſplendour and tenacity, and are converted into a ſtate of ruſt.

They are alſo very differently affected by expoſure to heat. In cloſe veſſels they ſimply melt, and may in ſome inſtances be volatiſed; but if air be admitted, whilſt ſome reſiſt its influence, as platina, gold, and ſilver, others are converted into oxyds ſuſceptible of ſubſequent vitrification, and of communicating a tinge to glaſs; the former metals therefore called *perfect*, the latter *imperfect*. Tin, the moſt fuſible of the metallic bodies, melts at 410 *Farenh.* Platina, and ſome others, require for their fuſion the application of the moſt intenſe degrees of heat. When melted, the metals aſſume a convex ſurface, and exhibit a diſpoſition to cryſtallize in cooling. By fuſion they may, with a few exceptions, be combined with each other in all proportions, undergoing thereby remarkable changes of volatility, fuſibility, and weight. Moſt of them may alſo in this way be united with ſulphur, many with phoſphorus, and ſome with charcoal.

All the metals are ſoluble either in the nitric or oxy-muriatic acid, and precipitable from their ſolutions in theſe acids, not only by the alkalies and moſt of the earths, and often by each other, but likewiſe by pruſſiate of pot-aſh in every inſtance, the ſolution of platina excepted. They are all in the moiſt way, except zinc, ſoluble alſo in alkaline ſulphurets.

The principal ſtates in which theſe bodies are preſented to us in the mineral kingdom are, either *native*, that is when in poſſeſſion of the foregoing properties, or where they

they loſe theſe properties by combination with oxygen, with certain of the acids, ſulphur, oxyde of arſenic, &c. and are then ſaid to be *mineraliſed*.

The metallic bodies are generally found in veins, cleſts, or fiſſures, running more or leſs obliquely in the ſtrata of primitive or ſecondary mountains, and are for the moſt part accompanied by quartz, calcareous ſpar, or other heterogeneous matter, which ſerves them as a matrix, and from which they are ſeparated in the mechanical operations of pounding, ſifting, waſhing, &c.

The liſt of the metallic bodies is, Platina, Gold, Quickſilver, Silver, Lead, Copper, Iron, Tin, Biſmuth, Nickel, Arſenic, Cobalt, Zinc, Antimony, Manganeſe; to which may be added Scheele, Uranite, Molybdena, Menachanite, and as ſtill later diſcoveries, Silvanite and Titanite.

ORDER I. *DUCTILE.*

GENUS I. *PLATINA.*

Platine, Or blanc, Fr.

When pure, this is of a white colour, intermediate between that of tin and ſilver, and is the heavieſt body in nature, its ſpecific gravity being upwards of 22. It is malleable and ductile to a great extent, though harder than either gold or ſilver. It undergoes no change by expoſure to the air. In the common fire it cannot be fuſed, but may be ſoftened to ſuch a degree as to become capable of being wielded. To the oxy-muriatic acid or aqua regia, in which alone it is ſoluble, it communicates at firſt a yellow and afterwards a reddiſh brown colour, and from theſe it may be precipitated by muriate of ammoniac, but neither by pruſſiate of potaſh nor ſolution of ſulphate of iron, properties which diſtinguiſh it from gold. It is ſaid to be alſo ſoluble in ſulphuret of potaſh. It is ſcarcely affected in the dry way either by compound ſalts or by ſulphur, but may be united by fuſion with arſenic; and in different proportions with ſeveral of the other metals, but moſt eaſily and intimately with zinc. With copper it produces a compound of a golden colour, hard, malleable, cloſe grained, ſuſceptible of a fine poliſh, and durable. It amalgamates readily with mercury.

This metal was firſt brought into Europe from the Spaniſh ſettlements in *South America* in the year 1741, and has hitherto been found only in a metallic ſtate, in ſmall flatted grains of a grey ſilver white colour, intermixed with ferrugineous ſand and particles of native gold and of quickſilver, being collected in the waſhings of the arenaceous gold ores, and principally thoſe of *Novita* and *Citaria*, north of *Choco* in *Peru*. It is alſo ſaid to have been met with in the iſland of *Barbadoes*.

SPECIES

SPECIES I. *NATIVE PLATINA.*

VARIETY I. *IN GRAINS.*

I. *a* 1. Native platina in ſmall flatted angular grains of a dark tin white colour.
Bogodo, Santa Fé.

Platina in this ſtate is found to contain from one third to one fourth its weight of iron, by which it is rendered magnetic, and reduced nearly one half in its ſpecific gravity. To purify it moſt effectually, it muſt either be diſſolved in oxy-muriatic acid and precipitated by muriate of ammoniac, or fluxed with a mixture of oxyde of arſenic and potaſh, heated afterwards with oil, and then digeſted in the nitric acid. Vide *Kirw. Elem. Min. Vol. II. P.* 104.

GENUS II. *GOLD.*

The moſt valuable of the metallic bodies, when pure, is of a bright yellow colour and very ſplendid. Next to platina it is the heavieſt body in nature, being to water as 19.300 to 1.000, and by far the moſt malleable, as well as the moſt ductile ſubſtance we are acquainted with. It is harder and more elaſtic than lead or tin, but leſs ſo than platina, ſilver, copper, or iron; not ſonorous. It ſuffers no change either on expoſure to air or moiſture. It melts at 32 of *Wedgw.* = 5237 *Farenheit*, exhibiting a beautiful bluiſh green, or aqua marine colour; but is incapable of being volatiliſed or oxydated, unleſs under the application of the moſt intenſe degrees of heat. Upon being allowed to cool ſlowly it cryſtallizes into four-ſided pyramids.

The only acids capable of acting on it are the oxy-muriatic acid and aqua regia, with which it forms a yellowiſh ſolution, remarkable for the properties of ſtaining the ſkin purple. From theſe, as in other inſtances of metallic ſolutions, the gold may be precipitated by the alkalies and ſoluble earths. It may alſo be thrown down by zinc, biſmuth, quickſilver, tin, and many other metals, and in its metallic ſtate by æther, different eſſential oils, phoſphorus, and ſolution of ſulphate of iron. It is likewiſe ſoluble in ſolutions of alkaline ſulphuret. The precipitate by tin is of a purple colour (*Purple powder of Caſſius*) that by ammoniac (*Aurum fulminans*) explodes with great violence on expoſure to gentle heat.

Gold in its metallic ſtate readily and intimately combines by fuſion with all the other metals. With ſilver it becomes paler; with copper of a deeper colour, more fuſible, harder and more elaſtic. Its oxyde communicates a red colour to glaſs. The ores of gold are,

SPECIES I. *NATIVE GOLD.*

Or Native, Fr. *Gediegen Gold*, Germ.

In this ſtate gold is never met with perfectly pure, being always alloyed with ſilver, copper, or iron, more eſpecially the two former. The proportion of alloy has in ſeveral inſtances been found to be nearly the ſame with that of our common gold coin, viz. about 22 carrats. Native gold varies much in its colour, which is ſometimes of a bright yellow, often as pale as braſs, and ſometimes tarniſhed of a reddiſh brown. It varies alſo conſiderably in its forms, being either found cryſtalliſed or in detached amorphous maſſes ramifying or interſperſed through other ſubſtances, or applied to them ſuperficially, or in looſe grains. When cryſtalliſed, its form is generally the aluminiform octohedron with its modifications.

In collecting it from thoſe ſubſtances through which it is diſſeminated, or with which it may be accidentally in mixture, advantage is taken of its diſpoſition to amalgamate with quickſilver, and to free it from alloy requires cupellation with lead or ſome other proceſs of refinement. The richeſt mines of native gold are thoſe of *Hungary*, *Siberia*, the *Braſils*, *Chili*, *Peru* and *Mexico*.

VARIETY I. *CRYSTALLISED.*

I. *a* 1. Pure regulus of gold ſuperficially cryſtalliſed.

II. *a* 2. Native gold tarniſhed on the ſurface, ramifying on ochry quartz, in many places cryſtalliſed in very ſmall and regular octohedrons. *Nagiag, Tranſylvania.*
R. de & Iſle, Pl. 3. *Fig.* 1.

III. *a* 3. In very ſmall octohedral cryſtals of a braſs yellow colour, on grey quartz. *Cremnitz.*

IV. *a* 4. Partly in very ſmall octohedral cryſtals, and partly dendritiform, and of a pale yellow gold colour, on cryſtalliſed quartz. *Same place.*

V. *a* 5. In very ſmall octohedral cryſtals of a braſs yellow colour, intermixed with black ſilver ore alſo minutely cryſtalliſed, on milk-white ſpongy quartz. *Hungary.*

VI. *a* 6. In very regular ſmall octohedral cryſtals, implanted on laminated native gold of a braſs yellow colour, on impure grey quartz. *Nagiag.*

VII. *b* 1. In ſmall aggregated tetrahedral priſms with tetrahedral pyramids, of a braſs colour

colour and very ſplendid, producing a lace-like appearance on greyiſh argillaceous quartz. *Tranſylvania.*

Catal. de Raab. xvi. A. b. 3.

VIII. *c* 1. In ſmall cubic cryſtals, imbedded in laminated native gold, without matrix. *Vereſpatack, Tranſylvania.*

d. Indeterminate.

By *R de l'Iſle*, the pyramidal cryſtalliſation ſo often obſervable on the ſurface of lamilated native gold, is conſidered as depending on the projection of the ſolid angles of ſmall cubes of which theſe lamellæ are compoſed.

VARIETY II. *OF PARTICULAR SHAPES.*

IX. *a* 1. Of a bright yellow colour, dendritiform or moſs-like, with minutely cryſtalliſed ſemitranſparent quartz and galena, on an argillaceous breccia interſperſed with yellow pyrites. *Abrudbanya, Tranſylvania.*

X. *b* 1. Of a deep yellow colour, thickly ramifying on fat milk white quartz. *Peru.*

c 1. Filiform.

XI. *d* 1. In laminæ partly of a deep gold yellow, and partly of a pearly grey colour, in white calcareous ſpar with a ſmall vein of quartz underneath.
Kongſberg, Norway.

The pearly appearance in this ſpecimen is probably owing to the gold being combined with a greater than uſual proportion of ſilver.

XII. *d* 2. The ſame, of a gold yellow colour, in fat quartz, with grey ore of antimony. *Hungary.*

XIII. *d* 3. The ſame, in variegated copper ore. *Norway.*

XIV. *d* 4. The ſame, of a brown colour and without luſtre, with cubic vitreous ſilver ore and cryſtalliſed quartz, on aſh-coloured indurated clay. *Chemnitz, Hungary.*

VARIETY III. *AMORPHOUS.*

XV. *a* 1. In a large irregular maſs of a pure gold colour, in which are imbedded ſmall fragments of ſemitranſparent white quartz. *Peru.*

XVI.

XVI. *b* 1. In looſe irregular grains. *Thibet.*

XVII. *b* 2. In ſmaller grains intermixed with grains of ſtream tin ore. *Cornwall.*

XVIII. *c* 1. Interſperſed through native cinnabar in grey opake quartz. *Hungary.*

XIX. *c* 2. Interſperſed through pale braſs yellow iron pyrites in ſemitranſparent fat quartz. *Adelfors, Sweden.*

XX. *c* 3. The ſame, in yellowiſh grey opake quartz. *Nagyag, Tranſylvania.*

XXI. *c* 4. Intermixed with brilliant yellow pyrites and interſperſed through grey opake quartz. *Same place.*

XXII. *c* 5. Interſperſed through decompoſing ochry pyrites. *Catharinaberg, Siberia.*

XXIII. *c* 6. In decompoſing iron pyrites of a liver colour. *Banat.*

XXIV. *c* 7. In browniſh red ſinopel and yellow ſcaly blende. *Schemnitz.*

XXV. *c* 8. In dull yellowiſh clay. *Biber* in *Heſſe.*

XXVI. *c* 9. With yellow tetrahedral blende intermixed with quartz and covered with cellular decompoſed felſpar. *Schemnitz.*

XXVII. *c* 10. In grey antimonial ore. *Bareuth.*

XXVIII. *c* 11. In native realgar with minutely cryſtalliſed quartz on bluiſh grey indurated clay. *Tranſylvania.*

XXIX. *c* 12. In leaden grey granulated galena in milk white opake quartz. *Bareuth.*

XXX. *c* 13. In grey ſilver ore, with cinnabar and white opake quartz. *Hungary.*

XXXI. *c* 14. In reddiſh brown phoſphoreſcent blende, with tranſparent laminated gypſum. *Konſtock, Bohemia.*

SPECIES II. *GREY GOLD ORE.*

Or gris, Fr. *Nagyager Golderz*, Germ.

It occurs either in ſmall tetrahedral cryſtals, or more commonly in hexagonal or indeterminate lamellæ, or in grains interſperſed through roſe red pearl ſpar, and often accompanied with quartz, grey copper ore, and auriferous pyrites. The lamellæ are of different degrees of thickneſs, and are attached to and interſect each other in various directions. The colour of this ore is blackiſh leaden grey, with conſiderable luſtre. Its fracture foliated, the folia being ſomewhat flexible and opake. It may be eaſily ſcraped with the knife, and ſtains the fingers like plumbago. Specific gravity 8.919. Under the blow-pipe it yields ſulphur, and oxyde of antimony and of arſenic, leaving on the charcoal a globule of gold and ſilver, together with ſome oxyde of lead and of iron. When reduced to powder, three parts in a hundred are found to be attractible by the magnet, and twenty-one ſoluble in the nitric acid.

The richeſt ſpecimens of this ore have been computed to contain 25 per cent. of gold in combination with ſilver. By the analyſis of *Ruprecht*, it conſiſts of Sulphur 41.66, Oxyde of Lead 25.00, Oxyde of Iron 16.66, Gold 11.66, Silver 2.33, Oxyde of Arſenic 1.00, Oxyde of Antimony 2.08. It has hitherto been found only at *Nagyag* near *Deva* in *Tranſylvania*.

VARIETY I. *CRYSTALLISED.*

XXXII. *a* 1. In aggregated tetrahedral cryſtals, with minutely cryſtalliſed fleſh red pearl ſpar on metalliferous rock. *Nagyag.*

XXXIII. *a* 2. In aggregated cubes variouſly truncated, with tranſparent cryſtalliſed quartz and pale fleſh red pearl ſpar and brown blende. *Same place.*

XXXIV. *b* 1. In large ſhining hexagonal laminæ, in a mixture of quartz and reddiſh white pearl ſpar. *Same place.*

XXXV. *b* 2. In ſmaller laminæ, in a mixture of yellow pearl ſpar and brown blende. *Same place.*

XXXVI. *c* 1. Interſperſed through reddiſh white pearl ſpar. *Same place.*

VARIETY II. *OF PARTICULAR SHAPES.*

XXXVII. *a* 1. Intermixed with brown ſcaly blende, and exhibiting a dentritic appearance, in roſe red pearl ſpar. *Same place.*

SPECIES III. *WHITE GOLD ORE.*

Aurum Graphicum. Or blanc, Fr. *Weiſſes Golderz*, Germ.

This occurs moſt commonly either interſperſed, or in ſmall indeterminate or tabular cryſtals of a greyiſh white colour, intermediate between that of regulus of antimony and biſmuth. Its cryſtals are generally attached to each other laterally, and diſtributed ſuperficially on their matrix (a mixture of lithomarga and quartz interſperſed with pyrites) ſo as ſomewhat to reſemble print, hence called *Aurum graphicum.* It is of conſiderable ſplendour; its texture in one direction foliated, in others finely granular; its fragments irregularly angular and uneven. It yields readily to the knife; ſoils the fingers; ſpecific gravity 5.723. It decrepitates, and fuſes eaſily under the blow-pipe, and by a continuance of the heat a conſiderable part flies off in the form of an inodorous whitiſh ſmoke, leaving behind a pale gold globule. According to *Muller*, this ore conſiſts of Gold in union with a new Semimetal, together with a ſmall proportion of Arſenic and of Nickel.

It has hitherto been found only at *Facebay* and at *Offenbanya* in *Tranſylvania.*

VARIETY I. *OF PARTICULAR SHAPES.*

XXXVIII. *a* 1. Of a tin white colour inclining to ſteel grey, cryſtalliſed in ſmall ſtriated aggregated priſms, on minutely cryſtalliſed ſemitranſparent quartz, covering metalliferous rock. *Offenbanya, Tranſylvania.*

XXXIX. *a* 2. The ſame, on coarſe red jaſper intermixed with white quartz. Said to come from *Spain*, but more probably from *Tranſylvania.*

VARIETY II. *AMORPHOUS.*

GENUS III. *QUICKSILVER.*

Argentum Vivum, Hydrargyrus. Mercure, Fr. *Queckſilber*, Germ.

Pure quickſilver is of a ſilver or tin-white colour, and of a liquid form at all temperatures between 600° above, and 40° below 0 of *Farenh.* Its ſpecific gravity 13.56. It is not perceptibly altered either by the ſimple application of heat, or by expoſure to the air; but by agitation in this fluid it may be converted into a black, and by the aſſiſtance of heat into a red oxyde, from which by an increaſe of the heat alone, it may be brought back to its metallic ſtate.

The nitric and oxy-muriatic are the only acids which are acted on by this metal without the aſſiſtance of heat; but, when reduced to an oxyd, it combines with the ſulphuric, muriatic, acetic, and moſt of the other acids without difficulty. From its ſolutions in theſe it may be precipitated by copper, iron, and zinc; and if thrown down by an alkali, the precipitate when mixed with ſulphur, upon being gradually heated, poſſeſſes the power of exploding. Quickſilver combines readily with pure platina, gold, ſilver, and moſt of the other metals, forming what are called amalgams. By trituration or fuſion, it may be united with ſulphur into a dark compound, known by the name of *Æthiops*, which in cloſe veſſels ſublimes into a red ſtriated maſs called *artificial Cinnabar*. It may be converted alſo into an *Æthiops* by trituration with the ſolutions of ſulphure of potaſh or of ſoda, and into *factitious Cinnabar* with a ſolution of ſulphuret of ammonia. Beſides the application of the various preparations of quickſilver in the practice of medicine, it is employed in the working of gold ores, as before mentioned, in the conſtruction of philoſophical inſtruments, and of mirrors, as alſo in gilding and painting. The ores of this metal are,

SPECIES I. *NATIVE QUICKSILVER.*

This is generally met with in ſmall brilliant globules diſſeminated through ſtones, clays, and various mercurial ores, or collected in more conſiderable quantity in the clefts and hollows of rocks. It differs from diſtilled quickſilver only with regard to its degree of purity. It is found in the greateſt abundance in *Idria*, *Deux Ponts*, and other parts of *Germany*, and at *Almaden* in *Spain*.

VARIETY I. *FLUID.*

I. *a* 1. Fluid quickſilver. *Hungary.*

VARIETY II. *INTESPERSED.*

II. *a* 1. Native quickſilver in ſmall globules, on ponderous coarſe grained dark cinnabar without matrix. *Almaden.*

III. *a* 2. The ſame, with ferruginous cinnabar, on grey emery. *Palatinate.*

IV. *a* 3. The ſame, diſſeminated through coarſe grained ferruginous cinnabar with yellow iron pyrites. *Wolfſtein.*

V. *a* 4. The ſame, in irregular globules diſſeminated through coarſe ferruginous cinnabar. *Stahlberg.*

VI. *a* 5.

VI. *a* 5. The ſame, diſſeminated through bluiſh-black argillaceous ſchiſtus. *Idria.*

SPECIES II. *NATIVE AMALGAM.*

This, which is of a ſilver or tin-white colour and metallic ſplendour, is found moſt commonly either interſperſed through, or lying on the ſurface of other quickſilver ores containing ſilver. It ſometimes alſo occurs in ſmall lumps, and ſometimes in aluminiform octohedral cryſtals truncated at their ſolid angles and borders. In its hardneſs, brittleneſs, and weight, it differs according to the proportion of its conſtituent parts. In general it is found to yield from 80 to 90 per cent. of quickſilver, and from 10 to 20 of ſilver, which are eaſily ſeparable from each other by the ſimple application of heat. It has principally been met with in the mines of *Deux Ponts* and *Upper Hungary*.

VARIETY I. *CRYSTALLISED.*

a. In truncated octohedrons.

VII. *b* 1. Native amalgam, in amorphous ponderous ſpar. *Obermoſchel.*

VIII. *b* 2. The ſame, in bluiſh indurated clay intermixed with cinnabar and pyrites. *Idria.*

IX. *b* 3. The ſame, on grey indurated clay mixed with cinnabar. *Moſchellandſberg, Deux Ponts.*

X. *b* 4. The ſame, minutely diſſeminated through grey clay. *Idria.*

SPECIES III. *NATIVE OXYDE.*

Queckſilber Lebererz, Germ.

This occurs in opake lumps of a dark grey, or dark cochineal-red colour. Its texture either fine grained, compact or flaty. Its internal luſtre generally approaches to the metallic. Its fragments are angular. Specific gravity from 7.186 to 9.230. It may be eaſily ſcraped with the knife, and gives a dark red ſtreak. It is not acted on by the nitric acid, but diſſolves in the muriatic by the aſſiſtance of heat. It yields from 20 to nearly 80 per cent. of quickſilver. It is often intermixed with native Quickſilver, Cinnabar, and Oxyde of Iron, and has by ſome been thought to be little elſe than cinnabar intimately combined with bituminous ſlate. It is the moſt common of all the quickſilver ores of *Idria*. The *Coralline ore*, as it is called, is one of its moſt remarkable varieties.

VARIETY

VARIETY I. *AMORPHOUS.*

XI. *a* 1. Of a browniſh red colour and granular texture, internally of a glimmering luſtre. *Idria.*

XII. *a* 2. The ſame, ſomewhat more ſplendid, and covered with black ſhining indurated bitumen. *Kirchheim, Pohlen.*

XIII. *b* 1. Of a greyiſh liver brown colour, very compact and ponderous. *Idria.*

XIV. *c* 1. Of a conchoidal texture, and dark cochineal red colour (*Coralline ore*). *Same place.*

XV. *c* 2. Of a flaty texture, and ſhining dark reddiſh brown colour. *Same place.*

XVI. *c* 3. The ſame, leſs ponderous, and of a dark grey colour. *Same place.*

Theſe ores all yield a ſmall proportion of quickſilver under the ſimple application of heat in cloſe veſſels; but are found by experiment to contain alſo a conſiderable proportion of cinnabar.

SPECIES IV. *HORN QUICKSILVER.*

Is met with either in ſmall cryſtals, or forming an incruſtation on the exterior ſurface or in the cavities of coarſe ferruginous cinnabar ores, and is generally accompanied with native mercury. It is of a whitiſh, greyiſh, greeniſh, or blackiſh colour, with more or leſs tranſparency and ſplendour. The figure of its cryſtals, the tetrahedral rhomboidal priſm with tetrahedral pyramids. Under expoſure to heat it ſublimes without decompoſition, and according to the experiments of Mr. *Woulfe*, by whom this ore was firſt analyſed, it conſiſts of oxyde of mercury in union with the muriatic acid, and a ſtill larger proportion of the ſulphuric. Monſ. *Sage* ſtates it to yield 86 per cent. of quickſilver. It is found at *Moſtbellandſberg* in the Dutchy of *Deux Ponts*, and alſo, as it is ſaid, in *Heſſe*.

VARIETY I. *CRYSTALLISED.*

XVII. *a* 1. In olive coloured tetrahedral priſms terminated by tetrahedral pyramids, the faces of which are triangular, with native quickſilver and ferruginous cinnabar, on grey quartz. *Obermoſchel.*

N. B. The

N. B. The cryſtalliſation of this differs from that given by *Romé de L'Iſle, Pl.* 7. *Fig.* 31, in which the faces of the pyramid are rhomboidal.

XVIII. *a* 2. Forming a ſemitranſparent incruſtation of minute cryſtals of a grey colour on coarſe hematitical cinnabar, with indurated clay. *Same place.*

b. Indeterminate.

SPECIES V. *CINNABAR.*

This is by far the moſt common of the ores of quickſilver. It occurs either cryſtalliſed, or in irregular veins or lumps intermixed with, or interſperſed through, other mineral ſubſtances, or forming an efflorescence on their ſurface. Its colour is moſt commonly cochineal-red or ſcarlet, ſometimes reddiſh brown, or even greyiſh black. Its texture in the maſs is either fibrous, granular, ſcaly, or compact. It is in moſt inſtances ſo ſoft as readily to ſtain the fingers, is very brittle, and, when rubbed to powder, or ſcratched with the knife, it loſes its ſplendour and becomes of a lighter colour. When cryſtalliſed it has always more or leſs tranſparency and luſtre, and aſſumes the form of double tetrahedral pyramids truncated at their ſummits, with or without intermediate priſms. It varies in its ſpecific gravity, from 5.419 to 10.1285. Before the blow-pipe it is volatiliſed, emitting a bluiſh flame and ſulphureous odour.

The pureſt cinnabar ores are found to contain about 80 parts of quickſilver, and 20 of ſulphur; which in the moiſt way are moſt eaſily ſeparated by the oxy-muriatic acid, and in the dry by diſtillation with admixture of lime or filings of iron.

The principal European mines of cinnabar are thoſe of *Idria* in *Carniola*, *Carinthia*, *Frioul*, the *Palatinate*, *Deux Ponts*, *Tranſylvania*, *Hungary*, and more eſpecially of *Almaden* in *Spain*. It is alſo found in conſiderable quantities in different parts of *South America*, *Japan*, and *China*.

VARIETY I. *CRYSTALLISED.*

XIX. *a* 1. In large tetrahedral cryſtals having the apices deeply truncated parallel to their baſe; of a bright red colour and ſemitranſparent;—on black ferruginous ſand ſtone. *Almaden.*

XX. *a* 2. In ſmall brilliant cryſtals confuſedly aggregated, many of them of the ſame figure with the former, with native quickſilver in ſmall globules and compact cinnabar, on yellowiſh indurated clay. *Obermoſchel.*

XXI. *a* 3. In minute cryſtals confuſedly aggregated, with globules of native quickſilver, in aſh-coloured indurated clay intermixed with white quartz. *Morſfeldt.*

XXII. *a* 4.

XXII. *a* 4. The ſame, in blackiſh indurated clay. *Idria.*

b. Indeterminate.

VARIETY II. *AMORPHOUS.*

XXIII. *a* 1. Of a bright red colour, ſemitranſparent and of a ſcaly texture, in fat white quartz intermixed with yellow pyrites. *Almaden.*

XXIV. *a* 2. Of a ſhining browniſh black colour and ſcaly texture. *Hungary.*

b. Fibrous.

XXV. *c* 1. Of a bright red colour and granular texture, with yellow pyrites and white quartz. *Same place.*

XXVI. *c* 2. Of a bright red colour, in white quartz artificially poliſhed. *Almaden.*

XXVII. *c* 3. Of a browniſh red colour, ſtalactitical on the ſurface. *Obermoſchel.*

XXVIII. *c* 4. Of a lighter colour, intermixed with white clay. *Tranſylvania.*

XXIX. *c* 5. Compoſed of large irregular grains of a reddiſh colour, with white baro-ſelenite. *Hungary.*

XXX. *d* 1. In detached compact pieces of a bright red colour. *Eaſt Indies.*

XXXI. *d* 2. The ſame, in ſmaller pieces. *Same place.*

XXXII. *d* 3. In ſmall pieces of a paler colour, with white quartz and native ſulphur. *Hungary.*

e. Earthy.

XXXIII. *f* 1. In a powdery form, and of a bright ſcarlet colour (*native Vermilion*): in cellular ferruginous clay. *Wolfſtein.*

XXXIV. *f* 2. In a ſandy form, intermixed with white quartz and yellow pyrites. *Hungary.*

XXXV. *f* 3. Pulverulent, and of a reddiſh colour, interſperſed through indurated clay, with minutely cryſtalliſed azure copper ore. *Obermoſchel.*

XXXVI. *f.* 4.

XXXVI. *f* 4. The ſame, intermixed with ochry indurated clay and cryſtalliſed baroſelenite. *Stahlberg.*

SPECIES VI. *HEPATIC ORE.*

Cinabre Alkalin, Fr. *Queckſilber-Schwefellebererz*, Germ.

This is deſcribed by *Baron Born*, as of a bright red colour, tranſparent, and of a ſparry texture; breaking into rhomboidal fragments, and upon being ſcratched or powdered, exhaling an hepatic odour. It was diſcovered not many years ſince in the mines of *Idria*, and is ſuppoſed to conſiſt of Oxyde of Quickſilver in union with Sulphuret of Alkali or of Lime; it differs therefore conſiderably from the *Lebererz* of the Germans, SPECIES III. Vide *Catal. de Raab.* T. 11. P. 394.

VARIETY I. *AMORPHOUS.*

a. Foliated.

GENUS IV. *SILVER.*

Argentum. Argent, Fr. *Silber*, Germ.

Silver unalloyed is of a pure or, as it is called, ſilver white colour; ſuſceptible of a high poliſh and very ſplendid, but tarniſhing on expoſure to air. Next to platina and gold, it is the moſt ductile as well as the moſt tenacious of the metallic bodies. A wire of $\frac{1}{10}$ of an inch in diameter ſupports a weight of 270 pounds. It is more elaſtic, and therefore more ſonorous than gold, tin, or lead. Its ſpecific gravity 10.474, when hammered 10.510. It melts at 28 of *Wedgw.*=4717 *Farenh.* By the higher degrees of heat it may be volatiliſed and oxydated, ſo as to become capable of communicating a yellow colour to glaſs. It diſſolves in the nitric acid with great facility, and alſo without difficulty in the nitro-ſulphuric acid or aqua regina of *Keir*; from both which it may be precipitated in its metallic ſtate by zinc, iron, copper, and quickſilver. The effects of phoſphorus on its ſolutions are likewiſe ſimilar to thoſe which take place on the application of this ſubſtance to the ſolution of gold. When precipitated from the nitric acid by lime water, the precipitate, when dried and afterwards waſhed with a ſolution of pure ammoniac, explodes upon the ſlighteſt friction with uncommon violence, hence called *Argentum fulminans*. Silver may be united by fuſion with all the other metals; if alloyed by copper it becomes harder and more ſonorous. It combines readily with ſulphur, and upon expoſure to hepatic gas is immediately blackened. The uſes of ſilver are equally various and important with thoſe of gold. The ores of ſilver are,

SPECIES I. *NATIVE SILVER.*

Argent natif, Fr. *Gediegen Silber*, Germ.

This, like gold, is never found free from alloy, being always combined with a certain proportion of copper, and ſometimes with a ſmall quantity of gold, iron, or regulus of antimony. Like gold too it differs in its colour and degrees of luſtre, and is equally various in its forms. Though ſometimes free from tarniſh, it is generally of a golden yellow, browniſh, or even black colour. It is frequently met with in the maſs; frequently alſo interſperſed through, or attached to various other mineral ſubſtances; or in the form of knobs; or in plates or branches, which are often compoſed of ſmall accumulated cryſtals; or in the form of wire or hair. The figure of its cryſtals is either octohedral or cubical, generally the former. It differs little from pure ſilver in its weight, texture, hardneſs, ductility, fuſibility, &c. From its alloy with copper, iron, and antimony, it may be eaſily refined by cupellation with the neceſſary quantity of lead. Amongſt the principal mines of native ſilver are thoſe of *Kongſberg* in *Norway*, *Freyberg* in *Saxony*, *Catharinenberg* in *Siberia*, *Joachimſthal* in *Bohemia*, and more eſpecially of *Potoſi* in *Peru*.

VARIETY I. *CRYSTALLISED.*

I. Pure regulus of ſilver ſuperficially cryſtalliſed.

II. *a* 1. In aggregated cubes of a ſilver white colour, in white calcareous ſpar and tranſparent cryſtalliſed quartz. The faces of the cubes in this ſpecimen meaſure from $\frac{1}{4}$ to $\frac{1}{8}$ of an inch. *Kongſberg, Norway.*

III. *b* 1. In ſuperficial tetrahedral pyramids of the ſame colour with the former, ſome very regular, and variouſly interſperſed with minute needleform ſtellated calcareous ſpar, on decompoſing grey ſilver ore intermixed with yellow baroſelenite and quartz. *St. Marie aux Mines.*

IV. *c* 1. In penniform cryſtals, the quadrangular branches of which are terminated by tetrahedral pyramids. *Potoſi.*

VARIETY II. *OF PARTICULAR SHAPES.*

V. *a* 1. Dendritic, and of a yellowiſh ſilver white colour, in pearl-grey baroſelenite. *Freyberg.*

VI. *a* 2. In larger ramifications in fleſh coloured baroſelenite. *Same place.*

VII. *a* 3.

VII. *a* 3. The ſame, with red oxyde of cobalt, in white calcareous ſpar on grey horn-ſtone. *Norway.*

VIII. *a* 4. Forming a vein in gneiſs. *Marienberg.*

IX. *a* 5. Of a bronze yellow colour, producing a netted appearance in grey horn-ſtone. *Annaberg.*

X. *a* 6. Having externally an ochry appearance. *Catharinenberg, Siberia.*

XI. *a* 7. Forming a vein in ochry quartz with horn ſilver ore on the ſurface. *Johngeorgenſtadt.*

XII. *b* 1. Ramoſe and ſomewhat tarniſhed, the branches variouſly contorted, and covered partly by vitreous ſilver ore, and partly by minutely cryſtalliſed aſh-grey baroſelenite. Attached to its branches are ſeveral cryſtals of galena and brown blende. *Freyberg.*

XIII. *b* 2. The ſame, in long branches ſhooting from calcareous ſpar. *Norway.*

XIV. *b* 3. In contorted branches projecting from vitreous ſilver ore. *Norway.*

XV. *b* 4. Ramifying in indurated bitumen with calcareous ſpar.

XVI. *b* 5. In ſhort irregular branches, in black blende intermixed with rhombic calcareous ſpar. *Same place.*

XVII. *b* 6. Branching through the ſubſtance of tranſparent cryſtalliſed quartz, with vitreous ſilver ore and pyrites. *Norway.*

XVIII. *c* 1. Filiform, of a ſilver white colour, and without matrix. *Norway.*

XIX. *c* 2. Of the ſame form, with an ochry covering on grey ochry quartz. *Freyberg.*

XX. *d* 1. Capillary, and of a ſilver white colour, in brown quartz minutely cryſtalliſed on the ſurface. *Johngeorgenſtadt.*

XXI. *d* 2. The ſame, on grey decompoſing cobalt ore with quartz. *Schneeberg.*

XXII. *d* 3. With black ſilver ore and arſeniate of cobalt, on grey quartz intermixed with grey cobalt ore. *Same place.*

XXIII. *d* 4. Somewhat tarniſhed, on pale greeniſh indurated clay. *Allemont, Dauphiné.*

XXIV. *d* 5. With black ſilver ore intermixed with cubic fluor. *Freyberg.*

VARIETY III. *AMORPHOUS.*

XXV. *a* 1. In broad ſplendid laminæ, imbedded in and covering the ſurface of tranſparent calcareous ſpar. The ſurface of the exterior plate ſtudded with numerous triangular facets. *Norway.*

XXVI. *a* 2. Partly ſuperficial, and partly interſperſed through brown indurated ſteatite. *Johngeorgenſtadt.*

XXVII. *a* 3. In ſmall laminæ interſperſed through opake quartz, cellular on the ſurface and very minutely cryſtalliſed. The ſilver in this ſaid to be rich in gold, therefore called *Electrum Nativum. Auriferous Native Silver*, Kirw. *Norway.*

XXVIII. *b* 1. In thin lamellæ, on the ſurface of grey hornſtone. *Johngeorgenſtadt.*

XXIX. *b* 2. On blackiſh grey petro-ſilex. *Siberia.*

XXX. *b* 3. The ſame, on indurated white lithomarga. *Obermoſchel.*

XXXI. *b* 4. Superficial and interſperſed through a vein of galena and quartz, in gneiſs. *Freyberg.*

XXXII. *b* 5. On grey petro-ſilex, with minutely cryſtalliſed quartz. *Siberia.*

XXXIII. *b* 6. Superficial and tarniſhed, on a micaceous ſchiſtus containing garnets. *Kongſberg.*

XXXIV. *c* 1. Nearly ſolid, amorphous, and of a dull colour, with calcareous ſpar. *Same place.*

XXXV. *c* 2. Interſperſed through grey limeſtone, intermixed with yellowiſh green ray ſtone, quartz, and yellow pyrites. *Norway.*

XXXVI. *c* 3. Imbedded in compact cinnabar. *Stahlberg, Sweden.*

XXXVII. *c* 4. In brown ſpathoſe tin ore, with quartz and aſh-coloured indurated ſteatite. *South America.*

XXXVIII. *c* 5.

XXXVIII. *c* 5. Forming an irregular granular maſs, on ſemitranſparent yellowiſh quartz. *Norway.*

SPECIES II. *ARSENICAL SILVER.*

Argent Arſenical, Fr. *Arſenik Silber*, Germ.

This occurs either interſperſed, or in lumps, or cryſtalliſed in truncated hexaedral priſms longitudinally ſtriated. Its colour tin-white approaching to leaden grey; when tarniſhed, yellowiſh or ſteel grey. Its luſtre metallic; fracture foliated, ſtriated, or granular. It cuts eaſily with the knife, and is in a ſlight degree malleable, and very ponderous. Under the blow-pipe its arſenic is given out in the uſual form of a white ſmoke with a fœtid odour. It conſiſts, according to the analyſis of *Laſius*, of from 12 to 95 per cent. ſilver, the remainder regulus of arſenic, arſenicated iron, and antimony. It is generally accompanied with brittle vitreous ſilver ore, black ſilver ore, and brown blende in ponderous or calcareous ſpar, and has principally been met with at *Andreaſberg* in the *Hartz*, and at *Kaſalla* near *Guadanalcanal* in *Spain*. A ſpecimen of the former analyſed by *Klaproth*, furniſhed Silver 12.75, Iron 44.45, Arſenic 35, Regulus of Antimony 4; of the latter, by *Monet*, Silver 90, the remainder Arſenic and Iron without Antimony.

Allied to the foregoing, and by moſt conſidered as of the ſame ſpecies, is the antimoniated native ſilver (*Spieſsglas Silber*) which alſo occurs interſperſed or in lumps, or in ſtriated hexaedral or quadrangular priſms, of a ſilver or tin-white colour, and metallic luſtre; ſubject, like the former, to tarniſh on expoſure to air; generally of a foliated or ſomewhat conchoidal texture, and of great weight, its ſpecific gravity being eſtimated at 10,000. Its hardneſs is ſuch as to give fire with ſteel. It amalgamates with quickſilver without heat. By the aſſiſtance of a boiling heat it is partially ſoluble in the nitric acid, but not in the oxymuriatic. Under the blow-pipe it fuſes eaſily, and emits a greyiſh white ſmoak, devoid of arſenical odour, the remainder yielding a pure ſilver regulus on the addition of borax. According to the analyſis of Mr. *Selb*, it conſiſts of from 70 to 75 of Silver, with regulus of Antimony and a little Iron. It has as yet been only met with in the cavern of St. *Wenzel* near *Altwohlfach* in the principality of *Furſtenberg*, accompanied by native ſilver, and ponderous or calcareous ſpar.

VARIETY I. *CRYSTALLISED.*

XXXIX. *a* 1. In hexhedral priſms longitudinally ſtriated on the ſurface and truncated at the extremities, with native ſilver and galena in white plated ponderous ſpar. *Andreaſberg, Hartz.*

XL. *a* 2. In larger and more maſſy cryſtals, in white ponderous ſpar. *St. Wenzel, Furſtenberg.*

XLI. *a* 3.

XLI. *a* 3. In rhomboidal plates, and alſo in truncated hexhedral priſms with galena and white ponderous ſpar covered by yellow oxyde of lead. *Same place.*

b. Indeterminate.

VARIETY II. *AMORPHOUS.*

XLII. *a* 1. Of a foliated texture and tin-white colour, intermixed with galena and white ponderous ſpar. *Guadanalcanal, Spain.*

XLIII. *b* 1. Partly granular and partly laminated, in red ſilver ore and calcareous ſpar. *Hartz.*

XLIV. *b* 2. Granular, and partly of a yellow colour, in white ponderous ſpar interſperſed with galena. *Furſtenberg.*

c. Compact.

SPECIES III. *HORN SILVER.*

Argent Corné, Fr. *Hornerz*, Germ.

This is found either in compact amorphous maſſes, in globules, or diſperſed through other mineral ſubſtances, or lying on their ſurface in an earthy or powdery form, or in thin laminæ, but moſt frequently in ſmall cryſtals. It is generally of a pearly grey, browniſh, or bluiſh colour, ſometimes of a dark olive green. Its ſemitranſparency approaches in ſome inſtances to that of horn, though in general it is ſemitranſparent only at the edges, or when in thin pieces. The form of its cryſtals is cubic; its ſurface ſmooth; texture compact; internal luſtre ſomewhat unctuous or waxy. Specific gravity from 4.745 to 4.804. It yields in moſt inſtances to the nail, and in thin laminæ is found to be ſomewhat flexible, though ſometimes brittle. It melts with great facility under the blow-pipe, and gradually evaporates; but by the addition of an alkali may be reduced without difficulty.

According to the analyſis of *Klaproth*, it contains Silver 67.75, Muriatic Acid 21, Oxyde of Iron 6, Alumine 1.50, Lime 0.25, Sulphuric Acid 0.25. The *Buttermilk ore*, as it is called, which is no other than a variety of the horn ore, by the analyſis of the ſame chymiſt, contains Silver 24, Muriatic Acid 8, Alumine 67, with ſome Oxyde of Copper. Horn ſilver ore is generally accompanied by the vitreous ores of ſilver, native ſilver, and often by ochre of Iron. It occurs in certain mines in *Saxony*, *Bohemia*, and *Siberia*: it has alſo been found in conſiderable quantities in *Cornwall*, but the richeſt and fineſt ſpecimens are from *Cuexnabaca* in *Mexico*, and *Guamanga* in *Peru*.

VARIETY

VARIETY I. *CRYSTALLISED.*

XLV. *a* 1. Very minutely cryſtalliſed, of an olive green colour, on indurated ochre; the cryſtals cubic, but variouſly truncated. *Cornwall.*

XLVI. *a* 2. In numerous ſmall ſemitranſparent browniſh cubes on brown ochry argillaceous ſchiſtus. *Johngeorgenſtadt.*

XLVII *b* 1. Confuſedly cryſtalliſed on gneiſs; the colour on one ſide of the ſpecimen black, and on the other fawn colour. *Same place.*

VARIETY II. *AMORPHOUS.*

XLVIII. *a* 1. Lying ſuperficially, with vitreous ſilver ore, on dendritic native ſilver in quartz. *Potoſi* in *Peru.*

XLIX. *a* 2. Compact and without matrix. *Johngeorgenſtadt.*

L. *b* 1. Of a pearl grey colour, laminated and ſuperficial (*Buttermilk ore*) on calcareous ſpar. *Hartz.*

SPECIES IV. *VITREOUS SILVER.*

Argent Vitreux ou *Sulphureux*, Fr. *Glaſerz*, Germ.

The uſual colour of this ore is leaden grey, inclining more or leſs to the black, having internally a metallic ſplendour, and being on the ſurface often variouſly tarniſhed. It occurs either in irregular maſſes; interſperſed, or ſuperficial; or of particular ſhapes, as dendritic, ramoſe, filiform, &c. or cryſtalliſed in cubes or octohedrons with their variations. Its cryſtals are generally ſmall, and, like thoſe of native ſilver, often variouſly accumulated on each other. The fracture of this ore is for the moſt part compact, ſometimes inclining to conchoidal. It is to a certain degree both malleable and flexible; generally ſo ſoft as to be cut eaſily with the knife, and ſometimes to ſtain the fingers. By the ſtreak it becomes more ſplendid. Its ſpecific gravity from 6.909 to 7.215. It fuſes when heated to redneſs, but if expoſed to a gentle heat its ſulphur is gradually diſſipated. Its ſilver may alſo be obtained by fuſion with four times its weight of potaſh. It is difficultly acted on by the nitric acid.

By analyſis it is found to contain from 70 to 85 parts of Silver, and from 12 to 25 of Sulphur.

It

It is met with chiefly at *Kongſberg* in *Norway*; in the ſilver mines of *Sweden* and *Siberia*; as alſo in thoſe of *Saxony*, *Bohemia*, and *Hungary*, where it goes under the name of *Weichgewaechs*.

This ore is juſtly conſidered as deriving its origin in moſt inſtances from the action of the vapour of ſulphur upon native ſilver, by which it is ſo frequently accompanied, and in which the tranſitions from the native to the mineral ſtate are often very apparent.

The *Silberſchwärze* (black ſilver) or *Silbermulm*, which is found in a powdery form, or but ſlightly coherent, and of a black colour, is thought by *Baron Born* and ſome others to be only a variety of this ore.

VARIETY I. *CRYSTALLISED.*

LI. *a* 1. In cubes more or leſs perfect, branching from ſemitranſparent lenticular calcareous ſpar. *Freyberg.*

LII. *a* 2. In large cubes variouſly truncated and irregularly aggregated, incloſing a detached octohedral cryſtal of brilliant yellow pyrites. *Same place.*

LIII. *a* 3. In cubes deeply truncated, forming cryſtals of 14 ſides, with aſh coloured calcareous ſpar and cryſtalliſed quartz, on grey blende. *Hungary.*

LIV. *a* 4. In ſmall irregular truncated cubes, and alſo in octohedrons, with pearl coloured tabular calcareous ſpar, on quartz intermixed with yellow blende. *Hartz.*

LV. *a* 5. In aggregated cubes, with a quartzy incruſtation and pyrites, on aſh coloured aluminous clay having the appearance of *Mountain Leather*. *Johngeorgenſtadt.*

LVI. *b* 1. In irregular octohedrons interpoſed between layers of cryſtalliſed quartz with lenticular calcareous ſpar. *Joachimſthal.*

LVII. *b* 2. In regular aggregated octohedrons, irideſcent on the ſurface, adhering to grey quartz. *Johngeorgenſtadt.*

LVIII. *b* 3. In regular octohedrons, aggregated on galena. *Joachimſthal.*

LIX. *b* 4. In regular octohedrons of different ſizes, truncated at their ſolid angles, and attached to the ſurface of long convoluted branches of native ſilver incruſted with vitreous ſilver ore, and minutely cryſtalliſed aſh coloured pearl ſpar. *Freyberg.*

LX. *c* 1. In the form of a flat irregular plate, in ſeveral places minutely cryſtalliſed. *Freyberg.*

VARIETY

VARIETY II. *OF PARTICULAR SHAPES.*

LXI. *a* 1. Partly dendritic and moſs-like, partly ſolid and amorphous, and partly cryſtalliſed in ſmall cubes variouſly truncated; without matrix. *Freyberg.*

LXII. *a* 2. Dendritic, with galena in yellowiſh ponderous ſpar. *Same place.*

b. Ramoſe.

LXIII. *c* 1. In very fine capillary filaments, exhibiting a moſs-like appearance; without matrix. *Same place.*

VARIETY III. *AMORPHOUS.*

LXIV. *a* 1. Of a laminated texture, with white calcareous ſpar and yellow pyrites. *Kongſberg.*

b. Superficial.

LXV. *c* 1. In the maſs, and without matrix.

LXVI. *d* 1. Interſperſed through aſh-coloured lime-ſtone (*Alkaline Silver Ore* of *M. Juſti*). *Hungary.*

LXVII. *d* 2. Intermixed with white calcareous ſpar and dendritic native ſilver. *Freyberg.*

SPECIES V. *BRITTLE VITREOUS ORE.*

Argent fragile, Fr. *Spröd-Glaſerz*, Germ. *Röſchgewachs*, Hung.

This by many is conſidered as only a variety of the preceding ſpecies, to which it is very analogous in its colour, luſtre, texture, hardneſs, form and weight; its colour being greyiſh-black inclining to lead-grey, and, when tarniſhed, blue; its luſtre metallic; its texture compact inclining to conchoidal; yielding readily to the knife; its form amorphous, interſperſed, capillary, ſpongy, cellular, &c. and alſo occaſionally cryſtalliſed; ſpecific gravity 7.208. It differs however from the vitreous ore in being brittle, and eaſily reducible into a black powder. Under the blow-pipe it yields a white ſulphureous ſmoke, its ſilver being left behind accompanied with oxyde of iron, from which it may be purified by the addition of nitre and borax.

According to the analyſis of *Klaproth*, it conſiſts of Silver 66.5, Iron 5, Antimony 10, Sulphur 12, Copper and Arſenic 0.5, or by a later analyſis, Silver 20.40, Lead 48.06, Regulus of Antimony 7.88, Iron 2.25, Sulphur 12.25, Alumine 7, Silex 0.25.

It is found in the ſame mines with the vitreous and red ſilver ores, and is by *Romé de*

L'Iſle conſidered as the reſult of the decompoſition of the latter approaching to the nature of the former.

VARIETY I. *CRYSTALLISED.*

a 1. In hexhedral priſms or tables. *Widenmanns' Handbuch P.* 699, 766.

VARIETY II. *AMORPHOUS.*

LXVIII. *a* 1. Of a ſteel grey colour and granular texture, having a porous or ſpongy appearance; with ochry indurated clay. *Freyberg.*

LXIX. *a* 2. The ſame, with yellow pyrites and galena, on tranſparent rhomboidal tabular ponderous ſpar. *Hungary.*

LXX. *a* 3. Of a granular texture and tuberculated, with auriferous pyrites on grey quartz. *Schemnitz.*

LXXI. *b* 1. Of a ſpongy texture and granulated on the ſurface, partly of a ſoot-black, and partly of a ſteel-grey colour; on grey cobalt ore intermixed with red oxyde of cobalt and yellow ochre. *Freyberg.*

c. Pulverulent.

SPECIES VI. *RED SILVER ORE.*

Argent rouge, Fr. *Rothgultigerz*, Germ.

Of this modern authors make two varieties, the light coloured and the dark; the light intermediate betwixt blood and cochineal red, and often variegated on the ſurface; the dark holding the middle between dark cochineal red and bluiſh grey, and ſometimes inclining to iron black. They both occur either in the maſs, or interſperſed, or ſuperficial, ſometimes of particular ſhapes, and often cryſtalliſed; the light moſt commonly in acute double hexhedral pyramids, the dark in dodecahedrons with rhombic faces or in hexhedral priſms with trihedral pyramids. The cryſtals of the lighter coloured are more tranſparent than thoſe of the other, which are ſometimes nearly opake; the fracture of each is uneven, inclining to the conchoidal; ſplendour vitreous, approaching to the metallic; brittle. They yield a red ſtreak, and when powdered become of a blackiſh colour; ſpecific gravity from 5.442 to 5.684. Under the blow-pipe they decrepitate, and melt before they become red hot, giving out a white ſulphureous or arſenical ſmoke. According to the analyſis of *Klaproth*, the light red ſilver ore of the *Hartz*, contains Silver 60, Sulphur 11.7, Sulphuric Acid 8, Regulus of Antimony 20.3; and

that of *Freyberg* in *Saxony*, Silver 62, Sulphur 11, Sulphuric Acid 8.5, Regulus of Antimony 18.5; while the red silver ore analysed by *Bergman*, contained Silver 60, Arsenic 27, Sulphur 13. Varieties of both kinds are found in the silver mines of *Saxony*, *Bohemia*, *Hungary*, the *Hartz*, *St. Marie aux Mines* in *Alsace*, *Guadalcanal* in *Spain*, *Potosi*, &c. The dark coloured ore is found generally in the neighbourhood of native arsenic and of arseniated cobalt ores.

VARIETY I. *CRYSTALLISED.*

LXXII. *a* 1. In dodecahedrons with rhombic faces, opake, and of a dark red colour; on olive coloured decomposing iron pyrites. *Freyberg.*

R. de L. Espece 3d, Var. 5th.

LXXIII. *b* 1. In hexhedral prisms striated longitudinally and terminated by obtuse trihedral pyramids with rhombic faces, transparent, of a ruby colour and irideſcent on the surface, forming a small irregular groupe without matrix. *Same place.*

R. de L. Espece 3d, Var. 1st.

LXXIV. *b* 2. Fragment of a large hexhedral prism terminated by an obtuse trihedral pyramid, semitransparent and of a blood red colour. *China.*

R. de L. Espece 3d, Var. 1st.

LXXV. *b* 3. In large hexhedral prisms terminated by trihedral pyramids, dark coloured and opake; the prisms extremely short, irregularly aggregated, and having their surface incrusted with very minute crystals of the same, with white calcareous spar. *Marienberg.*

LXXVI. *b* 4. In minute hexhedral prisms with trihedral pyramids, of a light red colour, and transparent; on tuberculated iron pyrites. *Johngeorgenstadt.*

LXXVII. *b* 5. In hexhedral prisms terminated by hexhedral pyramids, dark coloured and opake; on amorphous red silver ore with cellular white quartz and calcareous spar. *Guadalcanal, Spain.*

R. de L. Espece 3d, Var. 9th.

LXXVIII. *b* 6. In numerous hexhedral prisms terminated by trihedral pyramids, the edges of which are deeply truncated, dark coloured and opake; on decomposing iron pyrites. *Saxony.*

R. de L. Espece 3d, Var. 2d.

LXXIX. *b* 7. In regular hexhedral prisms terminated by hexhedral pyramids, brilliant

liant and opake, with minutely cryſtalliſed tranſparent hexagonal truncated calcareous ſpar; on teſtaceous arſenic incruſted with red ſilver ore. *Hartz.*

R. de L. Eſpece 3d, Var. 9th.

LXXX. *b* 8. In large, dark, opake, and irregularly aggregated hexhedral priſms terminated by hexhedral pyramids, with amorphous red ſilver ore, teſtaceous arſenic, and calcareous ſpar. *Andreaſberg.*

LXXXI. *b* 9. In dark, opake, and ſplendid hexhedral priſms, terminated by very obtuſe trihedral pyramids, on the ſurface of amorphous red ſilver ore without matrix. *Hartz.*

LXXXII. *b* 10. In ſhort irregular hexhedral priſms with hexhedral pyramids, opake, and of a ruby colour, on the ſurface of amorphous red ſilver ore. *Same place.*

LXXXIII. *b* 11. In truncated hexhedral priſms, dark, opake, and ſplendid; on calcareous ſpar. *Same place.*

LXXXIV. *c* 1. In double hexhedral pyramids, tranſparent, and of a ruby colour; on decompoſing iron pyrites. *Marienberg.*

R. de L. Eſpece 3d, Var. 9th.

LXXXV. *c* 2. More minutely cryſtalliſed. *Same place.*

LXXXVI. *d* 1. In dark, opake, and very brilliant pyramidal cryſtals variouſly interwoven, in ſome places apparently priſmatic; intermixed with white cellular quartz. *Hartz.*

LXXXVII. *d* 2. In very minute cryſtals, incruſting lenticular calcareous ſpar of a cockſcomb appearance. *(Roſe of Jerico Spar.)* *Joachimſtahl.*

LXXXVII. *d* 3. With lenticular calcareous ſpar and yellow pyrites. *Hungary.*

VARIETY II. *AMORPHOUS.*

LXXXIX. *a* 1. Bright, tranſparent, compact and of a ruby colour, with teſtaceous arſenic; in ſolid white quartz. *St. Marie aux Mines.*

XC. *b* 1. Of a deep orange colour, ſuperficial; on grey horn-ſtone. *Same place.*

SPECIES

SPECIES VII. *WHITE SILVER ORE.*

Argent blanc, Fr. *Weiſſgultigerz*, Germ.

The true colour of this ore is light lead grey approaching more or leſs to ſteel grey. It has hitherto been found only in the maſs, or interſperſed, and generally through galena; its texture granular or compact. It is opake, and of a ſlight metallic ſplendour, rather ſoft, and not remarkably brittle. Specific gravity 5.322. Under the blow-pipe it in part evaporates, leaving a ſilver globule ſurrounded by yellow particles. By the analyſis of *Klaproth* it contains Silver 20, Lead 40, Sulphur 12, Antimony 8, Iron 2.5, Alumine 7, Silex 0.5. It is found in certain of the mines of *Freyberg*, and at *Facebay* in *Tranſylvania*.

VARIETY I. *AMORPHOUS.*

XCI. *a* 1. Steel grained and of a leaden grey colour, in galena intermixed with red ſilver ore. *Eſbiſdorf* near *Freyberg*.

XCII. *b* 1. Compact and of a leaden grey colour, intermixed with grey calcareous ſpar; on yelloviſh ponderous ſpar. *Freyberg*.

To the foregoing ſpecies might now be added the *Silberglanz* of *Renovantz* (*Cupriferous ſulphurated ſilver ore* of *Kirwan*, *Elem. Mineral. vol.* 2. *pag.* 121.) and the *Carbonate of Silver* diſcovered by *Selb* in the principality of *Furſtenberg* in the year 1788, (Vide *Widenmann*, § 232.) The accidental admixture of native ſilver, vitreous ſilver, red ſilver ore, &c. with copper, iron, cobalt and other heterogeneous ſubſtances, are to be conſidered as mere varieties.

GENUS V. *LEAD.*

Plumbum. Plomb, Fr. *Blei*, Germ.

Pure lead when freſh cut is of a bluiſh white colour, changing to yelloviſh white, bluiſh, and bluiſh black, upon expoſure to the air. So ſoft as to yield even to the nail and to blacken the fingers upon handling. It makes a ſenſible impreſſion both upon the organs of taſte and ſmell, and on the latter more eſpecially after being rubbed. It is more malleable than ductile, may without cracking be beaten into very thin plates, is inelaſtic, and of all the metals the leaſt ſonorous and the leaſt tenacious. Its ſpecific gravity according to *Briſſon* is 11.352. By long expoſure to a moiſt atmoſphere it contracts a white ruſt from ſuperficial oxydation, though little if it all affected when immerſed in pure water. It melts before it becomes red hot at 540 *Farenh.* By a continuance

tinuance of the heat in open veſſels it is eaſily converted into a grey, yellowiſh or reddiſh oxyde, which in the higher degrees of heat is not only itſelf capable of vitrification, but promotes remarkably that of the other imperfect metallic oxydes, and of all the earthy bodies; hence the refinement of gold and ſilver and the preparation of moſt of the finer kinds of glaſs. It is ſoluble in all the acids; in the diluted nitric acid without the aſſiſtance of heat. Its ſolutions have a ſweetiſh aſtringent taſte, and exhibit a dark browniſh colour on the addition of an alkaline ſulphuret.

With gold, ſilver, tin, and ſeveral other of the metallic bodies, it unites readily by fuſion; it may alſo in this way be artificially combined both with ſulphur and phoſphorus.

Amongſt the extenſive applications of this metal are the manufacture of Shot, the compoſition of Pewter, and of Soft Sodder, Glaſs-making, Glazing, Painting, Varniſhing, &c.

The ores of Lead are,

SPECIES I. *NATIVE LEAD.*

Plomb natif, Fr. *Gediegen-Blei*, Germ.

Lead is ſo ſeldom met with in this ſtate, that by many celebrated mineralogiſts its exiſtence has been called in queſtion; but that it does now and then actually occur, is proved by the following ſpecimen, No. II. from *Brittany*, as well as by one from *Monmouthſhire*. (*Kirw. Vol.* 2. *Pag.* 203.) The native in its colour, texture, weight, fuſibility, &c. ſo nearly reſembles common lead as to render a particular deſcription unneceſſary.

VARIETY I. *CRYSTALLISED.*

I. Lead artificially cryſtalliſed.

II. *a* 1. In irregular layers of a dull leaden colour, compoſed of accumulated pyramidal cryſtals attached to the ſurface of laminated galena, with cryſtalliſed quartz underneath. *Brittany.*

VARIETY II. *OF PARTICULAR SHAPES.*

a 1. Dendritic.

SPECIES II. *NATIVE OXYDE OF LEAD.*

Oxide de Plomb ſpathique rouge, Fr. *Roth-Bleierz*, Germ.

This occurs for the moſt part in ſemitranſparent brilliant priſmatic cryſtals, of an aurora red colour reſembling that of realgar, and ſometimes inclining to the hyacinth. The form

form of the cryſtals, the tetrahedral rhomboidal priſm with trihedral or dihedral ſummits. Its texture ſcaly; brittle; when powdered becoming of an orange yellow colour. Specific gravity 6.026. It does not effervesce with acids; the marine, which acts on it moſt readily, diſſolves about one ſixteenth its weight. Under the blowpipe it decrepitates, and the greater part may at length be converted into a black ſlag which imparts a greeniſh colour to glaſs of borax: mixed with charcoal it inflames in a red heat, and undergoes reduction. It contains, according to the analyſis of *Bindheim*, Lead 60, Molybdenic Acid 11.66, Nickel 5.66, Oxyde of Iron 1, Silex 4.5, Air and Water 5, and a ſmall proportion of Copper and Cobalt; and of *Maquart*, Lead 36, Oxygen 37, Iron 24, Alumine 2. It is principally found with yellowiſh lead ore and ſhattery quartz, on a micaceous ſandſtone, near *Katharinenberg* in *Siberia*; it has alſo lately, as it is ſaid, been met with at *Reczbanya* in *Hungary*, and at *Trappetes* in *Upper Faucigny* in *Savoy*.

VARIETY I. *CRYSTALLISED.*

III. *a* 1. In tranſparent tetrahedral rhomboidal priſms terminated by dihedral pyramids, of an aurora red colour, on whitiſh ferruginous quartz.
R. de L. Pl. 4. *Fig.* 28. *Bereſofskoi* near *Katharinenberg*, *Siberia*.

IV. *a* 2. The ſame, on a micaceous ochry ſandſtone. *Same place.*

b. Indeterminate.

VARIETY II. *AMORPHOUS.*

a. Compact.

V. *b* 1. In an earthy friable form, and of a bright tile red colour (*Native Minium*), in cellular quartz. Probably alſo from *Siberia*.

SPECIES III. *CARBONATE OF LEAD.*

White Spathoſe Lead Ore. Plomb Spathique, Fr. *Weiſs-Bleierz*, Germ.

The colour of this ore is ſilver white with conſiderable ſplendour, often, from accidental admixture or decompoſition, inclining more or leſs to yellow, grey, green or brown. It generally occurs in ſlender priſmatic cryſtals, often intimately interwoven or decuſſating each other, and not unfrequently in aggregated cryſtalline maſſes, more rarely ſtalactitical, in lumps, diſſeminated, or ſuperficial. The form of its cryſtals is derived from the double hexhedral pyramid with triangular faces. When cryſtalliſed, uſually tranſparent;

parent; the ſmaller cryſtals being of a fibrous or ſplintery fracture, the larger conchoidal. It is brittle and ſcratches eaſily with the knife. Specific gravity of the moſt tranſparent from 6.25 to 6.92, of the opake from 4.058 to 5.84. It is readily ſoluble with effervescence in the diluted nitric acid; it is alſo ſoluble in fat oils by the aſſiſtance of heat. When expoſed to the vapour of ſulphuret of ammonia it becomes of a dark colour, by which it is diſtinguiſhed from all other apparently ſimilar ſubſtances. Under the blow-pipe it decrepitates and becomes an oxyde of a yellowiſh colour inclining to red, and of very eaſy reduction. According to the analyſis of *Weſtrumb*, it contains Lead 80.25, Carbonic Acid 16, with ſome Lime, Alumine, and Iron.

The moſt beautiful ſpecimens of this ore have been found at *Gluckſtade* in the *Hartz*; it alſo occurs in conſiderable quantity in the mines of *Saxony*, *Bohemia*, *Brittany*, *Carinthia*, &c.; rich ſpecimens are likewiſe to be found in *Wales* and *Ireland*, and more eſpecially at *Lead Hills* in *Scotland*.

VARIETY I. *CRYSTALLISED.*

VI. *a* 1. In dodecahedral cryſtals compoſed of two hexhedral pyramids joined baſe to baſe, the ſurface brilliant, and having a metallic luſtre, on galena intermixed with fluor. *Derbyſhire.*

VII. *a* 2. In large white ſemitranſparent cryſtals moſtly irregular or in macles, ſome however ſimple and diſtinctly compoſed of two hexhedral pyramids joined baſe to baſe with ſhort intermediate priſms, on galena with grey limeſtone. *Przibram, Bohemia.*
R. de L. Pl. 6. *Fig.* 21, 22, 23.

VIII. *a* 3. In numerous tranſparent hexhedral priſms terminated by hexhedral pyramids, on black decompoſing galena. *Brittany.*

IX. *a* 4. In large irregular hexhedral priſms, faſciculated, and intermixed with ſtalactitical pyrites, the ſurface of which is black and partly incruſted with browniſh phoſphate of lead in ſtellated priſmatic needles. *Poullaoven.*

X. *a* 5. The fragment of a large tranſparent hexhedral cryſtal.
Mendip Hills, Somerſetſhire.

On this fragment are two diſtinct faces, one meaſuring three quarters and the other an inch and a half in breadth and two and a half in length; weight upwards of eight ounces.

XI. *a* 6. In ſmall irregular flatted hexhedral priſms terminated by ſimilar pyramids, covering the ſurface of cubic galena, with white ponderous ſpar underneath. *Poullaoven.*

XII. *a* 7.

XII. *a* 7. In flatted hexhedral prifms of a ſtriated texture and terminated by tetrahedral pyramids, the broad ſides of which correſpond with thoſe of the priſm, the cryſtals variouſly attached and interwoven. *Bleyfield, Hartz.*

XIII. *b.* 1. In numerous ſhort ſemitranſparent priſmatic cryſtals truncated at both extremities and grooved longitudinally, adhering laterally to the ſurface of grey decompoſing galena. *Hartz.*

The grooved appearance on the ſurface of theſe cryſtals evidently ariſes from the projecting edges of ſmall priſmatic cryſtals of which the larger are compoſed.

XIV. *b* 2. In ſmall ſheaves or faſciculi, compoſed of priſmatic needle-like cryſtals truncated at their extremities and united in various directions, ſome parallel, ſome diverging, ſome tranſverſe, &c. on ochry cellular quartz. *Hartz.*

XV. *b* 3. The ſame, in finer cryſtals alſo on ochry quartz, with green oxyde of copper on the ſurface. *Same place.*

XVI. *b* 4. Of a mother-of-pearl colour (having ſomewhat the appearance of Zeolite), in which the long ſlender priſmatic truncated cryſtals, diverging from different centres, meet in various points and curiouſly decuſſate each other. *Same place.*

XVII. *b* 5. In an aſſemblage of ſnow white needle-like cryſtals, variouſly attached and interwoven. *Gluckſtade, Hartz.*

Catal. de Raab XIII D. b. *a.* 3.

XVIII. *b* 6. The ſame, in very delicate cryſtals on blackiſh ferruginous quartz. *Same place.*

XIX. *b* 7. The ſame, incruſted with green carbonate of copper, on a ſimilar matrix with the laſt. *Same place.*

XX. *b* 8. The ſame, in larger cryſtals, incruſted alſo with green copper ore. *Same place.*

XXI. *b* 9. The ſame, thickly incruſted with radiated green carbonate of copper on ſpungy quartz. *Same place.*

XXII. *b* 10. In flatted aggregated cryſtals without matrix. *Lead Hills.*

XXIII. *b* 11. Of a dull white colour faſciculated in various directions, in ochry quartz. *Wales.*

XXIV. *b* 12. In a closely aggregated mass of a yellowish white colour, composed of striated prismatic crystals more especially distinct on the surface. *Lead Hills.*

XXV. *b* 13. In a mass composed of crystals, more compacted and of a whiter colour. *Same place.*

XXVI. *b* 14. The same, in a smaller mass of a more confused structure. *Derbyshire.*

VARIETY II. *AMORPHOUS.*

XXVII. *a* 1. In a ponderous mass, composed of diverging striæ of a dull white colour. *Hartz.*

XXVIII. *b* 2. In a laminated irregular mass, of an ochry yellow colour, formed on decomposing galena. *Freyberg.*

XXIX. *c* 1. In a solid irregular ponderous mass of a yellowish dull white colour, tuberculated on the surface. *Brittany.*

XXX. *c* 2. The same, of a light ash colour, less ponderous and without tubercles. *La Croix aux Mines.*

XXXI. *c* 3. The same, more compact and ponderous, of a light yellowish brown colour. *Scotland.*

VARIETY III. *PASSING INTO GALENA.*

Oxyde de Plomb Spathique gris. Catal. de Raab. Tom. 2. P. 373. *Mine noir* Romé de l'Isle, Crystall, Tom. 3, P. 400.

XXXII. *a* 1. In large truncated hexhedral prisms, of a greyish brown colour, issuing from a cavernous mass of grey lead ore. *Poullaoven.*

XXXIII. *a* 2. In large diverging fasciculi, composed of truncated hexhedral prisms of the same colour, incrusted on their surface by brownish spathose lead ore. *Same place.*

XXXIV. *b* 1. In large irregular aggregated prisms, covered on the surface by white spathose lead ore minutely crystallised. *Same place.*

XXXV. *b* 2.

XXXV. *b* 2. In a ſmall irregular maſs compoſed of ſhort truncated priſms, in ſome places having white ſapthoſe lead ore interpoſed. *Tſchopau.*

Vide Phoſphorated Lead Ore, SPECIES V.

XXXVI. *b* 3. In needle like priſms, lying in various directions on the ſurface of ochry quartz. *Hartz.*

SPECIES IV. *MOLYBDATE OF LEAD.*

Yellow Lead Ore of Carinthia. *Mine de Plomb jaune*, Fr. *Gelb-Bleierz*, Germ.

This generally occurs in tabular cryſtals, varying in colour from pale yellow to orange, with more or leſs tranſparency, and of a waxy luſtre. Its cryſtals are ſeldom large, often aggregated into compact or cellular maſſes; when perfect their form is cubic or octohedral. Its texture is ſparry; it yields eaſily to the knife, and is brittle. Specific gravity 5.092. It is ſoluble both in the nitric and muriatic acids by the aſſiſtance of heat, and may be decompoſed in the moiſt way by either of the fixed alkalis. Under the blow pipe it readily decrepitates, and melts into a dark coloured maſs, which fluxed with borax or microcoſmic ſalt communicates to them a greeniſh or deep blue colour. According to the late experiments of *Mr. Hatchett*, this ore conſiſts of Oxyde of Lead 58.4, Molybdic Acid 38, Oxyde of Iron 2, with a ſmall proportion of Silex. It is found at *Villach* in *Carinthia*, on a matrix of limeſtone of a pale browniſh grey colour, and tinged frequently with oxyde of iron.

VARIETY I. *CRYSTALLISED.*

XXXVII. *a* 1. In tabular orange coloured cryſtals, moſtly confuſed, but ſome diſtinctly octohedral, others tetrahedral, and all with bevilled edges, on compact ochry limeſtone. *Bleyberg*, near *Villach*, *Carinthia*.

R. de L. Pl. 3, *Fig.* 37.

XXXVIII. *b* 1. In lenticular tables of a dull yellow colour, ſet edgeways on a ſimilar matrix. *Same place.*

SPECIES V. *PHOSPHATE OF LEAD.*

Mine de Plomb vert, Fr. *Grün-Bleierz*, Germ.

The moſt common colour of this ore is green of various ſhades; it is alſo often browniſh or greeniſh yellow, greyiſh or browniſh red. It occurs occaſionally in lumps,

of particular ſhapes, or interſperſed, but moſt frequently more or leſs diſtinctly cryſtalliſed; the form of its cryſtals the hexhedral priſm, with or without hexhedral pyramids and their modifications. It has a waxy luſtre, and varies in its degree of tranſparency. Scratched with the knife it gives a greeniſh white ſtreak; is brittle; of an uneven fracture approaching to conchoidal. Specific gravity from 6.076 to 6 593. It diſſolves with ſlight effervescence in the diluted marine acid by the aſſiſtance of heat. It melts eaſily under the blow-pipe; to glaſs of borax it communicates a yellowiſh white colour, and if heated with charcoal emits luminous phoſphoric vapours, and is in part reduced. It may alſo be reduced by admixture with the mineral alkali. According to the analyſis of *Klaproth*, the green lead ore of *Tſchopau* contains Lead 72.08, Phoſphoric Acid 18.74, Iron 1.5, and the reſt Oxygen. It is met with ſometimes in conſiderable quantities in the mines of *Siberia*, *Bohemia*, *Saxony*, *Brittany*, and many other parts. In ſome of the lead mines of *Ireland* and of *South Wales* it occurs not unfrequently, and more eſpecially at *Lead Hills* in *Scotland*.

VARIETY I. *CRYSTALLISED.*

XXXIX. *a* 1. In hexhedral priſms of a yellowiſh graſs green colour, terminated by acute hexhedral pyramids; the cryſtals very numerous and many of them extremely minute, in lamellated ochry quartz. *Freyberg, Briſgau.*

R. de L. Eſpece 4, *Var.* 1.

XL. *a* 2. In large aggregated hexhedral priſms terminated by obtuſe hexhedral pyramids truncated near their baſe, of an olive green colour, on ochry ponderous ſpar.

R. de L. Pl. 6, *Fig.* 46. *Tſchopau.*

XLI. *a* 3. In ſmaller truncated hexhedral priſms of a yellowiſh graſs green colour, on a ſimilar matrix. *Same place.*

R. de L. Pl. 4, *Fig.* 18.

XLII. *a* 4. In hexhedral cryſtals ſomewhat pyramidal, lying in various directions, and at their larger extremities irregularly truncated and hollowed, aggregated into an irregular maſs of a yellowiſh graſs green colour. *Freyberg.*

XLIII. *a* 5. In ſhort truncated and rounded hexhedral priſms of the ſame colour with the former, on ochry ponderous ſpar. *Newtown Ards, Downſhire.*

XLIV. *a* 6. In ſhort hexhedral priſms truncated at both extremities, very diſtinct and numerous, of an olive green colour, on the ſurface of dark brown hematite.

R. de L. Pl. 4, *Fig.* 18, 19, 20. *La Croix, Lorraine.*

XLV. *a* 7.

XLV. *a* 7. In truncated hexhedral prisms, small in size, of a pale greenish yellow colour, on coarse brown hematite. *Cornwall.*

XLVI. *a* 8. The same, in an aggregated mass, with pulverulent bright yellow ochre. *Tschopau.*

XLVII. *b* 1. Minutely crystallised, of a greyish green colour and tuberculated, on the surface of ochry spongy quartz. *Freyberg.*

XLVIII. *b* 2. The same, of a perfect grass green colour, having a stalactitical appearance *(Mamellonè)* on a whitish ochry sandstone. *Hofergrund, Freyburg.*
Catal. de Raab 13 D. b. *d.* 2.

XLIX. *b* 3. Of a greenish yellow colour, in very minute and numerous diverging spiculæ, forming a kind of incrustation on the surface of greyish friable quartz. *Freyberg.*

L. *b* 4. Of a dark fawn colour, in numerous diverging fasciculi, composed of prismatic needle-like crystals, variously attached and interwoven, so as to form a moss-like or arborescent mass, from the interstices and surfaces of which shoot innumerable delicate spiculæ. *Huelgoet, Poullaoven, Brittany.*

LI. *b* 5. In detached and flatted fragments of a bright wax yellow colour. *Hungary.*

VARIETY II. *AMORPHOUS.*

LII. *a* 1. Of a pale greenish yellow colour and earthy texture. *Lead Hills, Scotland.*

LIII. *a* 2. Of an orange colour, forming a cellular incrustation on decomposing galena. *Same place.*

LIV. *a* 3. Forming a tuberculated incrustation, semitransparent and of a yellowish brown colour, on compact galena. *Poullaoven.*

LV. *a* 4. In a ponderous irregular mass of a yellowish brown colour. *Scotland.*

LVI. *a* 5. Of a sulphur yellow colour, incrusting the surface of prismatic white lead ore, irregularly aggregated. *Same place.*

SPECIES

SPECIES VI. *SULPHATE OF LEAD.*

Vitriolated Lead, Withering.

This combination of oxyde of lead with ſulphuric acid occurs in ſmall tranſparent cryſtals, of a yelloviſh white colour and of conſiderable brilliancy; their form the octohedron and its modifications. It is eaſily ſcratched with the knife; ſpecific gravity according to *Delametherie* 3.215. Soluble in about 1200 parts of boiling water. Under the blow-pipe it is readily reduced. According to *Dr. Withering*, by whom this ore was firſt analyſed, it contains 70 per cent. of Lead with Sulphuric Acid and Iron. This ore has only been met with at *Paris Mine* in the *Iſle of Angleſea* in the hollows of a brown ferruginous matrix.

VARIETY I. *CRYSTALLISED.*

LVII. *a* 1. In ſmall brilliant tranſparent octohedrons, on a ferruginous matrix. *Theorie de la Terre, par* Delameth. Tom. 1. Page 293. *Angleſea.*

LVIII. *a* 2. In large tranſparent octohedrons having a greeniſh tinge, on ochry decompoſing galena. *Zellerfeld, Hartz.*

From the weight, tranſparency, figure, and more eſpecially from comparative experiments made by the blow-pipe, theſe cryſtals appear ſimilar to the above.

LIX. *b* 1. In indeterminate tabular cryſtals, aggregated on decompoſing galena. *Same place.*

SPECIES VII. *SULPHURET OF LEAD.*

Potters Lead Ore. Galene, Fr. *Bleyglantz, Bleiſchweif*, Germ.

This occurs the moſt commonly, and is found in the greateſt abundance of all the ores of lead, which it ſo exactly reſembles in its luſtre and colour as ſcarcely to be diſtinguiſhed from it by the aſpect. Its texture is for the moſt part foliated, ſometimes granular or compact, the foliated eaſily ſeparable into rectangular teſſular fragments. It is opake, is readily ſcratched by the knife, gives a ſhining bluiſh grey ſtreak, and is very ponderous, its ſpecific gravity being from 6.565 to 7.786. It is found in large maſſes or in veins, ſuperficial, interſperſed, or of particular ſhapes, and very frequently more or leſs diſtinctly cryſtalliſed; its form the cube and octohedron with their modifications. It is decompoſed with effervеſcence both by the nitric and muriatic acids. Under the blow-

blow-pipe it firſt decrepitates, then fuſes, emits a ſulphureous ſmoke, and is afterwards reduced into a metallic globule, which contains generally a greater or leſs proportion of Silver and Iron. It is ſtated by Mr. *Kirwan* to yield from 45 to 83 per cent. of Lead, the remainder principally Sulphur. Beſides the great abundance in which this ore is met with in various parts of *Germany*, *Sweden*, *Norway*, *Poland*, &c. it is raiſed with us in very large quantities in *Cornwall*, *Derbyſhire*, *Cumberland*, *Northumberland*, &c. and alſo in *Scotland* and *Ireland*.

VARIETY I. *CRYSTALLISED.*

LX. *a* 1. In large diſtinct cubes of a dull greyiſh colour on the ſurface, on a plate of ſemitranſparent white quartz. *Charles Mine, Sweden.*

LXI. *a* 2. In ſmaller cubes of various ſizes, aggregated irregularly one on the other, the ſurfaces of the cubes covered by an incruſtation of minute cryſtals of white ſpathoſe lead ore, on white opake ponderous ſpar. *Derbyſhire.*

LXII. *a* 3. In cubes and rectangular parallelopepids, with brilliant cryſtalliſed blende intermixed with yellow copper pyrites and quartz. *Hungary.*

LXIII. *a* 4. In rhombs having their ſurfaces incruſted with minutely cryſtalliſed fluor, with tranſparent yellow and white cubic fluor on greyiſh limeſtone. *Derbyſhire.*
R. de L. Eſpece 2, *Var.* 2.

LXIV. *a* 5. In aggregated cubes the ſolid angles of which are ſlightly truncated, with cryſtalliſed tranſparent quartz, on white quartz mixed with dark grey ſchiſtus.
R. de L. Eſpece 2, *Var.* 3. *Pl.* 2, *Fig.* 5. *Hartz.*

LXV. *a* 6. The ſame, having the angles more deeply truncated, on cubic fluor and quartz. *Freyberg.*

LXVI. *a* 7. In aggregated cubes truncated ſo deeply that their faces again become cubic, with an ochry incruſtation on whitiſh indurated clay. *Bleyberg.*
R. de L. Eſpece 2, *Var.* 4. *Pl.* 2. *Fig.* 7.

LXVII. *a* 8. The ſame, with a cryſtallization extremely regular, blackiſh and without luſtre on the ſurface, on ferrugineous ſandſtone. *Johngeorgenſtadt.*

LXVIII. *a* 9. In large and ſhining cryſtals, ſtill more deeply truncated, producing ſix quadrangular and eight hexangular faces, with cubic arſenical pyrites. *Freyberg.*
R. de L. Eſpece 2, *Var.* 5. *Pl.* 2, *Fig.* 9.

LXIX. *b* 1.

LXIX. *b* 1. In regular octohedrons, on a maſs of lamellated galena intermixed with numerous cryſtals of white ſpathoſe lead ore. *Derbyſhire.*

R. de L. Eſpece 2, *Var.* 7. *Pl.* 3, *Fig.* 1.

LXX. *b* 2. In octohedrons variouſly imbedded in one another, and aggregated into an irregular maſs. *Johngeorgenſtadt.*

LXXI. *b* 3. The ſame, irideſcent, having their apices ſlightly truncated, imbedded in lamellated galena with fluor. *Saxony.*

R. de L. Pl. 3, *Fig.* 3.

LXXII. *b* 4. In numerous octohedrons, ſome cuneiform (*R. de L. Pl.* 3, *Fig.* 2.) ſome compreſſed (*Pl.* 3, *Fig.* 12.) ſome with all their ſolid angles ſlightly truncated (*Pl.* 3, *Fig.* 4, 5.) the whole on gneiſs intermixed with galena. *Freyberg.*

LXXIII. *b* 5. The ſame, of an irideſcent appearance, having their ſolid angles ſlightly truncated, with arboreſcent galena, yellow pyrites, blende and double pyramidal calcareous ſpar, on reddiſh brown limeſtone. *Leiceſterſhire.*

R. de L. Pl. 3, *Fig.* 4.

LXXIV. *b* 6. The ſame, with numerous ſpecks of white opake ponderous ſpar, on white calcareous ſpar. *Derbyſhire.*

LXXV. *b* 7. In octohedrons having all the edges truncated, with whitiſh brown laminated ſpathoſe lead ore, on grey ſchiſtus. *Saxony.*

R. de L. Pl. 3, *Fig.* 7.

LXXVI. *b* 8. In large aggregated octohedrons truncated both at their angles and edges, with brown ſcaly blende. *Derbyſhire.*

R. de L. Eſpece 2, *Var.* 12. *Pl.* 3, *Fig.* 8.

LXXVII. *c* 1. In indeterminate polyhedral cryſtals confuſedly aggregated and very brilliant, on yellow pyrites mixed with black blende. *Copnick* in *Hungary.*

This galena ſaid to be rich in ſilver.

LXXVIII. *c* 2. The ſame, with cryſtalliſed tranſparent quartz, on reddiſh ponderous ſpar intermixed with quartz. *Freyberg.*

LXXIX. *c* 3. The ſame, having ſeveral of their ſurfaces depreſſed like melted lead which has contracted in cooling (*renfoncé*), with pyramidal quartz, alſo on reddiſh ponderous ſpar intermixed with quartz. *Same place.*

LXXX. *c* 4.

LXXX. *c* 4. The ſame, ſimilar in appearance with the laſt, with calcareous ſpar on quartz. *Freyberg.*

VARIETY II. *OF PARTICULAR SHAPES.*

LXXXI. *a* 1. Forming a hollow ſtalactite ochry on the ſurface. *Derbyſhire.*

VARIETY III. *AMORPHOUS.*

LXXXII. *a* 1. Of a teſſellated ſtructure, very brilliant and without matrix. *Same place.*

LXXXIII. *a* 2. Of a foliated texture, alſo very brilliant, with white lead ore on the ſurface. *Scotland.*

LXXXIV. *a* 3. The ſame, having a peculiar tarniſh on the ſurface. *Bohemia.*

LXXXV. *a* 4. Of a foliated texture, intermixed with red ochre of iron.

LXXXVI. *a* 5. The ſame, irideſcent on the ſurface and partly covered by white pearl ſpar. *Northumberland.*

LXXXVII. *a* 6. The ſame, with a brilliant ſurface having a tinge of brown, on white opake baroſelenite. *Derbyſhire.*

LXXXVIII. *a* 7. In thin diverging laminæ, ſomewhat irideſcent on the ſurface. *Saxony.*

LXXXIX. *a* 8. Of a foliated ſtructure, having the ſurface covered by very minute cryſtals of galena ſingularly irideſcent. *Brittany.*

XC. *a* 9. Of a foliated ſtructure, with horn ſilver. *Johngeorgenſtadt.*
This ore is ſaid to be very ſcarce, and is remarkable for yielding ſulphur on the application of a gentle heat.

XCI. *a* 10. Of a foliated texture and ſtrongly irideſcent, with white quartz, forming vein in indurated clay. *Bleyſtadt*, in *Bohemia.*

XCII. *a* 11. Of a foliated texture, the edges of the folia producing a nitted appearance, intermixed with purple fluor. *Saxony.*

XCIII. *a* 12. The ſame, of a brown tinge, the edges of the laminæ giving it a more ſtriated appearance, in ſome places ſtalactitical. *Freyberg.*

XCIV. *b* 1. Of a coarſe ſteel grained texture, very brilliant in its fracture. The *Levant.*

XCV. *b* 2. Of a fine ſteel grained texture. *Hartz.*

XCVI. *b* 3. Of a granular texture, intermixed with quartz and yellow pyrites. This variety becomes phoſphoreſcent on being rubbed.

XCVII. *c* 1. Compact and mixed internally with yellow copper pyrites. *Same place.*

XCVIII. *d* 1. Superficially ſmooth and ſpecular *(Sliken-Sides)* on white opake quartz. *Odin Mine, Caſtleton.*

XCIX. *e* 1. Forming very minute parallel veins in aſh-coloured ſandſtone. *Ilay*, in the *Hebrides.*

VARIETY IV. *PASSING INTO PHOSPHATE OF LEAD.*

C. *a* 1. In decompoſing cubes, incruſted with dull yellowiſh white phoſphate of lead. *Freyberg.*

SPECIES VIII. *ANTIMONIATED LEAD ORE.*

Galene Antimoniale, Fr. *Strahlichter Bleiglanz*, Germ.

This differs from common galena in being leſs ſplendid on the ſurface, and moſt commonly of a ſtriated or fibrous texture. Under the blow-pipe, it gives out a white oxyde of antimony in the form of light white flocculi. *Mr. Kirwan* has ſtated it to contain Lead from 40 to 50 per cent. with a ſmall proportion of Antimony and a little Silver. It is found in the mines of *Siberia* and *Sweden*, at *Schemnitz* in *Hungary*, at *Lauthenthal* in *Saxony*, &c. and at *Synares* in *Andaluſia* in *Spain.*

VARIETY I. *AMORPHOUS.*

CI. *a* 1. Of a ſtriated texture and irideſcent. *Freyberg.*

CII. *b.* 1. Of a foliated texture and dark grey colour. *Saxony.*

CIII. *c* 1. Compact, and of a light grey colour. *Freyberg.*

GENUS

GENUS VI. *COPPER.*

Cuprum. Cuivre, Fr. *Kupfer*, Germ.

Copper, when pure, is of a dull or muddy red colour ſomewhat inclining to yellow, leſs ſplendid than ſilver or gold, but more ſo than iron. Its fracture granular. When heated or rubbed it exhales a diſagreeable odour, and applied to the tongue impreſſes it with a nauſeous ſomewhat ſtyptic taſte. It is conſiderably leſs ductile and malleable than gold or ſilver, but in hardneſs and elaſticity inferior only to iron. Its toughneſs ſuch, that a wire of $\frac{1}{10}$ inch diameter ſupports a weight of 299½ pounds. It is the moſt ſonorous of all the metals. Its ſpecific gravity from 7.708 to 9.324. Upon expoſure to moiſt air it quickly tarniſhes, and in proceſs of time acquires a greeniſh ruſt more or leſs compact. When heated to redneſs it is converted into a brown ſcaly oxyde. It melts at 27 *Wedgw.* = to 4587 *Fahrenh.* and being partly volatiliſed communicates a bluiſh green colour to the flame. Of all metals it is the moſt readily affected by both acids and alkalis; with the former it produces in moſt inſtances blue or green cryſtalliſable ſaline compounds, and with ammoniac one which is of a beautiful blue colour. It is alſo readily acted upon by expreſſed oils and animal fats, particularly by thoſe moſt liable to become rancid. It may be precipitated from all the acids by means of iron and zinc, and alſo by the alkalis and ſoluble earths. Under fuſion it combines with the other metallic ſubſtances in various proportions. Silver and gold when alloyed with it, though rendered harder, loſe little or nothing of their malleability, but tin it makes more brittle. It heightens the colour of gold, is itſelf whitened by arſenic, and is rendered paler or changed to a yellow by zinc. Melted with ſulphur it forms a greyiſh-black friable maſs more fuſible than copper alone. Its oxyde tinges glaſs of an emerald green. Next to iron, copper is the moſt extenſively employed of all the metals, in the arts, manufactures, domeſtic uſes, and medicine.

SPECIES I. *NATIVE COPPER.*

Cuivre natif, Fr. *Gediegen-Kupfer*, Germ.

The colour, texture, ſplendour, and other properties of this differ in no material reſpect from thoſe of the pure metal. It occurs in amorphous maſſes; in plates more or leſs extenſive; of particular ſhapes, as dendritic, ramoſe, filiform &c. and not unfrequently cryſtalliſed in ſmall cubes or octohedrons and their modifications. Its cryſtals,

like thoſe of native gold and ſilver, being often compacted into plates or accumulated on each other ſo as to form branches. It is found, ſometimes in conſiderable quantity, in *Siberia* and *Canada*; on the *Eaſt Coaſt* of *Kamtſchatka*; in various parts of *Norway* and *Sweden*; in *Japan*; in *Upper Hungary*, and the *Bannat*; in ſeveral of the mines of *Saxony*, *Bohemia*, and other parts of *Germany*; in *Baygery* and other parts of *Spain* and *France*; at *Redruth* in *Cornwall*, and many other places: but the largeſt maſs as yet ever diſcovered is that mentioned by *Profeſſor Vandelli* from a valley near *Cachoeira* in the *Brazils*, weighing upwards of 2600 Portugueſe pounds. Beſides the various other ſubſtances with which native copper is aſſociated, as quartz, fluor, ponderous ſpar, &c. it is generally intermixed or incruſted with red or brown oxydes of copper or of iron, and often alſo with green or blue carbonate of copper.

VARIETY I. *CRYSTALLISED.*

I. Pure copper artificially cryſtalliſed on the ſurface.

II. *a* 1. In regular cubes aggregated into irregular branches, entangling fragments of micaceous quartz. *Bannat.*

Catal. de Raab. 12. A. d. 1.

III. *a.* 2. In irregular cubes forming aggregated branches, and without matrix. *Chevigney.*

IV. *b* 1. In numerous ſmall regular octohedrons, on the ſurface of an irregular granulated maſs of native copper. *Cornwall.*

Catal. de Raab. 12. A. d. 2.

V. *c* 1. In large indeterminate cryſtals, forming irregular connected branches of native copper intermixed with white quartz. *Hungary.*

VARIETY II. *OF PARTICULAR SHAPES.*

VI. *a* 1. Dendritic and brilliant, in the form of moſs, on ochry indurated clay. *Kamſdorf.*

VII. *a* 2. In fine dendritic and brilliant plates, with fragments of white quartz. *Cornwall.*

VIII. *b* 1. In lengthened wire-like threads variouſly interwoven. *Same place.*

IX. *b* 2. Ramoſe and covered by compact red and green copper ore. *Kamſdorf.*

X. *b* 3. Similar to the laſt, from *Mexico.*

XI. *b* 4.

XI. *b* 4. A larger ſpecimen of the ſame, in which the green copper ore is ſo compact as to have a ſemitranſparent glaſſy appearance. *Siberia.*

XII. *b* 5. Ramoſe, in white calcareous ſpar. *Norway.*

XIII. *b* 6. The ſame, on compact native copper without matrix. *North America.*

XIV. *b* 7. Solid, in a flatted irregular plate ſomewhat branched and without matrix. *Cornwall.*

c. Filiform.

VARIETY III. *AMORPHOUS.*

XV. *a* 1. In thin lamellæ, diſſeminated through white plated ponderous ſpar. *Lorraine.*

XVI. *b* 1. Granular and ſuperficial, with laminated red copper, on decompoſed granite. *Cornwall.*

XVII. *b* 2. The ſame, on white fat quartz.

XVIII. *c* 1. Compact and of a fine grain, intermixed with indurated clay and green copper ore. *Kamſdorf.*

XIX. Precipitated in an arboreſcent form from its ſolution by means of iron. *(Cement-Copper.)*

SPECIES II. *NATIVE OXYDE OF COPPER.*

Tile Ore, Ruby Copper. Cuivre oxidé rouge, Fr. *Ziegelerz, Roth-Kupfererz.* Germ.

Is of a browniſh or cochineal red colour, inclining occaſionally to yellow, and often reſembling that of bricks or tiles, whence called *Tile Ore*. It occurs more or leſs indurated, either interſperſed or in lumps, or inveſting or lining the fiſſures of other copper ores, or cryſtalliſed in ſmall ſplendid rectangular octohedrons, or in delicate capillary cryſtals variouſly interwoven. The amorphous has an earthy fracture, is brittle, opake, and of but little luſtre. The more indurated is often in its fracture imperfectly conchoidal, and becomes more ſplendid by the ſtreak. Its ſpecific gravity according to *Gellert* 3.572. This ore generally diſſolves with effervescence in the nitric acid, and on the ſubſequent addition of ammoniac affords a reddiſh or yellowiſh brown precipitate, which on ſtanding acquires a blue tinge. Under the blow-pipe it blackens and is found to be very difficult of fuſion. To glaſs of borax it communicates a yellowiſh or dull green colour. It appears to conſiſt chiefly of Oxyde of Copper in mixture with Oxyde of Iron; in

the cryſtalliſed however, which is generally accompanied with native copper, the proportion of Iron is comparatively ſmall. It is principally met with at *Moldava* and *Oravizza* in the *Bannat*, at *Great Kamſdorf* in *Saxony*, at *Lauterberg* in the *Hartz*, at *Saalfeld* and *Blankenberg* in *Thuringia*, at *Catharinenberg* and many other of the mines of *Siberia*, and at *Redruth* in *Cornwall*.

VARIETY I. *CRYSTALLISED.*

XX. *a* 1. In detatched rectangular octohedrons of a red colour, covered by green copper ore. *Siberia.*

XXI. *a* 2. In very regular octohedrons, ſemitranſparent, on red copper ore, intermixed with native copper and compreſſed into a thick irregular plate of a granular texture. *Cornwall.*

XXII. *a* 3. The ſame, of a brilliant luſtre, truncated at all their ſolid angles and intermixed with native copper, in white ſhattery quartz. *Same place.*

XXIII. *b* 1. In delicate ſilky fibres of a carmine colour, with white quartz, having white clay on the ſurface. *Rhein Breitenbach, Germany.*

VARIETY II. *AMORPHOUS.*

XXIV. *a* 1. In coarſe irregular grains of a browniſh red colour, diſſeminated through whitiſh ſhattery quartz. *Cornwall.*

XXV. *a* 2. In a flattened maſs of a granular texture and dark reddiſh brown colour, coated on each ſurface with white opake quartz. *Same place.*

XXVI. *b* 1. In ſmall ſhining ſcales of a dull red colour, in white cellular quartz. *Same place.*

XXVII. *c* 1. In a compact irregular maſs, of an earthy appearance and browniſh red colour. (*Ziegelerz*,) *Bannat.*

XXVIII. *c* 2. The ſame, alſo of an earthy form, with grey copper ore, in reddiſh compact limeſtone. *Same place.*

XXIX. *c* 3. The ſame, with fibrous green copper ore, ponderous ſpar and quartz. *Schwartzberg.*

XXX. *d* 1.

XXX. *d* 1. In a friable maſs of an ochry yellow colour and earthy texture.
Kamſdorf.

SPECIES III. *PITCH COPPER ORE.*

A more exact examination of this ore ſhews it to be no other than a variety of the indurated *Tile Ore*, more compact and ſhining. By many it is deſcribed as a dark yellowiſh brown Limeſtone impregnated with Oxyde of Copper. *Kirwan* conſiders it as tile ore, impregnated with Bitumen. It is found principally at *Moldava*, *Saſka*, and *Temeſwar* in the *Bannat*.

VARIETY I. *AMORPHOUS.*

XXXI. *a* 1. Of a ſhining conchoidal fracture and liver brown colour, tuberous on the ſurface and intermixed with green and blue carbonate of copper. *Bannat.*

XXXII. *a* 2. Compact and of a pitch colour, on indurated iron ochre. *Lauterberg.*

XXXIII. *a* 3. The ſame, of a dark brown colour, with ochry arboreſcent native copper on the ſurface. *Breidenbach, Cologne.*

XXXIV. *a* 4. The ſame, of a blackiſh colour, intermixed with grey and green copper ore. *Saxony.*

b. Pulverulent.

SPECIES IV. *CARBONATE OF COPPER.*

Green and Azure Copper Ore. Mine de cuivre verde ou azurée, Fr. *Kupferlazur, Kupfergrun*, Germ.

This, which is by many divided into two ſpecies, occurs either in earthy lumps; or interſperſed through, or covering the ſurface of other minerals; or of particular ſhapes, as ſtalactitic, botryoidal, mamillated, &c. or cryſtalliſed in rhomboidal octohedrons, or rhomboidal tetrahedral, or in hexhedral priſms with their varieties, or in capillary filaments. Its colour is either graſs, verdigris, or emerald green, or azure, ſmalt or indigo blue; its luſtre for the moſt part ſplendid, often ſilky; texture either earthy, compact or fibrous. The compact *(Malachite)* generally compoſed of concentric undulating layers, internally radiated and admitting of a fine poliſh; the earthy, on the contrary, often ſo ſoft as to ſtain the fingers; the cryſtalliſed generally brittle and tranſparent. Specific gravity from 3.5 to 3.994. It diſſolves with effervеſcence in the nitric acid and imparts to it a green colour, and to ſolution of ammoniac a blue. Under the blow-pipe it blackens without melting, but if urged by an intenſe heat it yields a metallic globule. With borax it effervеſces, communicating

municating to it a yellowiſh green colour. The ſilky malachite of *China* yields Copper 75, Carbonic Acid 19.4, Water 5.6; other varieties from 66 to 70 per cent. of Copper. This ore is found at *Helſtone* and near the *Land's End* in *Cornwall*, in the ſouth part of *Wales*, at *Moldava* in the *Bannat*, at *Lauterberg* and *Zellerfeld* in the *Hartz*, at *Saalfeld* in *Thuringia*, at *Bulach* in *Wirtemberg*, at *Falkenſtein* in *Tyrol*, at *Kamſdorf* and *Freyberg* in *Saxony*, at *Mezana Gora* in *Poland*, at *Schmolnitz*, *Neuſol*, and other parts of *Hungary*, in *Siberia* particularly in the northern parts of the *Ural*, at *Kupferberg* in *Sileſia*, as alſo in *Ruſſia*, *Norway*, *Heſſe*, the dutchy of *Deux Ponts*, and many other places.

The *Red Copper Ore*, on the authority of *Baron Born*, introduced at firſt as a variety of Carbonate of Copper, (*Cuivre regulin combiné avec l'acide carbonique Catal. de Raab.* T. 2. P. 323,) has by ſubſequent experiment proved to be an oxyde.

VARIETY I. *CRYSTALLISED.*

a. In rhomboidal octohedrons and their varieties.

XXXV. *b* 1. In brilliant rhomboidal tetrahedral priſms obliquely truncated at their extremities, of a deep azure blue colour, arranged in a ſtellated form on grey copper mixed with blue and green copper ore and quartz. *Bulach.*
R. de L. Eſpece 6th, Var. 1ſt.

XXXVI. *b* 2. The ſame, alſo of a blue colour with green velvety copper ore, on the ſurface of a ſolid irregular maſs of red copper ore. *Bannat.*

c. In hexhedral priſms.

XXXVII. *d* 1. Indeterminate, and of an indigo blue colour, forming ſmall tubercles diſpoſed in the cavities of hepatic copper ore, having green carbonate of copper on the ſurface. *Bulach.*

XXXVIII. *d* 2. The ſame, in minute cryſtals with green copper ore, in cavernous ochry quartz. *Bannat.*

XXXIX. *d.* 3. Minutely cryſtalliſed, of a Pruſſian blue colour, on the ſurface of ochry cavernous quartz mixed with ſky blue copper ore. *Hungary.*

XL. *d* 4. In delicate ſhort fibres of a dark green colour and velvety appearance, on red granular copper ore. *North America.*

XLI. *d* 5. In long ſilky ſtriæ converging to different centres, of a deep graſs green colour, on compact red copper ore. *Siberia.*

XLII. *d* 6.

XLII. *d* 6. In ſhort ſilky fibres of a lighter green colour, on white ponderous ſpar with indurated iron ochre. *Annaberg.*

XLIII. *d* 7. Of a fibrous ſtructure and mamillated externally, of a deep graſs green colour, on cellular ferruginous quartz, with tranſparent cryſtals of white ſpathoſe lead ore on the ſurface. *Hartz.*

XLIV. *d* 8. In ſmall detached cryſtalline fragments of a dark blue colour. *Siberia.*

VARIETY II. *OF PARTICULAR SHAPES.*

XLV. *a* 1. In long ſolid cylinders, adhering in a parallel direction and projecting from a cavernous maſs of ochry green carbonate of copper, the cavities of which and the cylinders on one ſide are covered by minute and brilliant cryſtals of blue copper ore. *Catal. de Raab.* 12. F. b. 3. *Bannat.*

XLVI. *a* 2. In numerous pyramidal perforated ſtalactites, of a light green colour and radiated texture internally, with a browniſh coating. *Kamſdorf.*

XLVII. *a* 3. In a very irregular maſs, compoſed of ſhort contorted ſtalactites of a light green colour inclining to white on the ſurface, with red copper ore and white cryſtalliſed quartz.

XLVIII. *b* 1. Forming large aggregated tubercles, having a botryoidal appearance, internally of a green colour and covered on the ſurface with yelloviſh white clay. *Middleton Tiers, Yorkſhire.*

XLIX. *b* 2. Of a vitreous texture and dull green colour, forming ſmall botryoidal ramifications on yellow copper ore. *Siberia.*

L. *b* 3. Of an indurated texture and bright green colour, affording a ſuperficial botryoidal coating to yellow copper ore. *Ludgvan.*

LI. *b* 4. In ſmall tubercles partly aggregated, of a bluiſh colour with green carbonate of copper, on an aſh-coloured ſandſtone. *Molina, Spain.*

LII. *c* 1. Of a green colour and compact texture, having a mamillated ſurface of a brown colour. *Siberia.*

LIII. *c* 2. The ſame, cut and poliſhed. *Same place.*

LIV. *c* 3. The ſame, in more aggregated tubercles. *Hungary.*

LV. *c* 4. In very long ſilky diverging fibres, compact and mamillated on the ſurface, attached to reddiſh ochry copper ore with cryſtalliſed quartz. *Saxony?*

LVI. *c* 5. An irregular maſs of green copper ore intermixed with red copper ore, having a green velvetty mamillated ſurface. *Carnarvonſhire.*

LVII. *c* 6. Mamillated green copper ore of a compact texture, intermixed with copper ore of a pruſſian and indigo blue colour. *Molina, Spain.*

LVIII. *c* 7. The ſame, of a pale green colour and irregular on the ſurface, the paleneſs of the colour depending on an admixture of clay. *Cornwall.*

LIX. *c* 8. In an irregular indurated maſs compoſed of diverging fibres. *Siberia.*

LX. *c* 9. The ſame, of a lighter colour, on ochry ponderous ſpar. *Annaberg.*

VARIETY III. *AMORPHOUS.*

LXI. *a* 1. An irregular piece, compoſed of layers of a fibrous texture and brown colour intermixed with green. *China.*

LXII. *b* 1. Of an earthy texture, light and of a pale green colour, *(Viride montanum.)* *Hungary.*

LXIII. *b* 2. Of a pale green colour, and indurated, cut and poliſhed. *Molina, Spain.*

LXIV. *b* 3. In looſe pieces of a deeper green colour. *Walckenried.*

LXV. *b* 4. Of a light green colour, covering the ſurface of a layer of yellow copper ore, on plated barofelenite. *Alva, Scotland.*

LXVI. *b* 5. Of an indigo blue colour, lying ſuperficially on grey copper ore with ochry indurated clay. *Marienberg.*

LXVII. *b* 6. Of an earthy texture and ſmalt blue colour, with light green copper ore, on white opake ponderous ſpar. *Matlock, Derbyſhire.*

LXVIII. *b* 7. Blue and green carbonates of copper, ſuperficial, on white plated ponderous ſpar. *Saalfeld.*

LXIX. *b* 8.

LXIX. *b* 8. Of a light green colour and earthy, on the ſurface of cryſtalliſed yellow copper ore with galena and ochry quartz. *Hartz.*

LXX. *b* 9. Of a light green colour, impregnating pieces of argillaceous ſchiſtus.

LXXI. *b* 10. Of a light green colour, penetrating the ſubſtance of a piece of animal bone. *Denbyſhire.*

SPECIES V. *ARSENIATE OF COPPER.*

Oxide de Cuivre combiné avec L'Acid arſenique, Fr. *Olivenerz*, Germ.

This combination of copper with the acid of arſenic is ſeldom found in any other than a cryſtalliſed form, and then either in ſmall tranſparent cubes, or in lengthened tetrahedral or compreſſed hexhedral priſms longitudinally ſtriated, or more frequently in ſlender capillary cryſtals often decuſſating each other, or aggregated into faſciculi, or aſſuming the appearance of moſs. Its colour varies from blackiſh or dark olive green to that of verdigris. Its ſurface ſplendid; fracture apparently foliated. It is brittle, yields eaſily to the knife, and gives a ſtraw yellow or deeper olive green ſtreak. Specific gravity according to *Delametherie* 3·8. Under the blow-pipe the capillary cryſtals detonate, give out a ſtrong arſenical ſmoke and melt into a grey globule, that fluxed with borax yields a pure regulus; while the cubic cryſtals tumify without decrepitation, afford leſs vapour and yield to borax a globule, which though malleable is of a paler colour, and, according to the analyſis of *Mr. Klaproth*, contains a ſmall proportion of Iron.

This ore has hitherto been found principally at *Carrarach* in *Cornwall* in cellular ferruginous quartz or brown iron ſtone, and is often accompanied with malachite and other copper ores, and alſo, as it is ſaid, with uranite. *Gerhard* ſtates it as occurring likewiſe at *Jonſback* near *Rudelſtadt* in *Sileſia*.

VARIETY I. *CRYSTALLISED.*

LXXII. *a* 1. In ſmall lengthened tetrahedral priſms of a dark olive green colour, variouſly interwoven, on the ſurface of white ochry opake quartz. *Cornwall.*

LXXIII. *a* 2. The ſame more cloſely aggregated, on the ſurface of ochry quarz intermixed with light green carbonate of copper. *Same place.*

LXXIV. *a* 3. The ſame in ſhorter priſms, arranged in diverging faſciculi, in cellular ochry quartz. *Same place.*

LXXV. *b* 1. In ſmall cubes of an emerald green colour, numerouſly aggregated on brown feldſpar. *Same place.*

LXXVI. *c* 1. In delicate tranſparent hexagonal tables, of a bright emerald green colour, lining cavities in indurated red calciform copper ore with quartz. *Same place.*

LXXVII. *d* 1. In minute indeterminate cryſtals of an olive green colour, on the ſurface of and diſſeminated through ſpongy ferruginous quartz. *Same place.*

LXXVIII. *d* 2. The ſame intermixed with green carbonate of copper. *Same place.*

SPECIES VI. *SULPHATE OF COPPER.*

Vitriol de Cuivre, Fr. *Kupfer-Vitriol*, Germ.

This, though generally met with in a ſtate of ſolution in what are called *Cupreous* ſprings, occurs ſometimes concrete, and when pure forms tranſparent tetrahedral cryſtals of a deep blue colour and ſtrongly ſtyptic taſte; ſoluble in about four times their weight of water, and by expoſure to the air loſing their luſtre and becoming covered with a greyiſh efflorescence. They are however, for the moſt part, contaminated with ſulphate of iron or of zinc, and ſometimes with both. By analyſis a hundred parts of the pure ſulphate contains nearly of Oxyde of Copper 35, Sulphuric Acid 27.68, Water of Cryſtalliſation 28. In ſolution it gives a beautiful blue colour on the addition of ammoniac, and yields its copper in the metallic ſtate to poliſhed iron. In the concrete form it is found in many places, as in *Siberia*, *Norway*, *Sweden*, *France*, *Hungary*, &c. In ſolution the more remarkable inſtances with us are, thoſe of *Paris Mine* in the *Iſle* of *Angleſea*, and of *Wicklow* in *Ireland*.

VARIETY I. *CRYSTALLISED.*

LXXIX. *a* 1. In ſmall rhomboidal parallelopepids of a blue colour, on yellow copper ore.

R. de L. Pl. 4, *Fig.* 71.

LXXX. *b* 1. In flatted rhomboidal cryſtals of the ſame colour, in indurated blue carbonate of copper. *Norway.*

LXXXI. *b* 2. In a minutely cryſtalliſed incruſtation on opake muriate of Soda. *Hungary.*

LXXXII. *b* 3. In a maſs, irregularly cellular on one ſide, on the other indeterminately cryſtalliſed, with yellow copper pyrites. *Goſlar.*

LXXXIII. *b* 3.

LXXXIII. *b* 4. Black argillaceous ſchiſtus impregnated with ſulphate of copper, partly in the form of an efflorescence and partly in minute cryſtals. *Yorkſhire.*

VARIETY II. *OF PARTICULAR SHAPES.*

a. Stalactitic.

VARIETY III. *IN SOLUTION.*

SPECIES VII. *MURIATE OF COPPER.*

Green Sand of Peru.

Brought from *Peru* by *Mr. Dombey* in ſhining ſemitranſparent particles of a beautiful emerald or graſs green colour. Specific gravity according to *Delametherie* 3.78. On diſtillation with the ſulphuric acid it yields a certain quantity of muriatic acid, in which as well as in the nitric it is ſoluble without effervescence, communicating to the firſt a blue, to the latter a green colour; it is alſo ſoluble in the aqueous ſolution of ammoniac. Projected on burning coals or under the blow-pipe it communicates a greeniſh or bluiſh flame, and by the latter fuſes into a bluiſh glaſs.

VARIETY I. *AMORPHOUS.*

LXXXIV. *a* 1. In a ſandy form and of a bright emerald green colour. *Peru.*

SPECIES VIII. *SUPHURET OF COPPER.*

Vitreous Copper Ore. Cuivre Sulphuré, Fr. *Kupferglas, Kupferglanz, Schwarzes-Kupfererz*, Germ.

This is of a lead grey colour, inclining often to iron black, and ſometimes to yellow or red. It is met with either in lumps, interſperſed or ſuperficial, and not unfrequently cryſtalliſed in hexhedral truncated priſms, and alſo, as it is ſaid, in cubes and octohedrons. Often both internally and externally of a metallic ſplendour, and always opake. Its fracture compact or foliated. It is ſoft, ſometimes ſemimallable, and often cuts eaſily with the knife; becomes more ſplendid by the ſtreak; ſpecific gravity from 4.129 to 5.66. It effervesces with and communicates a green colour to nitric acid, to ſolution of ammoniac a blue. Under the blow-pipe it fuſes very eaſily and tinges borax of an emerald green colour. According to *Klaproth* the vitreous ore of *Treceven* in *Cornwall* contains 56¼ per cent. of copper. This combination of copper and ſulphur is found in various parts of the world, as at *Frolowſkoi* in *Siberia*, *Bottendorf* and *Eiſleben* in *Thuringia*, *Freyberg* in *Saxony*, *Saſka* in the *Bannat*, in *Scotland*, and in many of the mines of *Cornwall*.

VARIETY

VARIETY I. *CRYSTALLISED.*

LXXXV. *a* 1. In hexhedral prisms truncated at their extremities and irideſcent on the ſurface, very ſlender, attached to each other irregularly, and lying on botryoidal yellow copper ore. *Cornwall.*

LXXXVI. *a* 2. In ſmall and ſhorter priſms, on the ſurface of compact ſulphuret of copper with yellow pyrites, forming a vein in reddiſh granite. *Same place.*

LXXXVII. *a* 3. In numerous ſhort priſms of a lamellated texture and lead grey colour, aggregated confuſedly on grey ochry quartz intermixed with the ſame. *Same place.*

LXXXVIII. *a* 4. In larger aggregated cryſtals of the ſame colour, on compact ore of the ſame, intermixed with quartz and covered on the ſurface with ochry red copper ore. *Same place.*

VARIETY II. *AMORPHOUS.*

LXXXIX. *a* 1. Of a cloſe granular texture and leaden grey colour, with friable quartz and green carbonate of copper on the ſurface. *Same place.*

XC. *b* 1. Of a foliated texture and reddiſh grey colour, with green calx of copper and whitiſh indurated clay. *Saxony.*

XCI. *c* 1. Compact, of a ſteel grey colour with yellow pyrites and quartz. *Cornwall.*

XCII. *c* 2. The ſame, in an irregular piece of a dark grey colour, without matrix. *Same place.*

XCIII. *c* 3. The ſame, of a ſteel grey colour with aſh-coloured micaceous clay. *Banat.*

XCIV. *c* 4. The ſame, intermixed with ochry red oxyde of copper. *Cornwall.*

SPECIES IX. *VARIEGATED COPPER ORE.*

Mine de Cuivre violette ou azurée, Fr. *Bunt-Kupfererz, Buntes-Kupferglas*, Germ.

This differs from the foregoing in containing a ſmall proportion of iron. It occurs either in maſſes, interſperſed, ſuperficial, and, according to the opinion of ſome, cryſtallised

liſed in octohedrons. Its colour, when freſh broken, is intermediate between copper red and tombac brown, changing, according to length of expoſure, into dark red, violet, ſky-blue and green. It is always opake; has more or leſs of a metallic luſtre; fracture conchoidal; yields to the knife and gives a ſplendid red ſtreak; ſpecific gravity about 4.95. Like the former it diſſolves with effervescence in the nitric acid, imparting to it a green colour, but does not ſo immediately communicate a blue colour to ſolution of ammoniac. Under the blow-pipe it alſo melts eaſily and tinges borax green. It yields from 40 to 60 per cent. of Copper. It is found, generally accompanied with other copper ores, in the mines of *Norway*, *Sweden*, and *Siberia*, of the *Bannat*, *Saxony*, *Thuringia*, *Cornwall*, &c. &c.

VARIETY I. *CRYSTALLISED?*

a. In octohedrons.

VARIETY II. *AMORPHOUS.*

XCV. *a* 1. Compact, of a dark grey colour, interſperſed through black indurated ſchiſtus. *Ilmenau.*

XCVI. *a* 2. The ſame, but without matrix. *Kamſdorf.*

XCVII. *a* 3. The ſame, with white quartz. *Cornwall.*

SPECIES X. *YELLOW COPPER ORE.*

Pyrite de Cuivre, Fr. *Kupferkies*, Germ.

In this there is a larger proportion both of iron and of ſulphur than in the variegated ore. Its colour when recently dug or fractured is braſs yellow of different ſhades, inclining ſometimes to ſteel grey. By expoſure to air it becomes tarniſhed or variegated. It is found either in veins or lumps, interſperſed, ſuperficial, more rarely of particular ſhapes, and very frequently cryſtalliſed in equilateral tetrahedrons or in dodecahedrons with triangular faces and their modifications. The ſurface of the cryſtals is commonly ſmooth and of a metallic ſplendour; fracture uneven or conchoidal; hardneſs nearly the ſame with the preceding; ſpecific gravity from 3.8 to 4.31. It diſſolves in the nitric acid without effervescence, and yields a reddiſh brown precipitate on the addition of ammoniac. Before the blow-pipe it decrepitates, emits a greeniſh ſulphureous ſmoke, and melts into a black maſs, which communicates a green tinge to glaſs of borax. It varies in the proportion of Copper from 4 to 20, or as ſome ſay to 30 per cent. The harder it is, the larger is its proportion of Iron. The univerſality of this ore is ſuch, that where mining has been carried to any extent it has ſeldom failed to occur.

VARIETY I. *CRYSTALLISED.*

XCVIII. *a* 1. In large aggregated equilateral tetrahedrons, irideſcent and of a velvety appearance on the ſurface, on priſmatic ochry quartz. *Cornwall.*
Catal. de Raab 12. C. b. 1.

XCIX. *a* 2. In ſmaller tetrahedrons implanted one on the other ſo as to form aggregated columns, covered on the ſurface by green carbonate of copper and yellow ochre. *Lorraine.*

C. *a* 3. In tetrahedrons forming irregular aggregated trihedral pyramids, irideſcent, on an amorphous maſs of yellow copper ore. *Hungary.*

b. In dodecahedrons with triangular faces.
R. de L. Pl. 1, *Fig.* 9.

CI. *c* 1. In numerous cubes of different ſizes, variouſly truncated, ſtriated on the ſurface and of a bright gold colour on white cryſtalliſed quartz. *Same place.*

CII. *d* 1. In aggregated octohedrons of a duller colour, with lenticular calcareous ſpar on fleſh coloured baroſelenite. *Freyberg.*

CIII. *d* 2. The ſame, in cryſtals leſs diſtinct, of a bronze yellow colour, on opake baroſelenite. *Hartz.*

CIV. *e* 1. In pyramidal cryſtals united into an irregular cluſter, variegated on the ſurface, on tranſparent cryſtalliſed quartz with galena and pearl ſpar. *Furſtenberg.*

CV. *e* 2. In large cryſtals, confuſedly aggregated, irideſcent on the ſurface, and encloſing a large octohedral cryſtal of yellow iron pyrites. *Germany.*

CVI. *e* 3. In ſmall brilliant cryſtals of a ſky blue colour on the ſurface, with minutely cryſtalliſed tranſparent calcareous ſpar, on aſh-coloured lime-ſtone.
Elton Mine, Staffordſhire.

CVII. *e* 4. The ſame, partly blue and partly yellow, numerouſly aggregated on tuberculated opake baroſelenite. *Same place.*

CVIII. *e* 5. In minutely aggregated cryſtals, variegated in colour, in the clefts of whitiſh indurated clay. *Alſace.*

CIX. *e* 6.

CIX. *e* 6. In a maſs compoſed of very irregular cryſtals with a dull greeniſh efflorescence on the ſurface, intermixed with white pearl ſpar. *Newſtadt.*

VARIETY II. *OF PARTICULAR SHAPES.*

CX. *a* 1. In aggregated tubercles of a bluiſh colour and without luſtre, producing a botryoidal appearance on the ſurface of amorphous yellow copper ore. *Cornwall.*

CXI. *a* 2. In brilliant tubercles with white calcareous ſpar. *Elton Mine, Staffordſhire.*

CXII. *b* 1. Of a knitted appearance. *Cornwall.*

VARIETY III. *AMORPHOUS.*

CXIII. *a* 1. Of a granular texture intimately intermixed with galena. *Catharinaberg, Siberia.*

This mineral is ſaid to be ſcarce, and is highly phoſphoreſcent.

CXIV. *a* 2. In coarſe grains variegated in colour, forming minute ramifications through white opake pearl ſpar. *Hartz.*

CXV. *b* 1. Compact, of a purple and ſhining green colour, like that of the *Cantharis* or Spaniſh fly, ramifying in and intermixed with white opake pearl ſpar, with grey indurated ſchiſtus. *Kamſdorf.*

CXVI. *b* 2. In an irregular maſs covered with an ochry efflorescence. *Same place.*

CXVII. *b* 3. Compact and irideſcent on the ſurface, with milk white ſemitranſparent opal. *Reſkeir, Cornwall.*

CXVIII. *b* 4. The ſame, intermixed with yellow iron pyrites and white quartz. *Schalback.*

CXIX. *b* 5. The ſame, leſs irideſcent. *Hartz.*

CXX. *b* 6. Compact, in light green fibrous aſbeſtos. *Bannat.*

CXXI. *b* 7. The ſame, in green ſemitranſparent fluor. *Cornwall.*

CXXII. *b* 8. The ſame, with brown indurated ochre, green ſilky carbonate of copper and cryſtalliſed quartz. *Saxony.*

CXXIII. *b* 9. In a compact mafs, very brilliant in its fracture and highly irideſcent on the ſurface. *Bannat.*

CXXIV. *b* 10. The ſame, variegated in colour, having on its ſurface minute ſtalactites of a dark blue colour. *Cornwall.*

SPECIES XI. *GREY COPPER ORE.*

Cuivre gris, Fr. *Fahlerz*, Germ.

The ore generally comprehended under this denomination, is of a ſteel grey colour, often approaching to iron black or lead grey, and not unfrequently variegated on the ſurface. It occurs either in lumps, interſperſed, more rarely ſuperficial, and frequently cryſtalliſed in tetrahedrons or dodecahedrons with triangular faces and their modifications. It is generally of a bright metallic ſplendour, very brittle, not eaſily ſcratched by the knife, exhibiting a blackiſh or browniſh black ſtreak. Its texture compact; fracture more or leſs uneven or inclining to the conchoidal; ſpecific gravity nearly 4. Under the blow-pipe it decrepitates, emits an inodorous white ſmoke and melts into a dark grey globule, which is brittle, and though infuſible with borax, tinges it of a yellowiſh or browniſh red colour. The different analyſes of this ore ſhew it to vary conſiderably with reſpect to its compoſition. According to the experiments of *Klaproth* one from *Andreaſberg* in the *Hartz*, which has been conſidered as the true *Fahlerz*, contained Copper 16.25, Grey Antimonial Ore 16, Iron 13.75, Lead 34.50, Silver 2.25, Sulphur 10, Silex 2.50; one from *Kremnitz*, Copper 31.36, Grey Antimonial Ore 34.09, Iron 3.30, Silver 14.77, Sulphur 11.50, Alumine 0.30; and one from *Cornwall*, Copper 13.5, Antimony 21, Iron 1.5, Lead 49, Sulphur 7, Silex 0.5. By *Mr. Kirwan* and others the preſence of Lead and of Silver is conſidered as accidental. Grey ore or *Fahlerz* is found as well in primitive as in alluvial mountains, and is often accompanied with copper or iron pyrites, blende, galena, and various other mineral ſubſtances, in the mines of *Germany, Hungary, Norway, Sweden, Siberia*, &c. &c.

VARIETY I. *CRYSTALLISED.*

CXXV. *a* 1. In a large tetrahedron, in tranſparent cryſtalliſed quartz, with white pearl ſpar on the ſurface. The ſides of this cryſtal meaſure an inch and a half, and from the external ſurface is a projection of the ſolid angle of another cryſtal.

R. de L. Cuivre, Eſpece 3d. Pl. 1, *Fig.* 1 & 38. *St. Marie aux Mines.*

CXXVI. *a* 2. In tetrahedral cryſtals irregularly aggregated, with tranſparent cryſtalliſed quartz and yellow iron pyrites. *Hungary.*

CXXVII. *a* 3.

CXXVII. *a* 3. The ſame in larger cryſtals, with white cryſtalliſed quartz, on grey ſchiſtus. *Hartz.*

CXXVIII. *a* 4. In ſmall regular tetrahedrons, interſperſed through whitiſh indurated clay. *Obermoſchell.*

CXXIX. *a* 5. The ſame, imbedded in greyiſh black argillaceous ſchiſtus.

CXXX. *a* 6. In tetrahedrons, ſome diſtinctly bevilled at their edges (*R. de L. Pl.* 1, *Fig.* 17.) others more or leſs rounded, ſome ſolitary, others aggregated, and all covered on the ſurface with an irideſcent pyritical incruſtation, with dull whitiſh cryſtalliſed pearl ſpar and cryſtalliſed galena, on grey wacke. *Hartz?*

CXXXI. *b* 1. In ſmall dodecahedrons, formed from the elevation of an obtuſe trihedral pyramid on each face of the tetrahedron, with ramoſe native ſilver and cryſtalliſed calcareous ſpar, on a mixed maſs of grey copper and calcareous ſpar. *Same place?*

CXXXII. *c* 1. In an irregular cellular maſs, having many of the cells filled with lumps of teſtaceous arſenic and covered with an aſh-coloured calx. *St. Marie aux Mines.*

VARIETY II. *AMORPHOUS.*

CXXXIII. *a* 1. Of a dark grey colour, compact and without matrix. *Kongſberg.*

CXXXIV. *a* 2. Of a leaden colour and ſomewhat granulated texture, with ſpongy opake quartz and green carbonate of copper on the ſurface. *Naſſau Dillenbourg.*

CXXXV. *a* 3. Of a more compact texture, on one ſide ſpecular and on the other covered by aſh-coloured indurated clay. *Biber, Naſſau.*

CXXXVI. *a* 4. The ſame, covered by dark brown ochre of iron. *Hungary.*
This by ſome is called *White Copper* and is ſaid to be very ſcarce.

CXXXVII. *a* 5. Compact, with reddiſh feldſpar intermixed with yellow copper ore. *St. Bell, Lyonois.*

CXXXVIII. *a* 6. Very compact, in black argillaceous ſchiſtus. *Biber, Heſſe.*

CXXXIX. *a* 7. Impregnating aſh-coloured ſchiſtus bearing vegetable impreſſions on the ſurface. *Frankenberg, Heſſe.*

CXL. *a* 8. Impregnating grey argillaceous ſchiſtus, reſembling fir cones and ears of corn. *(Frankenberger* or *Heſſiſchen Kornähren.)* *Same place.*

CXLI. *a* 9. Intermixed with common coal. *Same place.*

SPECIES XII. *WHITE COPPER ORE.*

Cuivre Blanche, Fr. *Weiſs-Kupfererz*, Germ.

This rare ore of copper is deſcribed as being of a ſilver white colour, inclining to tin white or braſs yellow. It is found only in lumps and interſperſed. Its internal ſplendour is ſlightly metallic; texture granular, ſometimes foliated; fracture uneven; ſometimes of ſufficient hardneſs to give fire with ſteel; brittle, and of conſiderable weight. Before the blow-pipe it gives out an arſenical ſmoke and melts into a greyiſh black ſlagg. According to *Henkel* it contains Copper 40, in combination with Arſenic and Iron, and is therefore conſidered as intermediate between *Fahlerz* and *Copper Pyrites*, with both of which it is very frequently accompanied. It has been found principally near *Freyberg* in *Saxony*, *Frankenberg* in *Heſſe*, *Catharinaberg* in *Siberia*, and at *Freudenſtadt* in *Wirtemberg*.

VARIETY I. *AMORPHOUS.*

CXLII. *a* 1. Of a compact texture, covered by greeniſh amianthus. *Saxony.*

NOTE,

That under the foregoing ſpecies are comprehended,

1. Black copper ore *(Kupferſchwärze)* reſulting from the decompoſition of Fahlerz or of copper pyrites.
2. Hepatic copper ore *(Kupferlebererz, Leberſchlag)* a variety of the tile ore.
3. Bituminous copper ore *(Kupferbranderz)* copper pyrites intermixed with coal or other bituminous ſubſtances.
4. Braſs ore *(Meſſingerz)* a mixture of copper pyrites and blende.
5. Bell metal ore *(Glockenerz)* copper pyrites with oxyde of tin.
6. Slaty copper ore *(Kupferſchiefer)* copper pyrites contained in bituminous ſlate.
7. Sandy copper ore *(Kupferſanderz)* ores of copper intermixed with ſand ſtone.
8. Turquois *(Türkis)* the tooth of an animal impregnated with carbonate of copper. Vide *Emmerling's Lehrbuch der Mineralogie*, Vol. II. Pag. 244, 268, &c. vel *Widenmann's Handbuch*, § 269 *et* 280.

GENUS

GENUS VII. *IRON.*

Ferrum. Fer, Fr. *Eiſen*, Germ.

Crude iron, when freed from its impurities by expoſure to the combined action of heat and air, and ſubſequent hammering and rolling, is of a bluiſh white colour, hard, elaſtic, ſonorous, ductile, tenacious, magnetical and ſuſceptible of a fine poliſh. Its ſpecific gravity 7.788. Its hardneſs and elaſticity are greater than thoſe of any other metal, and next to gold it is the moſt tenacious, a wire of $\frac{1}{10}$ of an inch ſupporting a weight of 450 pounds. It ruſts more eaſily than moſt other metals on expoſure to moiſture, and when heated in the open fire undergoes various changes of colour, from ſuperficial oxydation, long before it is ignited, but is extremely difficult of fuſion; in a white heat however it becomes ſo ſoft that different portions of it may be united into one maſs by the operation of *Welding*. Iron is the only metal capable of combuſtion by colliſion. If expoſed when ignited to oxygen gas it burns with great brilliancy and rapidity, and is converted into a grey oxyde. It is alſo under ignition very readily oxydated by the vapour of water. By cementation with charcoal it is converted into ſteel, becoming fuſible, more brittle and elaſtic, and capable when heated and ſuddenly cooled of contracting extraordinary degrees of hardneſs. It diſſolves more or leſs perfectly in all the acids; with the ſulphuric acid it forms a cryſtalliſable ſalt of a ſea-green colour *(Green Vitriol)*, with the pruſſian acid, common *Pruſſian Blue*; and with the vegetable aſtringent principle or acid of galls, the baſis of *Common Ink*. From moſt of its acid ſolutions it ſeparates on expoſure to the air in the form of an ochry precipitate. When oxydated it combines by fuſion with both the fixed alkalis as well as with ſeveral of the earths, and according to its degree of oxydation communicates different tinges to glaſs. It may be united with all the other metals in different proportions with the exception of quickſilver, lead, and biſmuth. With arſenic it produces a compound, which has received the name of *red ſhort* iron from its being brittle when heated; whilſt by union with phoſphorus or its acid it acquires the oppoſite property, and is therefore called *cold ſhort* iron. Of all the metallic ſubſtances iron has the ſtrongeſt attraction for and unites the moſt readily with ſulphur. Bar iron, crude iron, and ſteel, according to the general opinion, vary from each other principally in containing different proportions of oxygen and carbon. The uſes of iron in theſe forms are too extenſive to be enumerated. Its ores, which are more general and abundant than thoſe of any other metal, are,

SPECIES

SPECIES I. *NATIVE IRON.*

Fer natif, Fr. *Gediegen-Eiſen*, Germ.

Is internally of a light ſteel grey colour approaching to ſilver white, externally yelloweiſh brown, or greyiſh black. It is found in irregular lumps generally rudely ramoſe or angular; its fracture hackly, becoming more ſplendid by the ſtreak; malleable and ductile; of a metallic ſplendour; ſpecific gravity between 7 & 8. Its chemical properties are ſimilar to thoſe of common iron.

Native iron has been found in the mountain of *Grand Gilbert* in *Upper Dauphiné*, at *Great Kamſdorf* and *Eibenſtock* in *Saxony*, and according to ſome at *Senegal* in *Africa*, but the moſt remarkable examples are thoſe of *Otumpa* in the dioceſe of *St. Jago del Eſtero* in *Peru*, and near the river *Jenſei* in the ſouth of *Siberia*. Of the firſt of which we have an account by *Don Rubin de Celis*, Phil. Tranſ. 1788; of the latter by Profeſſor *Pallas*, to whom we are indebted for its diſcovery.

VARIETY I. *OF PARTICULAR SHAPES.*

I. *a* 1. In an irregular ſolid maſs with numerous contorted branches projecting from the ſurface, the cavities of which are partly filled by a yellow tranſparent vitrified matter taken generally for cryſolite. *Mont Esmor, Siberia.*

II. *a* 2. In a ſmaller maſs having alſo projecting branches, but without cryſolite. *Senegal.*

This a portion of a larger maſs ſent ſome years ſince by *Governor O'Hara* to *General Rainsford*.

VARIETY II. *AMORPHOUS.*

III. *a* 1. In a compact irregular maſs. *Kamſdorf.*

SPECIES II. *GREY IRON ORE.*

Under this ſpecies are included ſuch ores of iron as in their colour, luſtre, ſpecific gravity, and diſpoſition to obey the magnet, are the moſt nearly allied to the foregoing, viz. the *Magnetic Iron ore* as it is called, and *Iron ſand*, *Specular Iron Ore*, *Micaceous Iron Ore*, &c.

The magnetic ore (*Fer noir*, Fr. *Magnetiſcher-Eiſenſtein*, Germ.) is of a blackiſh or bluiſh grey colour internally, often browniſh black on the ſurface. It occurs either in the

the maſs, or diſſeminated, and not unfrequently cryſtalliſed. Its fracture fine or coarſe grained, inclining ſometimes to conchoidal, ſometimes imperfectly foliated; luſtre metallic; opake; of ſufficient hardneſs to give fire with ſteel; brittle. Its cryſtals ſeldom large, often ſolitary and covered with a talcoſe incruſtation; their figure the octohedron and its modifications. Specific gravity from 4.094 to 4.688.

From this the iron ſand differs only in form, being no other than comminuted portions collected in the beds of rivers, and therefore generally accompanied with native gold.

The ſpecular ore (*Fer Speculaire*, Fr. *Eiſenglanz*, Germ.) is of a light or dark ſteel grey colour, inclining ſometimes to blue, red or black, and often beautifully variegated on the ſurface. It is found in ſtrata or in lumps, interſperſed, ſuperficial, and frequently alſo cryſtalliſed in modifications of the cube, in double hexhedral pyramids deeply truncated at the ſummits, and in hexhedral laminæ. It is of a metallic luſtre; opake; its fracture fine or coarſe grained and uneven; hardneſs nearly the ſame with the foregoing; gives a greyiſh or dark red ſtreak; ſpecific gravity from 4.939 to 5.218.

The magnetic iron ore and iron ſand are both ſtrongly attracted by the magnet, which in its native ſtate is indeed only a variety of this ore and generally ſuch as has been expoſed to the influence of the atmoſphere. The ſpecular ore on the contrary ſeldom poſſeſſes this property, at leaſt in any conſiderable degree. Both the magnetic and ſpecular ores are more readily acted on by the muriatic than by either the ſulphuric or the nitric acid, by which without the aſſiſtance of heat they are ſlightly, if at all affected. Before the blow-pipe the magnetic ore becomes brown and communicates a dark green colour to glaſs of borax. By means of oxygen gas it is eaſily fuſed and runs into a black globule. The ſpecular ore is more difficult of fuſion, reddens under torrefaction, and tinges borax of a dull yellow. In theſe ores the metal is conſidered as being partially oxydated, the magnetic yielding from 80 to 90, the ſpecular from 60 to 80 per cent. Iron, the product of the firſt, being according to *Rinman* brittle when hot, but loſing this property after a ſecond fuſion. They are found in great abundance in *Siberia*, *Norway*, and *Sweden*, where they ſometimes conſtitute entire mountains; in different parts of *Saxony*, *France*, and *Italy*; in *Virginia*, *Peru*, *St. Domingo*, *Coaſt* of *Africa*, and various other parts of the world.

The micaceous iron ore (*Eiſenmann*, Germ.) is of an iron black colour inclining ſometimes to the ſteel grey, ſometimes to the red. It is found in lumps, interſperſed, ſuperficial, or in thin plates or tablets, with a ſmooth and ſplendid ſurface and faintly tranſparent; is ſemi-indurated; ſtains the fingers, and gives a dark red ſtreak. Before the blow-pipe it exhibits nearly the ſame characters as the ſpecular iron ore. This is found in many parts of *Saxony*, *Hungary*, *Upper Palatinate*, *Baireuth*, *&c.*

VARIETY

VARIETY I. *CRYSTALLISED.*

IV. *a* 1. In detached octohedrons of different sizes, some regular, some cuneiform, others having two opposite and parallel faces truncated to a certain depth and more inclining to the rhomboidal parallelopepid. *Fahlun* in *Sweden*, also from *Corsica*.

R. de L. Pl. 3, *Fig.* 1, 2, 9, 12.

The larger crystals, which are from *Sweden*, have a coating of dark green talc.

V. *a* 2. In numerous small octohedrons, imbedded in dark green steatite. *Corsica*.

VI. *a* 3. In octohedrons which pass into the dodecahedron by the application of triangular lamellæ regularly decreasing, with greyish indurated clay, on compact grey iron ore. *Sweden*.

R. de L. Pl. 4, *Fig.* 69.

VII. *b* 1. In numerous small smooth cubes, imbedded in green fluor, in coarse ferruginous quartz. *Altenberg*.

VIII. *b* 2. The same, covering the surface of prismatic semitransparent quartz. *Alsace*.

IX. *b* 3. In cubes, some perfect, others variously truncated, in the cavities of ferruginous quartz. *Altenberg*.

X. *b* 4. In an irregular mass variegated on the surface, chiefly composed of flatted dodecahedral crystals made up of irregular pentagons, six of which are smooth and six striated parallel to their base. *Isle of Elba*.

R. de L. Pl. 2, *Fig.* 30.

XI. *b* 5. The same, but with more brilliant superficial colours. *Same place*.

XII. *b*. 6. The same, in more flatted dodecahedrons, six faces of which are striated pentagons, the others smooth and triangular. *Same place*.

R. de L. Pl. 2, *Fig.* 36.

XIII. *b* 7. The same, of a remarkably bright high-gold colour on the surface and interspersed with white prismatic quartz and yellowish rhombic crystals of felt-spar. *Same place*.

7

XIV. *b* 8.

XIV. *b* 8. In thin lenticular cryſtals, imbedded edgeways in priſmatic cryſtalliſed quartz. *Altenberg.*

R. de L. Pl. 2, *Fig.* 36.

XV. *b* 9. In ſplendid lenticular cryſtals compoſed of 24 irregular pentagonal faces, 6 ſtriated and 18 ſmooth, on grey ferruginous clay. *Same place.*

R. de L. Pl. 2, *Fig.* 39.

XVI. *b* 10. The ſame, in larger cryſtals without matrix. *Same place.*

XVII. *b* 11. In very flat lenticular cryſtals, of a dull purpliſh colour and ſplendid, with quartz and white clay. *Same place.*

XVIII. *b* 12. In cryſtals leſs flatted, having on the ſurface the blue luſtre of heated poliſhed ſteel, with quartz and white clay. *Same place.*

XIX. *b* 13. In ſmaller aggregated cryſtals. *Same place.*

XX. *c* 1. In double hexhedral pyramids deeply truncated at their ſummits with ſhort intermediate priſms cloſely aggregated, of a grey colour externally and variegated within.

R. de L. Pl. 6, *Fig.* 44. *Same place.*

XXI. *c* 2. The ſame, in minute cryſtals without priſms, covering the ſurface of priſmatic quartz, with ferruginous indurated clay. *Same place.*

R. de L. Pl. 6, *Fig.* 7.

XXII. *d* 1. In thin hexagonal laminæ on each ſide bevilled at the edges, implanted in the cavities of granular grey iron ore. *Lorraine.*

R. de L. Pl. 6, *Fig.* 44.

XXIII. *d* 2. The ſame aggregated into cryſtals, and from their projecting edges producing a ſtriated appearance on the ſurface. *St. Marie aux Mines.*

XXIV. *e* 1. In indeterminate polyhedral cryſtals of a lamp black colour. *Elba.*

XXV. *e* 2. In ſmall brilliant cryſtals covering the ſurface of grey iron ore *Hungary.*

XXVI. *e* 3. In indeterminate polyhedral cryſtals, imbedded in variegated grey iron ore of a fine ſcaly texture. *Norberg, in Dalurne, Sweden.*

XXVII. *e* 4. The ſame, implanted in aſh-coloured indurated clay. *Altenberg.*

VARIETY II. *AMORPHOUS.*

XXVIII. *a* 1. Compoſed of large thin ſhining folia, diverging and by their projection at the ſurface producing a cockſcomb appearance. *Oſnaburg.*

XXIX. *a* 2. ——— of ſmaller ſhining laminæ, diverging and friable. *Siberia.*

XXX. *a* 3. ——— of thin ſplendid irregularly conchoidal laminæ, in reddiſh quartz. *Northumberland.*

XXXI. *a* 4. ——— of thin ſtellated lamellæ of a ſteel grey colour, in greyiſh ferruginous quartz. *Sweden.*

XXXII. *a* 5. Of a dark ſteel grey colour, and foliaceous texture, giving it a feather-like appearance. *Siberia.*

XXXIII. *a* 6. Of a lamellated texture, and blackiſh grey colour, with a ſmall vein of grey quartz. *Norberg.*

The beſt Swediſh ſteel is obtained from this ore.

XXXIV. *a* 7. Compoſed of thick lamellæ irregularly aggregated and highly irideſcent on the ſurface. *Elba.*

XXXV. *a* 8. ——— of ſmall thin ſhining ſcales looſely cohering. *Devonſhire.* *(Eiſenman.)*

XXXVI. *a* 9. The ſame, more ſtrongly cohering and inclining to a reddiſh brown. *Goſſenback.*

XXXVII. *b* 1. Of an iron grey colour and granular texture. *Bitſberg, Sweden.*

XXXVIII. *b* 2. Of a bluiſh grey colour and finer texture, with indefinite cryſtals of grey iron ore interſperſed. *Sweden.*

XXXIX. *b* 3. Of a dull iron grey colour and coarſe granular texture, having numerous diſtinct dodecahedral garnets imbedded in it. *Tyrol.*

XL. *b* 4. Of a ſhining bluiſh grey colour and ſhattery angular texture. *New York.*

XLI. *b* 5. Of a ſteel grey colour and fine grained almoſt ſolid texture. *Kerna, Lapland.*

XLII. *c* 1.

XLII. *c* 1. Of a compact texture and dull grey colour. *Norway.*

XLIII. *c* 2. Of a compact texture and variegated on the surface, with quartz and yellowish talc. *Altenberg.*

XLIV. *c* 3. The same, of a liver brown colour, strongly magnetic. *Coast of Africa.*

XLV. *c* 4. A similar specimen from *Saxony.*

XLVI. *c* 5. Another of a coarser texture. *Elba.*

XLVII. *c* 6. Another cut and polished. *Siberia.*

XLVIII. *d* 1. In loose minute and shining grains *(Iron Sand).* *America.*

XLIX. *d* 2. The same. *Coast of Africa.*

L. *d* 3. The same. *Italy.*

LI. *e* 1. In coarse grains interspersed through quartz. *Turkey.*

LII. *e* 2. In finer grains of a lighter grey colour. *(Emery Stone.)* *Same place.*

SPECIES III. *HEMATITE.*

Hématite, Oxide de Fer endurci, Fr. *Glaskopf,* Germ.

This ore, which is usually more or less of a blood red colour, as its name imports, is also not unfrequently of different shades of brown, black, or yellow *(Roth, braun & schwartz Eisenstein,* Germ.*)*; its lustre generally approaching to the semi-metallic. It occurs either in veins or beds; or in amorphous masses; or of particular shapes, as stalactitical, mammillated, reniform, botryoidal, &c. or interspersed through or forming a covering to other ores; sometimes semi-indurated, or in loose scales. Its texture in the mass compact or earthy, in detached portions generally fibrous, its fibres often diverging and composed of concentric layers. It is, for the most part, scratched easily by the knife, sometimes soils the fingers, sometimes of sufficient hardness to give fire with steel; the red gives a black red streak, the brown and black a yellowish brown or ochry yellow. In specific gravity it varies from 3.4 to 5. By the assistance of heat it dissolves though slowly both in the sulphuric and nitric acids, the muriatic acts on it more readily, but without effervescence. It is not attracted by the magnet except when reduced to powder, and then only in a very slight degree; this property however it acquires by exposure to heat. Un-

der the blow-pipe it blackens, but is extremely difficult of fuſion. To glaſs of borax it imparts a yellowiſh or olive green colour. It yields from 40 to 80 per cent. of Iron, and appears to differ from the foregoing ſpecies principally in its greater degree of oxydation, and in containing a ſmall portion of Alumine. It is found in the forms above mentioned, and often accompanied by various other mineral ſubſtances in the *Hartz, Saxony, Bohemia, Hungary, Naſſau Siegen*, and ſeveral other neighbouring countries; but ſeldom in the more northern. The common red hematite occurs near *Ulverſton* in *Lancaſhire*, from whence it is ſent in large quantities to the *Carron* works in *Scotland*.

VARIETY I. *OF PARTICULAR SHAPES.*

LIII. *a* 1. In long parallel cylindrical ſtalactites adhering to each other laterally, of a dark brown colour and ſhining, with numerous tuberculæ on the ſurface. *Naſſau Siegen.* *Catal. de Raab.* 11 F. c. *b.* 11.

LIV. *a* 2. The ſame, with an ochry incruſtation, having the cylinders more irregularly diſpoſed. *Colebrook Dale.*

LV. *a* 3. Of an olive brown colour and ſomewhat fibrous texture, with numerous ſubulate ſtalactites projecting from the ſurface.

LVI. *a* 4. Of a yellowiſh brown colour and cellular texture, with numerous ſhort projecting ſtalactites intermixed with quartz. *Dean Foreſt, Glouceſterſhire.* *(Bruſh Iron ore.)*

LVII. *a* 5. In a flat piece of a dark brown colour with ſubulate ſtalactites projecting from both ſides. *Naſſau Siegen.*

LVIII. *a* 6. In nodular cylindrical ſtalactites, of a clove brown colour, aggregated laterally and covered on the ſurface by a ſplendid bronze-yellow hematitical incruſtation. *Same place.*

LIX. *a* 7. The ſame, leſs ſplendid, in more numerous and ſmaller cylinders with white ponderous ſpar. *Same place.*

LX. *a* 8. In ſubulate ſtalactites, irregularly aggregated on brown ſtriated hematite, dark and ſhining on the ſurface. *Naſſau Dillenberg.*

LXI. *a* 9. In cylindrical ſtalactites of a clove brown colour, curiouſly interwoven and attached to each other. *Naſſau Siegen.*

LXII. *a* 10.

LXII. *a* 10. In an irregular ſtalactitical maſs of a blackiſh grey colour. *Naſſau Dillenberg.*

LXIII. *a* 11. Of a dark brown colour, irregularly ſtalactitical and covered by a tile-coloured coating, on aſh-coloured indurated clay. *Naſſau Siegen.*

LXIV. *a* 12. In ſmall cylindrical ſtalactites, of a blackiſh brown colour, variouſly contorted, with cellular ochry quartz. *Same place.*

LXV. *a* 13. In large cylindrical aggregated ſtalactites, of a radiated ſtructure, dark and ſhining on the ſurface and internally of a chocolate colour. *Bendorf.*

LXVI. *b* 1. In a coarſely grained maſs tuberculated on the ſurface, with a reddiſh brown velvetty covering. *Lancaſhire.*

LXVII. *b* 2. The ſame, in ſmaller tubercles, having a brighter velvet-like coating.

LXVIII. *b* 3. Of a dark brown colour, ſhining, and of a mulberry-like appearance on the ſurface from numerous ſmall globular ſtalactites. *Naſſau Siegen.*

LXIX. *b* 4. Of a dark clove brown colour and ſtriated texture, with a ſhining tuberculated ſurface. *Norway.*

LXX. *b* 5. Of a reddiſh brown colour and vermicular form, on the ſurface of plated ponderous ſpar. *Scotland.*

LXXI. *c* 1. Reniform, internally fibrous and radiated. *Lancaſhire.*

LXXII. *d* 1. In a ſtalactitical nodule of a clove brown colour, compoſed of aggregated tuberculi. *Germany.*

LXXIII. *e* 1. In an aggregated cellular maſs light and friable, partly aſh-coloured, partly brown. *Naſſau Siegen.*

LXXIV. *e* 2. Forming a thin variegated incruſtation on the ſurface of cellular quartz. *Hungary.*

VARIETY II. *AMORPHOUS.*

LXXV. *a* 1. Compoſed of ſtriæ regularly diverging and of a reddiſh brown colour. *Lancaſhire.*

LXXVI. *a* 2.

LXXVI. *a* 2. Of a chocolate colour and ſtriated texture, ſmooth and ſhining on the ſurface. *Germany.*

LXXVII. *a* 3. Of a liver brown colour and divergingly ſtriated texture, having ſtrongly the appearance of wood tin. *Schmiedeberg.*

LXXVIII. *b* 1. Of a dark brown colour and ſcaly texture, having a radiated appearance. *Naſſau Siegen.*

LXXIX. *b* 2. The ſame, in a thinner portion, mammillary and variegated on the ſurface. *Seine.*

LXXX. *c* 1. Of a reddiſh brown colour, compact and ſpecular on the ſurface. *Bohemia.*

LXXXI. *d* 1. Of a liver brown colour and earthy texture, ſlightly indurated and light *(Umber)*. *Franckfort.*

LXXXII. *d* 2. The ſame, more ponderous, but of an ochre yellow colour. *(Common Ochre.)* *Carinthia.*

LXXXIII. *d* 3. The ſame, very light and of a deep orange colour. *Sileſia.*

LXXXIV. *d* 4. In an impalpable powder of a dull pruſſian blue colour. *(Native Pruſſian Blue.)* *Saxony.*
Catal. de Raab. 11 E. 1.

LXXXV. *d* 5. The ſame, inclining to a lavender blue colour and mixed with portions of brown peat. *Scotland.*

LXXXVI. *d* 6. In a cohering ponderous maſs, of a browniſh red colour.

SPECIES IV. *ARGILLACEOUS IRON ORE.*

Fer Limoneux, Fr. *Thonartiger-Eiſenſtein*, Germ.

This may be diſtinguiſhed into ſuch as is found in drier and more elevated ſituations, and ſuch as occurs in low or ſwampy. The former called *Highland* or *Upland Ore*, is generally of different ſhades of grey, brown, red, or yellow, thoſe of a lighter colour becoming darker on expoſure to the air. It occurs either in ſtrata; or in indeterminate nodules; or in nodules of particular ſhapes, as reniform, ſpheroidal, &c. or in ſmall round and flatted portions *(Minera Ferri numiſmalis)*; or in more or leſs regular ſpherules

of different ſizes *(Pea Iron Ore. Bohnerz)*; or in teſtaceous petrifactions, &c. Its texture uſually compact, earthy and more or leſs even or inclining to the conchoidal, not unfrequently internally cellular or corroded, ſometimes columnar *(Baſaltic Iron ore)*, ſometimes compoſed of ſmall diſtinct globular concretions *(Korniger thonartiger Eiſenſtein.)* Its nodules are ſometimes hollow and encloſe detached indurated ſpherules *(Ætites)*, ſometimes on being broken they exhibit vegetable impreſſions internally. It is always opake, and for the moſt part without luſtre. It generally adheres to the tongue, and has an earthy ſmell when breathed on; is often ſo ſoft as to ſoil the fingers, though ſometimes nearly of ſufficient hardneſs to give fire with ſteel. Specific gravity from 2.673 to 3.471. Under the blow-pipe it blackens and becomes attractable by the magnet. To glaſs of borax, with which it is effervescent, it communicates an olive green colour.

The *Lowland, Swampy, Marſh, or Meadow Ore (Raſen-Eiſenſtein, Moraſterz, Sumpterz, Weiſenerz)* is of a yellowiſh, blackiſh, or reddiſh brown colour, inclining ſometimes to ſteel grey. It is found either looſe or ſlightly coherent, or in compacted ſtrata, or in detached nodules, which are ſometimes reniform, tuberous, dentiform, &c. but generally amorphous, and often perforated. Its texture like the former earthy and more or leſs even; internally dull; opake; has an earthy ſmell when breathed on; ſoils the fingers, but is never of ſufficient hardneſs to give fire with ſteel. Specific gravity of the indurated 2.944. Before the blowpipe it is affected nearly in the ſame manner as the *Upland Ore*, which yields from 30 to 40 or 50 per cent. of Iron; the Lowland only from 30 to 40. The iron thus procured is frequently found to be *cold-ſhort*, owing, as the experiments of *Scheele* have ſhewn, to the preſence of phoſphoric acid.

Theſe ores are in a great meaſure confined, the *Lowland Ores* more eſpecially, to the northern, eaſtern, and north-eaſtern parts of the globe; they are the product of alluvial diſtricts, and from theſe ores are ſupplied, the foundries of *Colebrook Dale*, and moſt of the other extenſive iron works in this country.

VARIETY I. *OF PARTICULAR SHAPES.*

LXXXVII. *a* 1. In a flatted oval nodule of an aſh-grey colour, having the impreſſion of fern in the centre. *Calſhead.*

LXXXVIII. *a* 2. In a ſmall irregular nodule of a brown colour. *Bohemia.*

LXXXIX. *b* 1. In ſmall detached rounded nodules of different ſizes and of an aſh-grey colour.

XC. *b* 2. In looſe ſpherical grains of a brown colour and poliſhed ſurface. *(Pea Iron Ore.)* *Swabia.*

XCI. *b* 3.

XCI. *b* 3. The ſame, imbedded in reddiſh ferruginous clay. *Hungary.*

XCII. *b* 4. Of a dark chocolate brown colour, light and of a ſhining fracture. *(Bituminous Iron Ore.)* *Saxony.*

XCIII. *b* 5. Compoſed of agglutinated globules of a browniſh red colour. *Dean Foreſt.*

XCIV. *c* 1. In large cylindrical aggregated ſtalactites, covered by yellow ochre. *Bareuth.*

XCV. *c* 2. In ſmaller ſtalactites of a reddiſh brown colour, covered alſo by yellow ochre. *Naſſau Siegen.*

XCVI. *c* 3. In aggregated cylindrical ſtalactites, of a dark liver brown colour, covered on the ſurface by minutely cryſtalliſed quartz. *Dean Foreſt.*

VARIETY II. *AMORPHOUS.*

XCVII. *a* 1. In an irregular maſs of a columnar ſtructure and dull purple colour. *Catal. de Raab.* 11 F. b. 11. *Hoſchenitz, Bohemia.*

XCVIII. *b* 1. In a compact irregular maſs, hollow internally and incloſing a looſe nucleus. *(Ætites.)* *France.*

XCIX. *b* 2. Of a compact conchoidal texture, and ochry yellow colour, cellular upon the ſurface. *Derbyſhire.*

C. *b* 3. In a flatted irregular piece, compact and of a liver brown colour, the ſurface artificially poliſhed. *Germany.*

CI. *b* 4. In irregular and hollow fragments, of a laminated texture and yellow colour. *Surry.*

CII. *b* 5. In a tabular portion, compact, and of a yellowiſh brown colour. *Suſſex.*

CIII. *b* 6. Portion of an irregular nodule, internally of a liver brown, and externally of a bluiſh grey colour. *Colebrook Dale.*

CIV. *b* 7. Another portion of the ſame, having undergone calcination. *South Wales.*

CV. *b* 8. In an irregular maſs, of a dull verdigris green colour. *Italy.*

CVI. *b* 9.

CVI. *b* 9. The ſame, of a lighter green colour and interſperſed with angular fragments of reddiſh brown ochre *(Grüu-Eiſenerde.)* *Bohemia.*

SPECIES V. *SPATHOSE IRON ORE.*

Fer ſpathique, Fr. *Spathiger-Eiſenſtein*, Germ.

The colour of this ore, when newly raiſed, is light greyiſh or yellowiſh white; but, being the reſult of the union or impregnation of calcareous ſpar with different portions of oxyde of iron and of manganeſe, it paſſes gradually upon expoſure to air through different ſhades of grey and yellow, to dark brown, or even iron black, and is often ſuperficially variegated. It occurs either in ſtrata, or in amorphous maſſes, or intermixed with other ores, ſometimes with impreſſions, ſeldom of particular ſhapes, but very frequently cryſtalliſed, and for the moſt part in rhomboidal parallelopepids and their modifications. Its ſurface, particularly when cryſtalliſed, is ſmooth or druſic, with more or leſs of a pearly or vitreous ſplendour, and as it is of a darker or lighter colour is leſs or more tranſparent. Its fracture foliated; fragments rhomboidal; hardneſs ſuch as to allow of its being pretty eaſily ſcratched by the knife; ſpecific gravity from 3.67 to 3.81. It is ſoluble with ſlight effervescence in all the mineral acids, and by digeſtion in ſolution of ammoniac it blackens and becomes magnetic. It undergoes a ſimilar change on expoſure to heat, by the continuation of which it loſes about one third of its weight. To glaſs of borax it communicates a dull yellow colour. The ſpathoſe iron ore of *Eiſenerz* in *Stiria* afforded *Bergman* Iron 38, Lime 38, Carbonic Acid and Manganeſe 24. In one from *Sweden* he found Iron 22, Manganeſe 28, Carbonate of Lime 50. It conſtitutes entire beds at *Eiſenerz* in *Stiria*, at *Huttenberg* in *Carinthia*, at *Schmalkalden* in *Heſſe*, &c. and is alſo found in different parts of *Bareuth*, *Bohemia*, *Saxony*, the *Hartz*, *Naſſau Siegen*, *Salzburg*, *Spain*, the *Tyrol*, *Hungary*, &c.

VARIETY I. *CRYSTALLISED.*

CVII. *a* 1. In large compound parallelopepids, of a pearly white colour, with dodecahedral cryſtals of yellow iron pyrites, on amorphous ſpathoſe iron ore of a light brown colour. *Viziles, Dauphiné.*

R. de L. Tom. 3, *Pag.* 284.

CVIII. *a* 2. In numerous aggregated rhomboidal parallelopepids, of a light liver brown colour on the ſurface of an amorphous maſs of the ſame. *Biber, Bareuth.*

R. de L. Pl. 4, *Fig.* 1.

CIX. *a* 3. The ſame, intermixed with white quartz, the cryſtals on the ſurface ſemitranſparent. *Biber, Bareuth.*

CX. *a* 4. Of a ſimilar cryſtalliſation and blackiſh brown colour. *Carinthia.*
The dark colour of this depends on the preſence of manganeſe.

CXI. *a* 5. In very minute variegated cryſtals, on the ſurface of an amorphous maſs of the ſame of a clove brown colour. *Same place.*

CXII. *b* 1. In numerous aggregated ſemitranſparent lenticular cryſtals, of a pale yellowiſh brown colour, on amorphous ſpathoſe iron ore intermixed with white quartz. *Bagorry.*

CXIII. *b* 2. In thinner and more irregularly aggregated lenticular cryſtals of a darker brown colour. *Bareuth.*

CXIV. *b* 3. In ſmall lenticular cryſtals of a liver brown colour, with dodecahedral calcareous ſpar and cubic fluor. *Brittany.*

VARIETY II. *AMORPHOUS.*

CXV. *a* 1. Of a foliated texture, dark brown colour and ſplendid, intermixed with white calcareous ſpar. *Naſſau Siegen.*

CXVI. *a* 2. The ſame, more ſplendid, partly browniſh partly aſh coloured, intermixed with white quartz and yellow pyrites. *Bareuth.*

CXVII. *a* 3. The ſame, of a pale yellowiſh brown colour and without admixture. *Dauphiné.*

CXVIII. *b* 1. Compact and of a dark reddiſh brown colour, with tranſparent rhomboidal and pyramidal calcareous ſpar on the ſurface. *Carinthia.*

CXIX. *b* 2. The ſame, covered on one ſide by calcareous ſpar confuſedly cryſtalliſed, opake and of a milk white colour, and on the other by the ſame of a pearl colour. *Stiria.*

CXX. *b* 3. Compact and having the ſurface incruſted by mammillated milk-white indurated clay. *Same place.*

CXXI. *b* 4. The ſame, having the ſuperficial clay incruſted with tranſparent pyramidal quartz. *Same place.*

CXXII. *c* 1.

CXXII. *c* 1. Spongy and of a dark brown colour, covered on the ſurface by yellow ochre. *Saltzbourg.*

SPECIES VI. *SULPHATE OF IRON.*

Vitriol de Fer, Fr. *Eiſen-Vitriol*, Germ.

This is ſeldom found free from admixture of ſulphate of zinc and of copper or other extraneous ſubſtances. When pure it is of a ſea-green colour and tranſparent, by decompoſition becoming more or leſs ochry. It occurs either in rhomboidal or capillary cryſtals, ſtalactitical, efflorescent, or in ſolution. It is ſoluble in about ſix times its weight of cold water, is ſtyptic to the taſte, and with vegetable aſtringents aſſumes a black colour. By calcination it at firſt becomes yellow and afterwards red, loſing about 40 per cent of its weight by the diſſipation of its water of cryſtalliſation. If urged by a ſtill ſtronger heat it parts alſo with its acid. A hundred parts of this ſalt contain Oxyde of Iron 28, Sulphuric Acid 26, Water 46. It moſt frequently owes its origin to the decompoſition of iron pyrites, and is found generally in Grottos, Caverns, and Galleries of the Mines of *Bohemia, Saxony, Hungary, Goſlar* in the *Hartz*, &c. &c.

VARIETY I. *CRYSTALLISED.*

a. In Rhombs.

VARIETY II. *OF PARTICULAR SHAPES.*

a. Capillary.

VARIETY III. *AMORPHOUS.*

CXXIII. *a* 1. In a compact maſs of a dull white colour and earthy texture. *Hungary.*

CXXIV. *a* 2. In a flatted irregular porous piece, tranſlucid, and when held to the light of an emerald green colour. *Cornwall.*

CXXV. *b* 1. Of a pale green colour and looſe ſugary texture. *Goſlar.*

CXXVI. *b* 2. The ſame, of a dull yellow colour. *High Cliff, Hampſhire.*

SPECIES VII. *SULPHURET OF IRON.*

Iron Pyrites, Pyrite ſulfureuſe, Fr. *Schwefelkies,* Germ.

A variation in the proportion of the conſtituent parts, as well as in the degree of oxydation of its iron, produces conſiderable diverſity in the properties and appearance of this ore, which is found in great abundance. Its colour is pale yellow with metallic luſtre, or ſteel grey, ſometimes inclining to brown and not unfrequently variegated. It occurs either in ſtrata, or extenſive beds; in lumps; interſperſed; ſuperficial; or of particular ſhapes, as ſtalactitic, capillary *(Haarkies)*, &c. or as having taken the place and form of various animal and vegetable ſubſtances; or cryſtalliſed in tetrahedrons, cubes, or octohedrons, and their various modifications. It is ſometimes ſlightly attracted by the magnet *(Magnetiſcher-Kies)*, and always of ſufficient hardneſs to give fire with ſteel. Its fracture generally compact and more or leſs uneven, ſometimes granular, ſometimes ſtriated or fibrous *(Strahlkies)*. Specific gravity from 3.44 to 4.789; opake. On expoſure to the atmoſphere ſome varieties gradually decompoſe and are converted into ſulphate of iron; others, though they retain their form, loſe their ſplendour, hardneſs and ſpecific gravity, and become more or leſs of a liver brown colour *(Fer hépatique, Leberkies)*, while others remain unchanged, more eſpecially the cubic. Before the blowpipe moſt of the varieties of this ore decrepitate, emit a ſtrong ſulphureous ſmell and burn with a blue flame, leaving a browniſh oxyde which tinges borax of a dull green. According to the opinion of *Mr. Kirwan*, thoſe which moſt eaſily vitriolize contain iron in its metallic ſtate, while in the others it is more or leſs oxydated. *Henkel* ſtates the proportion of ſulphur in pyrites to be between $\frac{1}{3}$ and $\frac{1}{4}$ its weight. This ore is ſo univerſally met with as to render it unneceſſary to ſay from whence it can be moſt readily obtained. It abounds in coal mines, and frequently, as already mentioned, forms entire ſtrata. The globular occurs often in beds of clay or chalk, the cryſtalliſed and more brilliant generally with argillaceous ſchiſtus. As this ore is ſeldom worked for its iron, it has by *Baron Born, Mr. Kirwan* and others, been ranked as an inflammable ſubſtance under the head of ſulphur.

VARIETY I. *CRYSTALLISED.*

a. In tetrahedrons and their varieties.

CXXVII. *b* 1. In ſmooth detached cubes and parallelopepids of different ſizes, and of a pale braſs yellow colour. *Tyrol.*

R. de L. Pl. 2, *Fig.* 1, 2, 3, 4.

CXXVIII. *b* 2. In large ſmooth aggregated cubes of the ſame colour. *Hungary.*

CXXIX. *b* 3.

CXXIX. *b* 3. The ſame, imbedded in greeniſh argillaceous ſlate. *Bareuth.*

CXXX. *b* 4. In numerous ſmall and more brilliant cubes, covering the ſurface of black ſlate or calp. *County of Dublin.*

CXXXI. *b* 5. In ſmall detached ſtriated cubes. *Tyrol.*
And in larger aggregated cryſtals. *Cornwall.*
R. de L. Pl. 2, *Fig.* 17.

CXXXII. *b* 6. In large ſtriated cubes of a pale braſs yellow colour, irregularly aggregated on the ſurface of a compact maſs of iron pyrites. *France.*

CXXXIII. *b* 7. In aggregated cubes of a deeper colour, truncated at their ſolid angles. *Elba.*
R. de L. Pl. 2, *Fig.* 5.

CXXXIV. *b* 8. In ſmall looſe ſtriated cubes, truncated at all their edges. *Tyrol.*
R. de L. Pl. 2, *Fig.* 18.

CXXXV. *b* 9. The ſame, having their edges more deeply truncated. *Same place.*
R. de L. Pl. 2, *Fig.* 19.

CXXXVI. *b* 10. In aggregated cubes ſlightly truncated in all their edges and ſolid angles, of a pale yellow colour and ſomewhat variegated; ſome of the cubes partly corroded. *Germany.*
R. de Pl. 2, *Fig.* 20.

CXXXVII. *b* 11. In detached dodecahedrons with pentagonal faces. *Tyrol.*
R. de Pl. 2, *Fig.* 27.

CXXXVIII. *b* 12. In ſmall brilliant dodecahedrons aggregated into an irregular maſs, with cryſtalliſed galena on quartz. *Geyer.*

CXXXIX. *b* 13. The ſame, in larger cryſtals, implanted on grey opake calcareous ſpar. *Kongſberg.*

CXL. *c* 1. In aggregated octohedrons ſlightly truncated in all their ſolid angles, on greyiſh limeſtone. *Bath.*
R. de L. Pl. 3, *Fig.* 4.

CXLI. *c* 2.

CXLI. *c* 2. The ſame, in very brilliant cryſtals, having, beſides the truncation at the angles, two oppoſite edges ſlightly bevilled, with tranſparent pyramidal calcareous ſpar, alſo on greyiſh limeſtone. *Bath.*

CXLII. *d* 1. In parallelopepids irregularly rhomboidal and aggregated into a maſs. *R. de L. Vol.* 3, *P.* 242. *Ehrenfriedersdorf.*

CXLIII. *d* 2. The ſame, of a pale yellow colour, in ſmaller cryſtals, and more confuſedly aggregated *(Cocks-comb Pyrites)*, on galena with cubic fluor. *Derbyſhire.*

CXLIV. *e* 1. In confuſedly aggregated cryſtals, producing a flatted tubercular appearance on the ſurface. *Cornwall.*

CXLV. *e* 2. The ſame, in more minute cryſtals, appearing ſpecular on the ſurface. *Same place.*

CXLVI. *e* 3. The ſame, in ſtill more minute irideſcent cryſtals, lining the fiſſures of brown argillaceous iron ore. *Brittany.*

VARIETY II. *OF PARTICULAR SHAPES.*

CXLVII. *a* 1. In detached cylindrical and ſpherical portions, of a brown colour and without ſplendour. *Coaſt of Eſſex.*

CXLVIII. *a* 2. In ſmall irregular vermiform ſtalactites, covered with very minute cryſtals of pyrites of bright and variegated colours, on grey cellular quartz. *Lorraine.*

CXLIX. *a* 3. Of a pale yellow colour and irregularly botroidal on the ſurface, on browniſh opake petroſilex. *Bohemia.*

CL. *b* 1. In delicate needle-like cryſtals diverging from different centres, in a cavity of coarſe ſchiſtus lined with minutely cryſtalliſed quartz. *Johngeorgenſtadt.*

CLI. *c* 1. In a rounded ſpherule, ſmooth on the ſurface, and of a dark brown colour. *Sheppey Iſle, Eſſex.*

CLII. *c* 2. In aggregated ſpherules more irregular on the ſurface. *Same place.*

CLIII. *c* 3. Portion of an irregular ſpherical nodule, externally dull, internally of a radiated texture, and of a pale braſs yellow colour. *Same place.*

CLIV. *c* 4.

CLIV. *c* 4. In variegated prominent tubercles, on white quartz covered by minutely cryſtalliſed calcareous ſpar. *Hartz.*

CLV. *c* 5. In a rounded portion, bearing internally the impreſſion of a *Cornu Ammonis*. *Iſle of Sheppey.*

CLVI. *d* 1. Of a duſky hue and cellular texture, having in many of the cells ſmall portions of decompoſing galena. *Hungary.*

VARIETY III. *AMORPHOUS.*

CLVII. *a* 1. Of a fibrous texture and bright ſurface, the fibres long and delicate, running moſtly parallel and cloſely compacted. *Johngeorgenſtadt.*

CLVIII. *a* 2. Of a cloſe ſtriated texture. *Cornwall.*

CLIX. *b* 1. Of a ſcaly or granular texture, forming a coating on pyramidal calcareous ſpar, and retaining the impreſſions of it on the ſurface. *Derbyſhire.*

c. Compact.

CLX. *d* 1. In an irregular decompoſing maſs.

VARIETY IV. *PASSING INTO HEPATIC IRON ORE.*

VARIETY I. *CRYSTALLISED.*

a. In tetrahedrons and their modifications.

CLXI. *b* 1. In ſmooth detached cubes and parallelopepids of different ſizes. *R. de L. Pl.* 2, *Fig.* 1, 2, 3, 4. *Hartz.*

CLXII. *b* 2. In looſe ſtriated cubes, one ſimple and entire, the others in maccles. *Same place.*

CLXIII. *b* 3. In dodecahedrons with pentagonal faces, aggregated into a ſpherical cluſter. *Dalmatia.*

CLXIV. *b* 4. In looſe ſpherical cluſters ochry on the ſurface, compoſed of ſmall aggregated cubes variouſly truncated, ſome octohedral. *Iſle of Sheppey.*

CLXV. *b* 5.

CLXV. *b* 5. In ſmall ſmooth rhombic cryſtals, ſome entire, ſome truncated obliquely at their edges. *Dalmatia.*

c. In octohedrons.

CLXVI. *d* 1. In rhomboidal parallelopepids preſenting cuneiform edges, implanted on an aggregated maſs of the ſame. *Derbyſhire.*

e. Indeterminate.

VARIETY II. *OF PARTICULAR SHAPES.*

CLXVII. *a* 1. Forming a conical ſtalactite, rough and ochry on the ſurface.

CLXVIII. *a* 2. Confuſedly aggregated, and forming an irregular cluſter, on the ſurface of a cylindrical piece of hepatic iron ore. *Derbyſhire.*

CLXIX. *a* 3. In numerous fine diverging faſciculi, forming an irregular ochry bruſh-like ſurface, on black iron ore. *Lorraine.*

CLXX. *a* 4. Portion of a nodule of a blackiſh brown colour, having a rough ſurface, and encloſing black indurated bitumen. *Baireuth.*

CLXXI. *a* 5. In a ſmall irregular maſs of a browniſh black colour, botryoidal and ſhining on the ſurface. *Hungary.*

CLXXII. *a* 6. In an irregular bulbous nodule of a liver brown colour.

VARIETY III. *AMORPHOUS.*

CLXXIII. *a* 1. Forming a compact vein in red jaſper.

CLXXIV. *a* 2. In ſmall looſe irregular fragments. *Eibenſtock.*

GENUS VIII. *TIN.*

Stannum. Etain, Fr. *Zinn,* Germ.

Is a metal of a ſilvery white colour and of conſiderable luſtre; ſoft, malleable, ſlightly ſonorous, and of but little tenacity, a wire of $\frac{1}{10}$ of an inch in diameter being only capable of ſuſtaining a weight of $49\frac{1}{2}$ pounds. It is the lighteſt of the metallic bodies, its ſpecific gravity being little more than ſeven times that of water, viz. from 7.063

7.063 to 7.331. Between the teeth, or in the act of bending or breaking, it occaſions a peculiar crackling, and on being rubbed or heated has an ungrateful ſmell and taſte. On being expoſed to air or moiſture it becomes ſuperficially dull, but ſuffers no further alteration. It melts at 410 *Farenh.* If expoſed to the combined action of heat and air it is readily converted into a greyiſh or whitiſh oxyde, which added to glaſs communicates to it an opaline opacity and colour, *Common Enamel.* In its metallic ſtate it detonates rapidly with nitre. It decompoſes all the mineral acids, but diſſolves moſt readily in the oxy-muriatic or in aqua regia, the ſolutions in which are remarkable for giving a bright ſcarlet colour to the infuſion of cochineal. When united to oxy-muriatic acid in the dry way, it produces a colourleſs liquor, ſtrongly diſpoſed to aſſume the gaſſeous form on expoſure to the air, *Smoaking Liquor of Libavius.* By fuſion it combines with the other metals in all proportions, diminiſhing remarkably the malleability of gold, ſilver, and copper, more eſpecially that of gold, which is rendered fragile even by expoſure to its fumes. United with a ſmall proportion of iron it becomes harder, more ſonorous, and of greater ſplendour. By ſimple trituration it amalgamates with quickſilver. It may by fuſion be combined alſo both with ſulphur and phoſphorus; with the former producing a dark ſtriated compound, which ſublimed in cloſe veſſels becomes of a beautiful golden colour and ſpongy texture, *Aurum Muſivum.*

The chief uſes of this metal are, in the compoſition of ſolder, pewter, bell-metal, and of printers types, in the conſtruction of mirrors, in tinning, enamelling, and in medicine. Whether tin has yet been met with in its native ſtate, is very doubtful. Its ores are,

SPECIES I. *NATIVE OXYDE.*

Spatboſe Tin Ore. Etain vitreux, Fr. *Zinnſtein,* Germ.

This, though comparatively a rare ore, may be conſidered as almoſt excluſively that from which tin has hitherto been procured. It occurs either in beds or veins *(Zinnſtein)*, interſperſed *(Zwitter)*, or in looſe grains *(Zinnſand, Seifenzinn)*, or in detached irregular portions, or cryſtalliſed *(Zinngraupen)*, and then generally in obtuſe tetrahedral pyramids with or without intermediate priſms, or in dodecahedrons with rhombic faces, and their modifications. Its colour, different ſhades of black, brown, yellow, or grey; as browniſh black, clove or nut brown, wine or Iſabella yellow, ſmoke grey, &c. and ſometimes blood red; but this probably from decompoſition. Its cryſtals are generally ſmooth, ſometimes ſtriated, have more or leſs of a glaſſy luſtre, and are more or leſs tranſparent in proportion to the lightneſs of their colour; they are ſometimes of conſiderable ſize, ſeldom diſtinct, on the contrary generally implicated in each other, or in maccles. The fracture of this ore is fine grained and uneven, inclining to the conchoidal or foliated; it is of ſufficient hardneſs to give fire with ſteel; brittle; ſpecific gravity from 6.3 to 6.989.

It is difficultly ſoluble in the acids. Under the blow-pipe it decrepitates, loſes its colour, and on charcoal is in part reduced. By ſimple torrefaction it is converted into a greyiſh oxyde, which gives a white tinge to glaſs of borax. It is met with moſt frequently in the veins of primitive mountains, more eſpecially of thoſe of granite, gneiſs and micaceous ſchiſtus; frequently alſo as collected in ſtrata of ſubaqueous formation. Its more common aſſociates are quartz, mica, lithomarga, ſteatite, fluor, clay, chlorite, pyrites, wolfram, blende, &c. It has as yet been principally procured from the mines of *Malacca*, *Banca*, and *Siam*, and thoſe of *Bohemia*, *Saxony*, and *Cornwall*.

The wood tin of Cornwall (*Etain mamelonné ou en Stalactites*, *Etain limoneux*, Born. *Korniſches Zinnerz*, Germ.) may from its compoſition be conſidered as a variety of the foregoing, though different in ſeveral of its characters. It is always found in ſmall fragments more or leſs rounded. Its colour light or dark brown, inclining to the yellowiſh grey or Iſabella yellow, and having frequently in the ſame piece tranſverſe parallel ſtripes incurvated and of different ſhades. Externally it is ſomewhat rough and of but little ſplendour, internally ſilky. Its texture delicately fibrous, the fibres generally diverging and faſciculated; ſpecific gravity from 5.8 to 6.45. Under the blow-pipe it becomes browniſh red, and at length decrepitates, but can neither be melted *per ſe*, nor with glaſs of borax. It has hitherto only been met with at *St. Columb*, *St. Dennis*, and *St. Roch* in *Cornwall*. By *Klaproth's* analyſis it contains, Tin 63.3, with a little Iron and Arſenic; the common native oxyde, according to *Born*, contains no Arſenic, and by *Kirwan* is ſtated toconſiſt of Oxyde of Tin 80, the remainder Oxyde of Iron.

VARIETY I. *CRYSTALLISED.*

I. Pure tin, artificially cryſtalliſed on the ſurface.

II. *a* 1. In looſe, dark brown and ſhining tetrahedral priſms terminated by tetrahedral pyramids, ſome perfect, others variouſly truncated. *Cornwall.*

R. de L. Pl. 3, *Fig.* 26, 27, 28, 29.

III. *a* 2. In more minute and lighter coloured cryſtals, on light brown ſcaly ſpathoſe tin ore intermixed with quartz. *Same place.*

IV. *a* 3. In long ſhining, tetrahedral priſms with the edges of the correſponding pyramid ſlightly truncated, implanted on the ſurface of grey limeſtone, intermixed with green chlorite, cryſtalliſed quartz, and purple fluor. *Same place.*

V. *b* 1. In regular dodecahedrons with rhombic faces, of a browniſh black colour and ſhining ſurface, implanted on compact tin ore of the ſame colour. *Bohemia.*

R. de L. Pl. 4, *Fig.* 106.

VI. *b* 2.

VI. *b* 2. The ſame, of a dark olive green colour, numerouſly interſperſed through white calcareous ſpar, on brown ſpathoſe tin ore. *Bohemia.*

VII. *b* 3. The ſame, in more numerous cryſtals, of a blackiſh brown colour and ſtriated on their ſurfaces. *Altenberg.*

In theſe two laſt the proportion of iron is ſo conſiderable as to render them attractible by the magnet even before torrefaction.

VIII. *b* 4. The ſame, truncated at their edges, intermixed with yellow copper ore and calcareous ſpar, on amorphous brown ſpathoſe tin ore. *Lower Hungary.*

IX. *b* 5. The ſame, alſo truncated at all their edges and variegated internally. *Tranſylvania.*

The proportion of iron contained in the foregoing (Nos. 5, 6, 7, 8, and 9), and the peculiarities of their form, lead juſtly to the ſuſpicion that they approach to the nature of *Garnet.*

X. *b* 6. In large lengthened hexhedral priſms terminated by trihedral pyramids having rhombic faces, ſemitranſparent at their edges and adhering laterally. *Bohemia.*
R. de L. Pl. 4, *Fig.* 38.

XI. *b* 7. In regular dodecahedrons, implanted with cryſtalliſed quartz on red argillaceous iron ore. *Altenberg.*

XII. *b* 8. In black ſplendid dodecahedrons or double hexhedral pyramids, with cuneiform ſummits, implanted diagonally and aggregated on compact brown tin ore.
R. de L. Pl. 6, *Fig.* 7. *Cornwall.*

XIII. *b* 9. The ſame, in larger and lighter coloured cryſtals implanted on purple fluor. *Bohemia.*

XIV. *b* 10. The ſame, more irregularly aggregated, with cryſtalliſed quartz and white mica. *Schlakkenwalde, Bohemia.*

XV. *b* 11. The ſame, in ſtill larger and more cloſely aggregated cryſtals, of a dark brown colour, ſtriated and ſhining on the ſurface, on quartz with ferruginous clay. *Bohemia.*

XVI. *b* 12. Fragment of a dodecahedron, of a liver colour, truncated at one of its angles. *Cornwall.*

XVII. *b* 13. In very large maccles or compounded dodecahedrons with reflected

angles, truncated alſo at one of the angles, of a black colour, ſmooth and ſplendid on the ſurface. *Bohemia.*

XVIII. *b* 14. In ſmaller cryſtals, forming a cluſter, adhering to the baſe of a cryſtal of white quartz. *Cornwall.*

XIX. *b* 15. In large aggregated dodecahedrons having the edges of the priſm truncated, on indurated talc intermixed with quartz. *Bohemia.*
R. de L. Pl. 3, *Fig.* 27.

XX. *b* 16. In very confuſedly aggregated dodecahedrons with the edges of the pyramid truncated, implanted on the ſurface of a large fragment of cryſtalliſed quartz. *Same place.*

XXI. *b* 17. The ſame, in ſmaller, leſs ſplendid, and more numerous cryſtals, on the ſurface of gneiſs. *Same place.*

XXII. *b* 18. In dodecahedrons having the edges of both pyramids and priſms truncated, with white quartz, forming a vein the ſides of which are argillaceous. *Saxony.*
R. de L. Pl. 3, *Fig.* 28.

XXIII. *b* 19. The ſame, of a dark brown colour, incruſted with yellowiſh talc. *Bohemia.*

XXIV. *b* 20. The ſame, in more minute cryſtals, on compact tin ore, alſo incruſted with yellowiſh talc. *Same place.*

XXV. *b* 21. The ſame, in dull white talc, intermixed with white cryſtalliſed quartz. *Same place.*

XXVI. *b* 22. The ſame, in ſmaller and more numerous cryſtals, on compact ſpathoſe tin ore. *Same place.*

XXVII. *b* 23. The ſame, with cryſtalliſed quartz, purple fluor, and whitiſh talc. *Ehrenfriederſdorf.*

XXVIII. *c* 1. In compounded cryſtals, of a dark brown colour and ſhining ſurface, implanted on greeniſh indurated clay. *Altenberg.*

XXIX. *c* 2. In indeterminate cryſtals with greeniſh white indurated ſteatite, on a plate of gneiſs. *Bohemia.*

XXX. *c* 3.

XXX. *c* 3. In aggregated indeterminate maccles, with yellow copper ore, quartz, fluor, and red ochre. *Bohemia.*

XXXI. *c* 4. The ſame, of a browniſh red colour and ſemitranſparent. *Ehrenfriederſdorf.*

XXXII. *c* 5. The ſame, of a lighter colour, forming a vein the ſides of which are covered by green indurated talc. *Same place.*

XXXIII. *c* 6. In ſemitranſparent indeterminate cryſtals, ſtriated on the ſurface and of a white colour, with brown ſpathoſe tin ore on gneiſs. *Same place.*

The ſtriated texture and configuration of the cryſtals in this ſpecimen diſtinguiſh them ſufficiently from *Tungſten.*

XXXIV. *c* 7. In ſmall priſmatic cryſtals on cellular quartz. *Cornwall.*
(Needle Tin.)

XXXV. *c* 8. In very minute priſms, tranſparent and of a browniſh colour, on grey cryſtalliſed quartz. *Same place.*

XXXVI. *c* 9. In an aggregated maſs, compoſed of polyhedral cryſtals of a brown colour, brown radiated ſhorl, and white cryſtalliſed quartz. *Same place.*

XXXVII. *c* 10. In ſmall polyhedrons of a dark brown colour, intermixed with brown ſhorl, quartz, and yellowiſh talc. *Bohemia.*

XXXVIII. *c* 11. In polyhedral cryſtals of a dark brown colour, with cryſtalliſed mica, in ferruginous cryſtalliſed quartz. *Zinnwald, Bohemia.*

XXXIX. *c* 12. In detached fragments of large polyhedral cryſtals, ſemitranſparent, and of a light reddiſh yellow colour. *(Reſin Tin Ore.)* *Bohemia.*

XL. *c* 13. The ſame, of a darker colour and leſs tranſparent. *Same place.*

XLI. *c* 14. A variety of the ſame. *Cornwall.*

XLII. *c* 15. In brown polyhedral cryſtals in talciferous argillite. *Bohemia.*

VARIETY II. *AMORPHOUS.*

XLIII. *a* 1. In looſe fragments, chiefly of a light liver brown colour and radiated texture, ſome of the pieces angular, others rounded. *(Wood Tin.)* *Same place.*

XLIV. *a* 2. In larger and more rounded pieces. *Same place.*

XLV. *b* 1. In an irregular maſs of an iron grey colour and granular texture, ſtrongly attracted by the magnet. *Johngeorgenſtadt.*

XLVI. *b* 2. In ſmall ſpecks, of a pale liver-brown colour, interſperſed through grey granite. *Cornwall.*

XLVII. *c* 1. Of a ſolid texture and browniſh grey colour, with ſmall veins of white quartz. *Bohemia.*

XLVIII. *c* 2. Of a light brown colour, ſemitranſparent and of a vitreous fracture, ſpecular on the ſurface. *Same place.*

XLIX. *c* 3. Of a browniſh black colour, compact and very ponderous, with a ſmall fragment of white quartz. *Same place.*

L. *d* 1. In large detached nodules. *(Shoad Tin.)* *Cornwall.*

LI. *e* 1. In large looſe angular grains of a dark colour. *Same place.*

LII. *e* 2. In more rounded grains, moſtly of a light brown colour and ſemitranſparent. *Same place.*

LIII. *e* 3. In a looſe ſandy form, of a clove brown colour. *(Stream Tin.)* *Same place.*

LIV. *e* 4. The ſame, of a darker colour, and intermixed with particles of native gold. *Same place..*

LV. *e* 5. The ſame, intermixed with grains of white quartz. *Junkelow, Iſle of Banca.*

SPECIES II. *SULPHURET OF TIN.*

Bell-metal Ore. Etain Sulphuré, Fr. *Zinnkies*, Germ.

The colour of this ore, as deſcribed by *M. Klaproth*, is bluiſh white, approaching to ſteel grey, and reſembling that of *Grey Copper*; in moſt ſpecimens however the grey is found to incline more or leſs to braſs or bronze yellow. Its luſtre is metallic; form amorphous; fracture uneven, of a coarſe or fine grain, inclining to the conchoidal or imperfectly foliated. It is brittle and ſeparates into ſharp-edged indeterminately angular fragments; of moderate hardneſs, ſcratching eaſily with the knife: ſpecific gravity 4.35. Under the blow-pipe it fuſes readily into a black globule, tinging the charcoal at the ſame time of a bluiſh colour, and emitting a ſulphureous ſmoke with a ſlight impregnation

nation of arſenic; by a more gentle and continued heat it is converted into a reddiſh oxyde. On digeſtion in aqua regia its metallic part is almoſt wholly diſſolved, and its ſulphur riſes to the ſurface.

According to what *Mr. Klaproth* conſiders as his moſt accurate analyſis of this ore, it conſiſts of Sulphur 25, Tin 34, Copper 36, Iron 3, Earthy matter 2. It has as yet been found only in *Cornwall*, where it was diſcovered ſome years ſince by the late *Mr. Raſpe*, at *Huel Rock* in the pariſh of *St. Agnes*, in a vein nine feet wide and twenty yards from the ſurface.

VARIETY I. *AMORPHOUS.*

a. Fibrous.

LVI. *b* 1. Of a pale braſs yellow colour and compact texture.
Huel Rock, Cornwall.

ORDER II. *FRAGILE.*

GENUS IX. *BISMUTH.*

Wiſmuthum. Biſmuth, Fr. *Wiſmuthum*, Germ.

Pure regulus of biſmuth is of a ſilver white colour with an admixture of yellowiſh red, becoming in a ſlight degree irideſcent on expoſure to air. Its luſtre and hardneſs nearly the ſame with thoſe of tin and lead; texture foliated; brittle, though with a ſlight degree of malleability; ſpecific gravity according to *Briſſon* 9.822. Next to tin it is the moſt fuſible of the metallic bodies, melting at 460 of *Farenh.* By increaſe of heat in cloſe veſſels it ſublimes without alteration, and in cooling cryſtalliſes into cubes; but in the open fire it inflames, and is eaſily converted into a yellowiſh vitrifiable oxyde. Though neither ſoluble in the ſulphuric nor muriatic acid without the aſſiſtance of heat, it diſſolves readily both in the nitric and oxy-muriatic, and with the former furniſhes a ſalt which detonates on being ſuddenly heated, and which on the addition of water yields a copious white precipitate *(Magiſtery of Biſmuth, Spaniſh White)*. With the exception of arſenic, cobalt, and zinc, it combines with all the other metallic bodies, renders them paler and more brittle, and, platina, gold and ſilver excepted, more ſuſceptible of oxydation; ſome it alſo renders more fuſible. In moderate quantity it ſcarcely diminiſhes the fluidity of quickſilver, with which it readily amalgamates; it alſo promotes its diſpoſition to union both with lead and tin. Its principal uſes are, in the compoſition of pewter, ſoft

ſoft ſolder, and printers types; in the conſtruction of mirrors, aſſaying, painting, and imitation of ſilver. Its ores are,

SPECIES I. *NATIVE BISMUTH.*

Biſmuth natif, Fr. *Gediegen-Wiſmuth*, Germ.

The properties of this are analogous to thoſe of the regulus; its colour being reddiſh white, luſtre metallic, fracture foliated, ſpecific gravity from 9.022 to 957. It is ſeldom found in veins; moſt commonly interſperſed, and then either in ſmall grains or ſcales, or in laminæ, often producing cellular, reticular, penniform *(Federwiſmuth)*, or dendritic appearances; and ſometimes, though rarely, cryſtalliſed in equilateral triangular or quadrangular plates. It is generally aſſociated with the grey and white ores of cobalt, with kupfernickel, iron pyrites and blende, in a matrix of quartz, hornſtone, jaſper, or of calcareous, pearl, and ponderous ſpars. It occurs principally in the mines of *Biber*, *Bohemia*, *Saxony*, *Swabia*, *Sweden*, *Tranſylvania*, and the *Temeſwar*.

VARIETY I. *CRYSTALLISED.*

I. Pure biſmuth artificially cryſtalliſed.

II. *a* 1. In thin rhomboidal laminæ, of a dull ſilver white colour, on compact native biſmuth, with pale green oxyde of nickel effloreſcent on the inferior ſurface. *Joachimſthal.*

III. *b* 1. Partly granulated, partly in broad ſtriated laminæ, of a brighter colour, producing a penniform appearance, in reddiſh white calcareous ſpar. *Schneeberg.*

VARIETY II. *OF PARTICULAR SHAPES.*

IV. *a* 1. Of a fine laminated texture and tarniſhed ſilver white colour, forming numerous dendritic ramifications through the ſubſtance of browniſh red jaſper. *Schneeberg.*

V. *a* 2. The ſame, cut and poliſhed. *Johngeorgenſtadt.*

VI. *a* 3. The ſame, of a greyer colour, in ſemitranſparent petroſilex, alſo cut and poliſhed. *Schneeberg.*

VII. *a* 4.

VII. *a* 4. Forming ramifactions in reddiſh white ponderous ſpar, poliſhed on one ſide. *Fürſtenberg.*

b. Penniform, *Vide* No. III.

VARIETY III. *AMORPHOUS.*

VIII. *a* 1. Of a tarniſhed ſilvery white colour and laminated texture, in reddiſh petroſilex. *Altenberg.*

IX. *a* 2. The ſame, very compact, ponderous and without matrix. *Joachimſthal.*

X. *a* 3. In ſmall folia, ſomewhat variegated in their colour, intermixed with baroſelenite, white quartz, and ſmall cubic cryſtals of grey cobalt ore. *Schneeberg.*

XI. *a* 4. In folia ſo fine as to have the appearance of coarſe grains, and ſomewhat cellular, from the folia not being cloſely compacted; of a brown colour on the ſurface, in ſome places inclining to purple. *Fürſtenberg.*

XII. *b* 1. In fine grains diſſeminated through yellowiſh ponderous ſpar. *Same place.*

XIII. *b* 2. In a maſs compoſed of fine grains, irideſcent on the ſurface. *Bohemia.*

XIV. *b* 3. The ſame, of a compact granular texture, angular and variegated in its fracture, intermixed with reddiſh petroſilex. *Schneeberg.*

XV. *b* 4. The ſame, forming a rich vein in a matrix of grey quartz. *Johngeorgenſtadt.*

XVI. *b* 5. The ſame, with yellowiſh green oxyde of nickel, efflorеſcent on the ſurface. *Schneeberg.*

XVII. *b* 6. The ſame, covered by peach bloom coloured oxyde of cobalt. *Same place.*

SPECIES II. *NATIVE OXYDE OF BISMUTH.*

Oxide de Biſmuth, Fr. *Wiſmuthokker*, Germ.

This occurs either in the form of powder, or more or leſs concreted, of a ſtraw or greeniſh yellow, or greyiſh colour; often covering the ſurface of, or interſperſed through other ores. It is nearly without ſplendour; when indurated has an earthy fracture; is

friable, and of conſiderable weight. On charcoal it is eaſily reduced by the blow-pipe. It is ſoluble in the nitric acid without effervescence. In the few ſpecimens hitherto met with, it has been found generally accompanied with native biſmuth, and often with different ores of cobalt, quartz, pearlſpar, argillaceous ſchiſtus, and indurated clay. The mines which have produced it in the greateſt abundance are thoſe of *Johngeorgenſtadt*, *Joachimſthal*, and the *Black Foreſt*, and more eſpecially of *Schneeberg* in *Saxony*.

VARIETY I. *AMORPHOUS.*

XVIII. *a* 1. Of a yellowiſh aſh-colour, on the ſurface of, and intermixed with granulated native biſmuth, with grey indurated clay. *Johngeorgenſtadt.*

XIX. *a* 2. Of a lemon yellow colour, on the ſurface of ferruginous indurated clay, intermixed with laminated native ſilver. *Same place.*

b. Friable.

XX. *c* 1. Of a pale yellow colour and powdery form. *Same place.*

XXI. *d* 1. Of an ochre yellow colour and indurated, on greyiſh ferruginous quartz. *Same place.*

XXII. *d* 2. Of a pale yellow colour, indurated and intermixed with arſeniate of cobalt and tabular baroſelenite. *Same place.*

XXIII. *d* 3. The ſame, of a darker colour. *Same place.*

XXIV. *d* 4. Of a liver brown colour, with oxyde of nickel and grey blende. *Zellerfeld, Hartz.*

SPECIES III. *SULPHURET OF BISMUTH.*

Biſmuth ſulphuré, Fr. *Wiſmuthglanz*, Germ.

This, which is alſo a rare ore, is of a pale leaden grey colour and generally ſuperficially variegated with yellow, red, or purple. It is found in lumps, or coarſely interſperſed, and ſometimes in acicular aggregated priſmatic cryſtals. Its luſtre metallic; fracture foliated; fragments angular; ſpecific gravity from 6.13 to 6.467. It is brittle; cuts eaſily with the knife; ſlightly ſtains the fingers. Before the blow-pipe it melts eaſily, and by continuance of the heat is gradually diſſipated in the form of a ſulphureous metallic vapour. It contains according to *Sage* 60 per cent. of Biſmuth, the remainder Sulphur and Iron.

Iron. The nitric and oxymuriatic acids act readily on its metallic part to the exclusion of its sulphur. The common associates of this ore are native bismuth, spathose iron ore, mispikel, copper pyrites, native oxyde of tin, quartz, fluor spar, and wacke; and the mines principally producing it are those of *Joachimsthal*, *Johngeorgenstadt*, *Schwarzenberg*, *Altenberg*, and *Riddarhyttan* in *Westmanland*.

VARIETY I. *AMORPHOUS.*

XXV. *a* 1. Of a greyish colour, partly striated, partly granular, intermixed with native bismuth. *Johngeorgenstadt.*

XXVI. *a* 2. The same, with a large proportion of native bismuth. *Hungary.*

XXVII. *b* 1. Of a dark steel grey colour, partly granulated and partly of a scaly texture. *Wurtemberg.*

XXVIII. *b* 2. Of a laminated texture with native bismuth, in reddish petrosilex. *Altenberg.*

GENUS II. *NICKEL.*

Niccolum. Nickel, Fr. *Nikkel*, Germ.

The properties of this metal are the less easily assignable that it has not hitherto been procured in a state of perfect refinement. When of the ordinary degree of purity its colour is greyish white, inclining to copper red; lustre the same as that of the other semimetals; fracture compact and more or less uneven; nearly of sufficient hardness to give fire with steel. Its specific gravity, according to the manner of its previous fusion, from 7.087 to 9.333. It possesses the property of being attracted by the magnet in common with iron, like which it is only capable of being melted in the higher degrees of heat. Under ignition in the open fire it is slowly converted into a brownish or greenish oxyde, which communicates a hyacinth colour to glass of borax and to soda, a honey yellow to microcosmic salt, and a blue to pot-ash. All the solutions of nickel are of a green colour, that in the nitric acid, in which it dissolves most readily, affords rhombic crystals by evaporation and cooling, and a bluish precipitate on the addition of ammoniac. It detonates, like most of the other metals, with nitre, and may be united by fusion with sulphur, arsenic, and cobalt. The uses of this metallic substance are as yet unknown. Its ores are,

SPECIES I. *NATIVE NICKEL.*

Nickel martial, Oxide de Nickel, Fr. *Nikkelokker,* Germ.

As mentioned by *Baron Born,* occurs in rhomboidal tablets accumulated on each other, of a foliated texture, and brittle; in its freſh fracture of a pale yellow colour, which on expoſure to the air changes to a blackiſh grey. Under the blow-pipe it diſcovers no traces either of arſenic or ſulphur, and is ſaid to conſiſt ſolely of Nickel and Iron. It was a few years ſince diſcovered at *Joachimſthal* in *Bohemia,* accompanied with red ſilver ore in an argillaceous ſchiſtus, and appears to be analogous to that of a dark red colour mentioned by *Rinman,* from *Biber* in *Heſſe.* Vide *Kirwan's Elem. Mineral* 1784, *Pag.* 342.

VARIETY I. *CRYSTALLISED.*

I. Pure regulus of nickel.

a. In rhomboidal tables.

VARIETY II. *AMORPHOUS.*

a. Foliated.

SPECIES II. *NATIVE OXYDE OF NICKEL.*

Oxide de Nickel, Fr. *Nikkelokker,* Germ.

The colour of this is analogous to that of the artificial oxyde, viz. apple or graſs green, or greeniſh white. Like the native oxyde of biſmuth, it generally occurs either in a powdery form, or of different degrees of induration, ſuperficial, in lumps, or interſperſed; ſometimes, according to *Kirwan,* in minute acicular cryſtals. The indurated is of an earthy texture with little luſtre, but of conſiderable weight; it feels meagre, and has an earthy ſmell when breathed on. By the blow-pipe it is infuſible *per ſe,* but communicates a yellowiſh red tinge to glaſs of borax. It is ſometimes found to be partially ſoluble in water, from the accidental preſence of the ſulphuric acid: its ſolutions in this and the other acids (in which it diſſolves ſlowly) are of a green colour and have the other properties of thoſe of its artificial oxyde. In moſt inſtances it appears to reſult from the decompoſition of kupfernickel, with which it is conſtantly aſſociated; and is met with not un-

 frequently

frequently in the mines of *Saxony*, the *Hartz*, *Heſſe*, *Sweden*, and the *Bogojablenſky Mountains* in *Siberia*.

VARIETY I. *AMORPHOUS.*

II. *a* 1. Of an earthy texture, and apple-green colour, intermixed with browniſh decompoſing kupfernickel, having minutely cryſtalliſed white calcareous ſpar on the ſurface. *Andreaſberg, Hartz.*

III. *a* 2. The ſame, of a paler colour, with kupfernickel leſs decompoſed, and more compact and ponderous. *Same place.*

IV. *a* 3. In an indurated irregular maſs, of a very pale green colour. *Saalfeld.*

V. *a* 4. In looſe portions, of a pale green colour. *Hartz.*

VI. *a* 5. Of a pale green colour, with calcareous ſpar, on grey cobalt ore. *Same place.*

b. Pulverulent.

SPECIES III. *KUPFERNICKEL.*

Nickel metallique, Born. *Kupfernikkel*, Germ.

Is either of a light or deep copper red colour, ſometimes inclining to white, yellow, or grey. It is found in lumps or diſſeminated, ſeldom reticular or arboreſcent; its luſtre metallic; its fracture fine grained, compact and more or leſs uneven, approaching ſometimes to the conchoidal. It is difficultly ſcratched with the knife, and is brittle. Its ſpecific gravity from 6.608 to 6.648, *Briſſon*, and according to *Gellert* 7.56. Under the blow-pipe it exhales both an arſenical and ſulphureous ſmoke, and melts into a globule, which loſes its luſtre on expoſure to the air. By calcination it is converted into a green oxyde, ſimilar in its properties to the foregoing. It is ſoluble both in the nitric acid and aqua regia, and imparts to both its characteriſtic green colour. By *Bergman* and moſt other authors it is conſidered as reſulting from the union of different proportions of Nickel with Iron, Arſenic, Cobalt, and Sulphur. It occurs as well in primitive as in alluvial mountains, accompanied generally with grey and white cobalt, and often with rich ſilver ores, in a matrix of ponderous calcareous or pearl ſpar or quartz, in the mines of *Bohemia*, *Saxony*, *Sweden*, *Swabia*, *Stiria*, *Thuringia*, the *Hartz*, *Heſſe*, *Spain*, *France*, and *England*.

VARIETY

VARIETY I. *OF PARTICULAR SHAPES.*

VII. *a* 1. In very minute ramifications, of a high copper red colour, on grey cobalt ore with green calx of nickel. *Hartz.*

VIII. *a* 2. In aggregated tubercles, of a pale copper colour in their fracture, and covered on the surface by an efflorescence of pale green oxyde of nickel, with cubic vitreous silver ore, rhomboidal pearl spar, and transparent lenticular calcareous spar; on ferruginous quartz. *Freyberg.*

IX. *a* 3. The same, having a knitted appearance on one part of the surface. *Same place.*

X. *a* 4. Of a pale copper colour, ramifying through white ponderous spar, one surface polished. *Saxony.*

XI. *a* 5. The same, in reddish petrosilex. *Schneeberg.*

VARIETY II. *AMORPHOUS.*

XII. *a* 1. Of a granular texture, with green oxyde of nickel, interspersed through white calcareous spar, covered on the surface by minutely crystallised yellow copper pyrites. *Cornwall.*

XIII. *b* 1. Of a compact texture and pale copper colour, intermixed with white ponderous spar, and partially covered by green oxyde of nickel. *Biber, Hesse.*

XIV. *b* 2. More compact and of a finer grain, intermixed with a small proportion of grey ore of cobalt and white calcareous spar, cut and polished on two sides. *Same place.*

XV. *b* 3. Of a pale copper colour, with crystallised grey cobalt ore and white quartz. *Schneeberg.*

XVI. *b* 4. Of the same colour and very solid, with minutely crystallised red silver ore on the surface. *Freyberg.*

XVII. *b* 5. Of the same colour, in white calcareous spar, intermixed with grey indurated clay. *Hartz.*

XVIII. *b* 6.

XVIII. *b* 6. In a very irregular maſs, with green oxyde of nickel on the ſurface.
Saxony.

XIX. *b* 7. In a rounded compact nodule, of a pale copper colour.
St. Marie aux Mines.

XX. *b* 8. Portion of a larger nodule, with cryſtalliſed iron pyrites. *Same place.*

SPECIES IV. *ARSENIATE OF NICKEL.*

Lately diſcovered at *Regenſdorf* by *Gmelin*, who deſcribes it as occurring in amorphous maſſes of a pale grey colour intermixed with pale green, without luſtre or tranſparency; its fracture compact and partly earthy, partly ſplintery; not very eaſily ſcratched with the knife; giving a white ſtreak; of difficult frangibility; adhering ſlightly to the tongue, and giving an earthy ſmell when breathed on. It is ſoluble in the nitric and muriatic acids by the aſſiſtance of a ſtrong heat, and affords green ſolutions which contain no copper, though they are changed to blue by the addition of ammoniac. *Gmelin* has found it to contain, Nickel in union with the Acid of Arſenic, ſome traces of Cobalt, a ſmall proportion of Alumine, and ſometimes of Baroſelenite, with which in its natural ſtate it is often intermixed.

VARIETY I. *AMORPHOUS.*

a. Compact.

GENUS III. *ARSENIC.*

Arſenicum. Arſenic, Fr. *Arſenik*, Germ.

This in its pure reguline ſtate is of a bluiſh white colour, with metallic ſplendour, and of a foliated or ſcaly texture. By expoſure to the air it becomes dulliſh yellow, and at length greyiſh black and pulverulent on the ſurface. It yields pretty readily to the knife, and is very brittle; its ſpecific gravity 8.31. In cloſe veſſels it ſublimes without alteration at 356 *Farenh.* but if expoſed to air it burns with an alliaceous ſmell and blue flame, and is converted into a white oxyde (*Common Arſenic*), which is itſelf alſo capable of being volatiliſed. It is not eaſily acted on by acids; the oxymuriatic diſſolves it moſt readily; the others, more eſpecially the muriatic, require the aſſiſtance of heat. By boiling it may be combined with unctuous oils, and, by fuſion, with ſulphur and with moſt of the metals: thoſe which are ductile it renders brittle, ſome it renders more fuſible,

as platina, others leſs, as tin; to the red and yellow metals it imparts a ſilvery whiteneſs, therefore, principally employed in the compoſition of certain metallic mixtures, as in the manufacture of ſhot and certain kinds of printers types. In the ſtate of oxyde it is likewiſe employed in glaſs making, dying, the preparation of *Scheele*'s green pigment, and in medicine. The ores of arſenic are,

SPECIES I. *NATIVE ARSENIC.*

Scherben Cobalt. Arſenic teſtacé, Born. *Gediegen-Arſenick*, Germ.

The colour of this, when recently broken, is a light bluiſh grey intermediate between tin white and lead grey, but, like that of the artificial regulus, changing very ſoon to a yellow, and afterwards to a blackiſh grey and greyiſh black. It is ſeldom found in lumps, interſperſed or in plates, and more rarely ſtriated; generally of particular ſhapes, as ſtalactitic, botryoidal, mammillated, &c. It is internally of a metallic ſplendour, externally dull. Its texture is compact, and generally more or leſs uneven, inclining to the conchoidal, ſometimes ſtriated, often compoſed of thick or thin curved or concentric layers. It is nearly of ſufficient hardneſs to give fire with ſteel, and is in a certain degree malleable. When ſtruck or rubbed it gives out a garlic ſmell. In its chemical properties it agrees pretty exactly with the pure metal, from which however it differs in containing a ſmall proportion of Iron, and often of Silver and Gold. It is found only in veins in primitive mountains, accompanied by red ſilver ore, ſulphuret of arſenic, galena, white cobalt ore, and other metallic ſubſtances, beſides ponderous, calcareous, pearl and fluor ſpars and quartz, and principally in the mines of *Bohemia*, *Saxony*, *Alſace*, the *Hartz*, *Carinthia*, *Swabia*, and *Tranſylvania*.

I. Pure regulus of arſenic.

VARIETY I. *OF PARTICULAR SHAPES.*

a. Stalactitic.

II. *b* 1. Of a very dull dark grey colour, botryoidal on the ſurface. *Geyer.*

III. *c* 1. Of a ſhining leaden grey colour, mammillated on the ſurface and compoſed of concentric layers, with white calcareous ſpar. *Hartz.*

VARIETY

VARIETY II. *AMORPHOUS.*

IV. *a* 1. Of a dark dull grey colour, compoſed of concentric layers with a looſe nucleus at the centre, intermixed with ſplendid ſcaly galena. *Hartz.*

V. *a* 2. The ſame, intermixed with a ſmall proportion of white ſilver ore. *Hartz.*

VI. *b* 1. Of a dull leaden colour and ſtriated texture, having numerous indentations on the ſurface, with reddiſh brown blende and white quartz. *Andaluſia.*

c. Compact.

d. Pulverulent.

SPECIES II. *NATIVE OXYDE OF ARSENIC.*

Arſenic oxydé, Fr. *Natürlicher-Arſnikkalk*, Germ.

This occurs either in a powdery form, or more or leſs indurated, or cryſtalliſed on the ſurface or in the cavities of other ores of arſenic, cobalt, &c. Its colour is greeniſh, yellowiſh, reddiſh or ſnow white, or light ſmoke grey. When pulverulent or ſimply indurated, it is generally dull; but if cryſtalliſed, it is for the moſt part ſemitranſparent and of a ſilky luſtre. Its fracture either earthy, or fibrous, or tending to the foliated. Both the indurated and cryſtalliſed are brittle and eaſily ſcratched by the knife; ſpecific gravity 3.706. It impreſſes on the tongue a ſweetiſh ſubacrid taſte; is ſoluble in eighty parts of water at a temperature of 60°, and in fifteen of boiling water: it is alſo ſoluble in moſt of the acids, more eſpecially in the muriatic and aqua regia, in both which it diſſolves without effervescence: by treatment with the nitric it may itſelf be converted into an acid of a peculiar kind (*Acid of Arſenic*). Under the blow-pipe it burns, like the native regulus, with a blue flame, and is converted into a white ſmoke, having alſo a ſtrong alliaceous odour. It effervesces violently with nitre and the fixed alkalis, and unites readily by fuſion with ſulphur and with all the metals which are capable of combining with its regulus. It is found in ſmall quantities, in the forms above mentioned, in the mines of *Joachimſthal, Raſchau, Riechelſdorf, Salatbna, Schmolnitz*, &c.

VARIETY I. *CRYSTALLISED.*

a. In truncated tetrahedral priſms.

VII. *b* 1. In delicate needle-like cryſtals, with minutely cryſtalliſed miſpickel, lining irregular cavities in black argillaceous ſchiſtus. *Richelſdorf, Heſſe.*

VIII. *b* 2. In ſemitranſparent white polyhedral cryſtals, on the ſurface of pieces of amorphous realgar. *Same place.*

VARIETY II. *AMORPHOUS.*

IX. *a* 1. Of a white colour and efflorescent, on the ſurface of a ponderous argillite. *Goſlar.*

SPECIES III. *SULPHURET OF ARSENIC.*

Oxide d'Arſenic ſulfuré, Fr. *Rauſchgelb*, Germ.

By moſt authors this is diſtinguiſhed into two kinds, the yellow and the red: the one (*Orpiment*, *Oxide d'Arſenic ſulfuré jaune*, Fr. *Gelbes Rauſchgelb*, Germ.) of different ſhades of gold, ſulphur, lemon or orange yellow; the other (*Realgar*, *Oxide d'Arſenic ſoufré rouge*, Fr. *Rothes Rauſchgelb*, Germ.) of an aurora, ſcarlet, carmine, or ruby red colour. They both occur either in lumps, diſſeminated or ſuperficial, ſometimes of particular ſhapes, and often cryſtalliſed, more eſpecially the realgar, in tetrahedral rhomboidal priſms with correſponding pyramids and their modifications. The fracture of the yellow is foliated, of the red granular and uneven inclining to the conchoidal; their ſplendour unctuous or vitreous, in ſome inſtances approaching to that of the diamond. When cryſtalliſed or in thin folia ſemitranſparent. They are both eaſily ſcratched by the knife, and give a yellowiſh ſtreak. Specific gravity, according to *Briſſon*, of the yellow 3.452, and of the red 3.338. Under the blow-pipe this ore melts, burns with a blue flame, and is diſſipated in the form of a ſulphureous arſenical ſmoke. It is ſoluble in aqua regia and by nitric acid the red is deprived of its colour, and though in general realgar has been conſidered as differing from orpiment in containing a larger proportion of ſulphur, it appears by the experiments of *M. Boquet* that, when prepared artificially, the redneſs or yellowneſs of colour depends altogether on the application of a greater or leſs degree of heat. Orpiment is ſtated by *Emmerling* rather to belong to alluvial, and realgar to primitive mountains; the firſt aſſociated with indurated clay, quartz, &c. in the *Bannat*, *Tranſylvania*, *Hungary*, *Wallachia*, *Natolia*, *Italy*, &c. the other with quartz, indurated clay, calcareous and ponderous ſpar, native arſenic, red ſilver ore, galena, &c. in the *Bannat*, *Bohemia*, *Hungary*, *Saxony*, the *Hartz* and the *Tyrol*, *Lothringia*, *Swabia*, *Tranſylvania*, *Italy*, &c.

VARIETY

VARIETY I. *CRYSTALLISED.*

X. *a* 1. In large tetrahedral rhomboidal priſms terminated by tetrahedral pyramids variouſly truncated, of a ruby red colour, and aggregated on ferruginous quartz. *Hungary.*

XI. *a* 2. The ſame, having their pyramids truncated both at their apices and at all their angles, on compact grey blende with a tubercular quartzy incruſtation. *R. de L. Pl.* 7, *Fig.* 12. *Same place.*

XII. *a* 3. The ſame, more minutely cryſtalliſed, on the ſurface of an indurated ſtony ſubſtance incruſted with native white vitriol. *Same place.*

XIII. *a* 4. In tetrahedral rhomboidal priſms terminated by tetrahedral pyramids, of a bright red colour and ſemitranſparent, with ſcabrous cryſtals of opake rhomboidal pearl ſpar, on grey opake quartz intermixed with reddiſh ponderous ſpar. *Felſobanya.* *R. de L. Pl.* 7, *Fig.* 11.

XIV. *a* 5. The ſame, in very minute and numerous cryſtals, with rhomboidal pearl ſpar, on granular native arſenic. *Hungary.*

b. Indeterminate.

VARIETY II. *OF PARTICULAR SHAPES.*

a. Stalactitic.

VARIETY III. *AMORPHOUS.*

XV. *a* 1. Of a foliated texture and lemon yellow colour *(Orpiment)* intermixed with red *(Realgar)*. *Hungary.*

XVI. *a* 2. Compoſed of parallel layers, of a bright ruby colour and very tranſparent. *Same place.*

XVII. *b* 1. In a compact maſs of a deep orange colour. *Same place.*

XVIII. *b* 2. The ſame, of a lemon yellow colour, on an indurated ſpongy matrix having the appearance of lava. *Same place.*

XIX. *c* 1. Of a granular texture and bright red colour, intermixed with dark grey quartz. *Tranſylvania.*

XX. *c* 2. The ſame, in a browniſh indurated ſandſtone. *Hungary.*

XXI. *c* 3. The ſame, in an indurated earthy matrix. *Same place.*

XXII. *d* 1. In a pulverulent form, of a yellow colour, on the ſurface of cryſtalliſed pyramidal quartz. *Hungary.*

SPECIES IV. *MISPICKEL.*

Arſenic pyriteux, Fr. *Gemeiner Arſenikkies*, Germ.

The properties of this, which by many is ranked with the ores of iron, render it eaſily diſtinguiſhable from the other kinds of pyrites. It is found either in lumps, or interſperſed, or cryſtalliſed in rhomboidal tetrahedral priſms with obtuſe dihedral ſummits. Its colour ſilver or tin white, with metallic luſtre, and inclining often to greyiſh, yellowiſh, or bluiſh, ſometimes variegated. Its texture uneven, of a coarſe or fine grain. When cryſtalliſed, the ſurface of its priſms is ſmooth, their ſummits indiſtinctly ſtriated; its cryſtals projecting in various directions, often compreſſed, imbedded in each other or confuſedly aggregated. It is opake, brittle, gives fire with ſteel, emits a garlic odour upon friction and is very ponderous, its ſpecific gravity being according to *Gellert* 5.753, to *Briſſon* 6.522. Under the blow-pipe it gives out a white arſenical ſmoke, leaving behind a reddiſh brown ferruginous oxyde. It is ſoluble with effervеſcence both in the nitric and oxymuriatic acids; by further analyſis it appears to conſiſt of Arſenic in union with Iron, and a ſmall proportion of Sulphur. This ore is conſidered by *Emmerling* as peculiar to primitive mountains, in which it occurs more commonly in beds than in veins, aſſociated for the moſt part with native oxyde of tin, galena, blende, ſpathoſe iron ore, iron and copper pyrites, quartz, calcareous and pearl ſpar, and fluor, in the mines of *Bohemia, Saxony, Sileſia*, &c.

A variety of this ore generally of a lighter colour and having leſs ſplendour, containing from one to ten per cent. of ſilver, and found principally accompanied with common miſpickel, red ſilver ore, galena, copper pyrites, &c. in quartz or pearl ſpar, at *Brauuſdorf* and *Freyberg* in *Saxony*, is deſcribed by *Werner* and others as a diſtinct ſpecies under the name of *Weiſerz, Miſpickelſilber*, Germ. *Arſenicum mineraliſatum pyritaceum argentiferum*, Wern. *Argentiferous arſenical Pyrites*, Kirw.

VARIETY I. *CRYSTALLISED.*

XXIII. *a* 1. In tetrahedral rhomboidal priſms with obtuſe dihedral ſummits, of a ſteel

ſteel grey colour, projecting from the ſurface of amorphous grey miſpickel intermixed with white quartz. *Freyberg.*

R. de L. Pl. 7, *Fig.* 10.

XXIV. *a* 2. The ſame in ſmaller cryſtals, with tranſparent priſmatic quartz, on a mixture of granulated miſpickel and aſh-coloured micaceous ſchiſtus. *Saxony.*

XXV. *a* 3. In larger and ſhorter rhomboidal priſms, having the pyramids of both extremities completely truncated, alſo with tranſparent quartz, on a mixture of miſpickel and blende. *Freyberg.*

R. de L. Pl. 7, *Fig.* 7, 4.

XXVI. *a* 4. In ſtill larger rhomboidal cryſtals, of a yellowiſh grey colour and ſcaly texture, with quartz, pearlſpar, blende, galena, and yellow pyrites. *Saxony.*

XXVII. *a* 5. Similar to the laſt, ſcabrous on the ſurface, in brown ſcaly blende with white priſmatic quartz. *Same place.*

XXVIII. *a* 6. The ſame, in ſmaller cryſtals, ſmooth on the ſurface, with minutely cryſtalliſed lenticular ponderous ſpar, on dark brown ſcaly blende. *Braunſdorf.*

XXIX. *a* 7. In ſmall ſhining rhombic cryſtals, diſperſed through a dull grey ſpongy irregular maſs of miſpickel, on ſemitranſparent white quartz. *Freyberg.*

b. Indeterminate.

VARIETY II. *AMORPHOUS.*

a. Granular.

XXX. *b* 1. Of a ſtriated texture and ſilver white colour, with brown blende, yellow pyrites and white quartz. *Cornwall.*

XXXI. *c* 1. Compact and of an angular fracture, without matrix. *Same place.*

GENUS

GENUS IV. *COBALT.*

Cobaltum. Cobalt, Fr. *Kobelt*, Germ.

When free from its general concomitants, arſenic, iron, and nickel, this ſemimetal is of a light or bluiſh grey colour, and of metallic ſplendour, if tarniſhed inclining to red; its fracture compact, uneven, and of a fine grain; nearly of ſufficient hardneſs to give fire with ſteel; brittle; ſpecific gravity according to *Briſſon* 7.811; even when moſt pure, obedient to the magnet. It is almoſt as difficult of fuſion as caſt iron. In the open fire it is ſlowly converted into a very deep blue or black oxyde, which communicates a blue colour to glaſs of borax, to both the fixed alkalis and to microcoſmic ſalt. In the ſulphuric and marine acids it is only ſoluble by the aſſiſtance of heat; the nitric and oxymuriatic acids diſſolve it more readily, more eſpecially the latter: in this its ſolution is of a reddiſh colour, and if diluted and uſed as an ink *(Sympathetic Ink)* poſſeſſes the property of changing to a blue colour, and if iron be preſent to a green on expoſure to heat, and of becoming inviſible when cold. It diſſolves alſo in ſolution of ammoniac. Cobalt is underſtood to be capable of combining with all the other metallic ſubſtances, with the exception of ſilver, mercury, lead, and biſmuth; with zinc it unites with difficulty, with difficulty alſo with ſulphur, but more readily with alkaline ſulphurets. The chief uſes of cobalt and its ores are, in glaſs-making, enamelling and painting. Its ores are,

SPECIES I. *GREY COBALT ORE.*

Cobalt arſenical, Born. *Grauer-Speiſskobelt*, Germ.

A variety in the proportion of their conſtituent parts, *viz.* Arſenic, Sulphur, and Iron, conſtitutes the chief difference between this, the ſulphuret of cobalt (SPECIES IV.) and the white cobalt ore (SPECIES V.), or the *Grauer Speiſskobelt*, *Weiſer-Speiſskobelt*, and *Glanzkobelt*, Germ. which paſs into each other by inſenſible degrees. The grey is generally in its freſh fracture of a bright ſteel grey colour and metallic ſplendour, but upon expoſure, becomes dull and greyiſh black or variegated. It occurs either in lumps, interſperſed, or of particular forms, as dendritic, ſtalactitic, botryoidal, &c. or cryſtalliſed in ſmooth cubes and their modifications. Its fracture compact, more or leſs uneven and of a fine grain; brittle; of ſufficient hardneſs to give fire with ſteel, and when ſtruck exhales a ſtrong arſenical ſmell; ſpecific gravity, according to *Kirwan*, from 5.309 to 5.511. In the nitric or oxymuriatic acid it diſſolves with effervеſcence. Under the blow-pipe it gives out an arſenical ſmoke without fuſing, but by means of glaſs of borax or black flux, it eaſily undergoes reduction and produces a dark blue ſlag. A ſpecimen of

of this ore from *Cornwall*, analyſed by *Klaproth*, contained Cobalt 20, Iron 24, Arſenic 33, the remainder Biſmuth, with a ſmall proportion of Sulphur. It is found frequently intermixed with and accompanied by the red oxyde and other ores of cobalt; often with kupfernickel, oxyde of nickel, and native biſmuth; alſo with the ores of ſilver, copper, iron, lead, zinc and arſenic, in calcareous pearl or ponderous ſpars, fluor, quartz, hornſtone, &c. and is principally obtained from the mines of *Saxony*, *Bohemia*, *Norway*, and *Sweden*.

VARIETY I. *CRYSTALLISED.*

I. Pure cobalt, artificially cryſtalliſed on the ſurface.

II. *a* 1. In ſmooth aggregated cubes truncated in both their angles and edges, of a ſteel grey colour, on compact grey cobalt intermixed with kupfernickel. *Schneeberg?*

b. Indeterminate.

VARIETY II. *OF PARTICULAR SHAPES.*

III. *a* 1. Of a reticular ſtructure and obſcure grey colour, intermixed with minutely cryſtalliſed red ſilver ore. *Marienberg.*

IV. *a* 2. The ſame, with a ſmall proportion of ponderous ſpar. *Same place.*

V. *a* 3. Of a knitted texture and dark ſteel grey colour, without any admixture. *Annaberg.*

VI. *a* 4. The ſame, cut and poliſhed. *Same place.*

VII. *a* 5. The ſame, of a lighter colour, with capillary native ſilver, and intermixed with white ponderous ſpar. *Saxony.*

VIII. *a* 6. Forming dendritic ramifications in fleſh-coloured ponderous ſpar, with a ſmall proportion of native ſilver. *Alva, Scotland.*

IX. *b* 1. Of a light ſteel grey colour, partly arboreſcent, reſembling the head of a cauliflower, and partly in aggregated cubes truncated, with arboreſcent kupfernickel. *Schneeberg.*

X. *b* 2. Of a dark lead grey colour and compact texture, tuberculated on the ſurface and incruſted with red oxyde of cobalt. *Same place.*

VARIETY

VARIETY III. *AMORPHOUS.*

XI. *a* 1. Of a laminated texture, the laminæ interſecting each other in various directions. *Schneeberg.*

XII. *b* 1. Of a granular texture and light ſteel grey colour, intermixed with whitiſh calcareous ſpar. *Sahlberg.*

XIII. *b* 2. Of a fine ſteel grained compact texture, incruſted on one ſide by whitiſh pyramidal quartz. *Schneeberg.*

c. Compact.

SPECIES II. *NATIVE OXYDE OF COBALT.*

Oxide ou *Chaux de Cobalt*, Fr. *Schwarzer-Brauner*-und *Gelber-Erdkobelt*, *Schwarzer-Kobeltmulm*, Germ.

The oxyde of cobalt, like the oxydes of moſt of the other metallic bodies, occurs either in a powdery form or of different degrees of induration, and of different colours; hence divided by *Werner* and others into different families, viz. 1ſt. browniſh, bluiſh, or greyiſh black, 2d. liver brown, 3d. ſtraw or greyiſh yellow. It is found either ſuperficial, interſperſed, or in lumps; ſometimes botryoidal or reniform or bearing particular impreſſions. The indurated has an earthy fracture and is dull, but becomes more ſplendid by the ſtreak; ſo ſoft as generally to ſoil the fingers; ſpecific gravity of the black, according to *Kirwan*, from 3 to 4, ſometimes lower. Under the blowpipe it generally gives out a ſlight arſenical ſmell, but is infuſible *per ſe*. To glaſs of borax it imparts a beautiful blue colour, and is ſometimes in part reduced. A variety of the black from *Schneeberg* is ſtated by *Mr. Kirwan* to be ſoluble both in the nitric and muriatic acids, giving with the former a reddiſh, with the latter, a bluiſh green ſolution. The aſſociates of this ore, the conſtituent parts of which have not as yet been accurately aſcertained, are, iron ochre, iron pyrites, arſeniate of cobalt and alſo oxyde of nickel, ſilver and copper ores with quartz, ponderous and calcareous ſpars, indurated clay, &c. It is met with as well in primitive as in alluvial mountains, and principally at *Schneeberg* and *Kamſdorf* in *Saxony*, at *Saalfeld* in *Thuringia*, at *Alpierſpach* and *Reinerzau* in the duchy of *Wirtemberg*, at *Wittichen* in the principality of *Furſtenberg*, at *Kitzbichel* in the *Tyrol*, and at *Allemont* in *Dauphiné*.

VARIETY I. *OF PARTICULAR SHAPES.*

a. Botryoidal.

b. Reniform.

VARIETY II. *AMORPHOUS.*

XIV. *a aa* 1. Of a dark blue colour, and friable earthy texture. *Schneeberg.*

XV. *a aa* 2. The ſame, of an indurated ſpongy texture, intermixed with yellow ochre and pale green oxyde of nickel. *Same place.*

XVI. *a bb* 1. Of a black colour and indurated, with plated ponderous ſpar. *Biber, Heſſe.*

XVII. *a bb* 2. The ſame, without matrix, having a greeniſh yellow incruſtation on the ſurface. *Dauphiné.*

XVIII. *a bb* 3. Of a bluiſh black colour in whitiſh ponderous ſpar. *Biber.*

XIX. *a bb* 4. Of a blackiſh colour, intermixed with arſenate of cobalt, in yellowiſh ſuber-montanum. *Johngeorgenſtadt.*

XX. *a bb* 5. Of a black colour and indurated, containing native ſilver with arſeniate of cobalt. *Dauphiné.*

XXI. *a bb* 6. The ſame, of a flaty texture. *Schneeberg.*

XXII. *a bb* 7. The ſame, in a powdery form, having the appearance of lamp-black. *Same place.*

XXIII. *a cc* 1. Of a liver brown colour and indurated earthy texture. *Saalfeld.*

XXIV. *a cc* 2. In a ſandy form, of a brown colour and ſomewhat ſparkling. *Same place,* or *Schneeberg.*

SPECIES III. *ARSENIATE OF COBALT.*

Fleurs de Cobalt, Fr. *Rother-Erdkobelt,* Germ.

Arſeniate of cobalt, commonly called *Cobalt Bloom,* occurs for the moſt part either as a covering to, or intermixed with other cobalt ores *(Kobeltbeſchlag,* Germ.*)*; or cryſtal-

liſed in tetrahedral priſms terminated by dihedral pyramids having rhombic faces (*Kobeltblüthe*). Its colour pale or deep peach bloom. When amorphous it is dull, and of an earthy fracture; when cryſtalliſed, more or leſs tranſparent, and of a ſtriated or foliated fracture; its cryſtals ſmall, and generally diverging: in both caſes it is capable of being eaſily ſcratched by the knife, ſometimes by the nail. Before the blow-pipe it emits a weak arſenical ſmell, becomes of a blackiſh grey colour without fuſing, but to glaſs of borax communicates a fine blue colour. The Arſenic which it contains is juſtly conſidered as united in a ſtate of Acid with the Oxyde of Cobalt. It is moſt commonly met with in the ſame mines which produce the native oxyde, and accompanied with nearly ſimilar ſubſtances.

VARIETY I. *CRYSTALLISED.*

a. In tetrahedral priſms terminated by dihedral pyramids having rhombic faces.

XXV. *b* 1. In ſemitranſparent ſhort priſms, diverging from a common centre and of a pale red colour, forming numerous ſtellæ in ochry indurated clay.
Catal. de Raab. 5 D. a. *b.* 4. *Schmolnitz, Hungary.*

VARIETY II. *AMORPHOUS.*

XXVI. *a* 1. Of a peach bloom colour, forming ſmall tubercles on plated ponderous ſpar. *Saalfeld.*

XXVII. *a* 2. Forming a ſpongy incruſtation, of a pale peach bloom colour, on agglutinated ſchiſtus. *Schneeberg.*

XXVIII. *a* 3. In ſmall tubercles, of a peach bloom colour, on a mixture of quartz and aſh-coloured indurated clay. *Saalfeld.*

XXIX. *a* 4. The ſame, on browniſh ſpongy clay. *Same place.*

XXX. *a* 5. The ſame, with pale green effloreſcing oxyde of nickel on the ſurface. *Cornwall.*

XXXI. *a* 6. The ſame, on decompoſing grey cobalt ore, with a browniſh and aſh-coloured effloreſcence on the ſurface. *Alva, Scotland.*

XXXII. *a* 7. In a compact maſs, intermixed with white ponderous ſpar. *Saalfeld.*

XXXIII. *a* 8.

XXXIII. *a* 8. Incrusting the surface of an irregular agglutinated mass of black oxyde of cobalt and white indurated clay. *Biber.*

XXXIV. *a* 9. Intermixed with green and blue carbonate of copper, and white plated ponderous spar, on decomposing grey cobalt ore. *Saalfeld.*

XXXV. *a* 10. Intermixed with green carbonate of copper, on grey cobalt ore. *Same place.*

b. Efflorescent.

SPECIES IV. *SULPHURET OF COBALT.*

Cobalt sulphuré, Born. *Glanzkobelt*, Germ?

Baron Born states this to be entirely devoid both of arsenic and iron, though in its external characters very analogous to the white cobalt ore. (SPECIES v.) He describes it as being, either amorphous or crystallised, in cubes and their modifications; of a whitish colour and granular texture; much disposed to tarnish and assume a steel grey colour on exposure to the air; as giving fire difficultly with steel, and on the application of heat emitting a sulphureous vapour free from any arsenical smell. The only specimens he mentions are from *Kegel* at *Schmolnitz* in *Upper Hungary*, and from *Joachimsthal* in *Bohemia*; the first employed at *Glokniz* in the preparation of the finest kind of smalt. Vide *Catal. de Raab.* Tom. 2. P. 183, 184.

VARIETY I. *CRYSTALLISED.*

XXXVI. *a* 1. In small distinct smooth cubes, of a dull steel grey colour, imbedded in dark grey quartz with native bismuth on the surface. *Schneeberg.*

XXXVII. *a* 2. In smaller cubes, with native bismuth, both superficial and interspersed. *Joachimsthal.*

b. Indeterminate.

VARIETY II. *AMORPHOUS.*

a. Granular.

b. Compact.

SPECIES V. *WHITE COBALT ORE.*

Cobalt blanc, Fr. *Weiſer-Spieſskobelt*, Germ.

The compoſition of this appears to be intermediate between that of the grey ore and the ſulphuret: like theſe it is found either amorphous or interſperſed, or of particular ſhapes, or more or leſs diſtinctly cryſtalliſed; the figure of its cryſtals, the cube and its modifications, their ſurface ſometimes ſtriated; its colour tin white, inclining, on expoſure, to yellow, red, or grey, ſometimes variegated; its luſtre metallic; its texture compact, uneven, and granular, ſometimes laminated; almoſt always of ſufficient hardneſs to give fire with ſteel; very ponderous and brittle. It diſſolves with effervescence both in the nitric and oxymuriatic acids. Under the blow-pipe it melts with more or leſs facility according to the proportion of arſenic, and on expoſure to a gradual heat emits at firſt an arſenical and afterwards a ſulphureous vapour, leaving behind a greyiſh oxyde, by which, according to the proportion of iron, a more or leſs perfect blue colour is communicated to glaſs of borax. The aſſociates of this ore are nearly ſimilar to thoſe of the grey. In *Saxony* and *Norway*, it is met with in micaceous ſchiſtus, at *Tunaberg* in *Sweden* in large and detached cryſtals.

VARIETY I. *CRYSTALLISED.*

XXXVIII. *a* 1. In large cubes truncated in their angles, of a tin white colour, ſmooth and ſplendid, with white opake calcareous ſpar. *Hartz.*

XXXIX. *a* 2. The ſame, in aſh-coloured indurated clay with quartz.
St. Marie aux Mines.

XL. *a* 3. In ſmall cubes, alſo truncated at their ſolid angles, of a perfect tin white colour and very ſplendid, imbedded in white calcareous ſpar. *Schneeberg.*

XLI. *a* 4. In large detached cubes, of a reddiſh white colour, ſtriated on the ſurface, and bevilled at all their edges. *Tunaberg, Sweden.*
R. de L. Pl. 2, *Fig.* 8.

XLII. *a* 5. In large diſtinct cubes, imbedded in fat quartz, with yellow copper ore.
Norway.

XLIII. *a* 6. In aggregated cubes having their ſolid angles deeply truncated, with white ponderous ſpar, on grey ſchiſtus. *Biber*, in *Heſſe.*

XLIV. *a* 7.

XLIV. *a* 7. In ſmall cubes variouſly truncated, and irregularly aggregated into branches, partly incruſted with tranſparent cryſtalliſed quartz and cryſtalliſed calcareous ſpar. *Saxony.*

b. Indeterminate.

VARIETY II. *OF PARTICULAR SHAPES.*

a. Reniform.

VARIETY III. *AMORPHOUS.*

XLV. *a* 1. Of a granular texture and reddiſh white colour, intermixed with black mica. *Norway.*

LXVI. *a* 2. The ſame, with a ſmaller proportion of mica, poliſhed on the ſurface. *Kongſberg.*

XLVII. *b* 1. In a thin layer and ſpecular on the ſurface, lying on white quartz. *Biber*, in *Heſſe.*

GENUS V. *ZINC.*

Zincum. Zinc, Fr. *Zink*, Germ.

Zinc is a ſemimetal of a light bluiſh or tin white colour, with common metallic luſtre; when tarniſhed inclining to a leaden grey, though comparatively but little ſubject to alteration on expoſure to the air. Its texture is broad ſtriated, paſſing into foliated. It bears the impreſſion of the hammer, and may even by compreſſion be ſqueezed into thin plates. Its ſpecific gravity, in its common form, is, according to *Bergman*, 6.862, when pure and compreſſed 7.190, according to *Briſſon.*

The effects of heat upon zinc are more remarkable than upon moſt other metallic bodies; for though in a certain degree malleable when cold, if heated it becomes ſo brittle as to be reducible into powder. It melts at about 700 *Farenh.* and in cloſe veſſels ſublimes unchanged, but in contact with air it burns with a luminous greeniſh and ſomewhat bluiſh white flame, and is converted into a flocculent oxyde *(Flowers of Zinc)* vitrifiable by a more intenſe heat into a yellowiſh glaſs. It is more or leſs ſoluble in all the acids, and has for them ſuch an attraction, as enables it to decompoſe moſt of the other metallic ſolutions. With the ſulphuric acid it produces the common *White Vitriol*, *Salt* or *Sulphate* of *Zinc.* Almoſt equally general is its diſpoſition to unite with the other metals, nickel and biſmuth being the only ones with which it cannot be combined by fuſion. With iron and cobalt it unites with more difficulty than with the reſt. It renders theſe, and all the others with which it is capable of combining, brittle and

and more volatile; and to ſuch as melt with difficulty it alſo communicates a degree of fuſibility. The brittleneſs which it occaſions is however leaſt remarkable in its union with tin and lead. To copper it imparts a golden yellow colour, as in the preparation of *Braſs*. With quickſilver it amalgamates with ſuch facility as to be ſeparable by it not only from copper, but from many of its other metallic mixtures.—From theſe it may be alſo eaſily freed by means of ſulphur, with which in no proportion nor in any way is it capable of being combined. The chief uſes of this ſemimetal are, in the compoſition of braſs, pinchbeck, princes-metal, tomback, tinſel, electrical amalgam, &c. and in certain medicinal preparations. Its ores are,

SPECIES I. *NATIVE OXYDE OF ZINC.*

Calamine. Calamine, Fr. *Gemeiner-Galmei*, Germ.

The colour of calamine varies according to the proportion of oxyde of iron with which it is intermixed, and is therefore generally yellowiſh, greyiſh, or reddiſh white, ochry or orange yellow, or yellowiſh brown, ſometimes yellowiſh, ſmoke or aſh-grey; when pure it is white; many of theſe colours are often met with in the ſame ſpecimen. Although for the moſt part found in lumps and interſperſed, it very frequently alſo occurs ſuperficial, cellular, or of particular ſhapes, as botryoidal, ſtalactitic, or forming ſecondary cryſtals by having ſupplanted calcareous ſpars, fluors, &c. It is without luſtre, and opake. When indurated its fracture is either earthy or compact, uneven, and of a fine grain, ſometimes fiſſile; ſeldom of ſufficient hardneſs to give fire with ſteel; ſpecific gravity, according to *Born*, from 4.4 to 5; according to *Kirwan* of one ſpecimen 2.585, of another 4.019. It diſſolves both in the vitriolic and nitric acids, and ſometimes with effervescence. Before the blow-pipe it decrepitates if ſuddenly heated, and becomes of a lighter colour, but reſiſts fuſion. By the experiments of *Margraff*, it yields from $\frac{1}{7}$ to $\frac{1}{4}$ its weight of Zinc; by *Bergman* from 100 parts of beſt prepared calamine were obtained, Oxyde of Zinc 84, Oxyde of Iron 3, Silex 12, Alumine 1. Such as does not contain at leaſt 30 per cent. of zinc is in the opinion of *Baron Born* unfit to be employed in the manufacture of braſs. Calamine is met with in *Bohemia, Poland, Weſtphalia, Carinthia*, and many other parts; and in great abundance in *Derbyſhire, Cumberland, Northumberland*, and ſeveral of the other counties of *Great Britain*, aſſociated with iron ochre, brown hematite, galena, ſpathoſe lead ore, calcareous ſpar, fluor, indurated clay, &c.

I. Pure regulus of zinc.

VARIETY

VARIETY I. *OF PARTICULAR SHAPES.*

II. *a* 1. Supplanting aggregated cryſtals of double pyramidal calcareous ſpar, hollow, cellular, and ochry, on the ſurface of cubic fluor. *Derbyſhire.*

III. *a* 2. Supplanting aggregated cubes of fluate of lime, on an irregular compact maſs of the ſame, intermixed with galena. *Same place.*

IV. *a* 3. Supplanting trihedral pyramids of calcareous ſpar, of a light brown colour, and internally cellular. *Wales.*

V. *a* 4. In large pyramidal cryſtals of the ſame, of an obſcure greeniſh yellow colour, internally cellular and ochry. *Same place.*

VI. *a* 5. In aggregated indeterminate cryſtals, of a dull white colour and ochry on the ſurface, forming numerous ramifications on opake grey quartz. *Pyrenees.*

VII. *b* 1. In ſhort ſtalactites, of a ſpongy texture and light brown colour, becoming dark on expoſure, and incruſted with pale yellow pyrites. *Aix la Chapelle.*

VIII. *b* 2. Of a browniſh yellow colour and cellular texture, having the ſurface covered by a mammillated incruſtation of the ſame. *Derbyſhire.*

IX. *b* 3. Of a paler colour, compact, ſemitranſparent, and mammillated on the ſurface. *Same place.*

X. *b* 4. Of a ſtill paler colour, cavernous ſtructure, and having ſmaller mammillæ. *Same place*

XI. *b* 5. Of a pale ſky-blue colour, having the texture of porcelain, botryoidal on the ſurface, and in part covered by a browniſh incruſtation. *Wanlockhead, Dumfries.*

XII. *b* 6. In a ponderous cavernous maſs, of a greeniſh yellow colour, having its cavities lined with numerous mammillæ. *South Wales.*

XIII. *b* 7. Of a reddiſh yellow colour, forming a compact tuberculated incruſtation on amethyſtine fluor. *Same place.*

XIV. *b* 8. Forming a tubercular incruſtation, partly white, partly light brown, on the ſurface of decompoſing fluor. *Same place.*

XV. *b* 9. The ſame, of an ochry yellow colour. *Derbyſhire.*

VARIETY II. *AMORPHOUS.*

XVI. *a* 1. Of a dull reddiſh white aſh-colour, indurated and of an earthy texture. *Carinthia.*

XVII. *a* 2. The ſame, of a white colour, reſembling chalk. *Bavaria.*

XVIII. *a* 3. The ſame, on browniſh indurated clay. *Carinthia.*

XIX. *b* 1. Of an ochry colour and ſpongy texture, intermixed with brown blende. *Spain.*

XX. *b* 2. Of a reddiſh brown colour and more ſpongy texture, formed on red calcareous ſpar. *France.*

XXI. *b* 3. Of a browniſh ochry colour, and cellular texture. *Germany.*

XXII. *b* 4. Of an ochry yellow colour and cellular ſtructure, on the ſurface of confuſedly cryſtalliſed calcareous ſpar. *Derbyſhire.*

c. Friable.

SPECIES II. *CARBONATE OF ZINC.*

Zinc ſpathique, Fr. *Zinkſpath*, Germ. *Blättriger-Galmei*, Karſten.

This, in proportion to its purity, is more or leſs white and tranſparent; commonly however its colour is yellowiſh grey, paſſing into the yellowiſh white, Iſabella or ochry yellow, ſometimes greeniſh or bluiſh white. It is found in lumps, or interſperſed; more frequently however of particular ſhapes, as mammillated or reniform; or cryſtalliſed in compreſſed hexhedral priſms with dihedral ſummits, or in quadrangular tables and their modifications, the cryſtals commonly more or leſs aggregated, and often diverging. It has generally a mother-of-pearl ſplendour; its fracture radiated, inclining to the foliated; ſometimes of ſufficient hardneſs to give fire with ſteel; brittle; ſpecific gravity of the greeniſh grey cryſtals according to *Briſſon* 3.523. Under the blow-pipe it loſes its colour, but is neither fuſible *per ſe* nor with the addition of borax. By calcination it loſes about $\frac{1}{4}$ of its weight. With the mineral acids, in which it effervesces, it becomes gelatinous, and hence was formerly miſtaken for zeolite. According to *Bergman* a ſpecimen of this ore from *Holywell* in *Flintſhire*, contained Oxyde of Zinc (with perhaps a little Iron) 65, in another from the ſame place *Margraaf* found 60 per cent. of the Oxyde, Carbonic Acid 28, Water 6; a ſtriated maſs examined by *Pelletier* yielded Carbonate

Carbonate of Zinc 36, Silex 48.52, Water 8.12. It is found principally at *Bleiberg* and *Raibel* in *Carinthia*, at *Hofsgrund* near *Freyberg* in the *Brisgaw*, at *Tirnitz* in *Stiria*, &c.

VARIETY I. *CRYSTALLISED.*

XXIII. *a* 1. In numerous ſlender, converging and ſomewhat flatted hexhedral priſms with dihedral ſummits, tranſparent and of a pearly luſtre, covering the ſurface of an irregular compact maſs of carbonate of zinc (*Zeolitiform, Zinc ore*). *Fribourgh, Briſgau.*

XXIV. *b* 1. In tranſparent oblong quadrangular tabular cryſtals, bevilled at their edges and angles, on whitiſh ochry calamine. *Tranſylvania.*
Catal. de Raab. IV. C. b. 2.

XXV. *b* 2. The ſame, irregularly aggregated and extended on the ſurface of yellowiſh ochry calamine. *Carinthia.*

c. Indeterminate.

VARIETY II. *OF PARTICULAR SHAPES.*

XXVI. *a* 1. Forming a ſemitranſparent yellowiſh white mammillated incruſtation, of a radiated texture, on cellular ochry calamine. *Carinthia.*

XXVII. *a* 2. The ſame, on decompoſing red copper ore. *Tranſylvania.*

XXVIII. *a* 3. In ſmall cryſtals, aggregated into irregular tubercles. *Carinthia.*

XXIX. *a* 4. The ſame, lining a cavity in yellowiſh ochry calamine. *Brittany.*

SPECIES III. *SULPHATE OF ZINC.*

Sulphate ou *Vitriol de Zinc*, Fr. *Zinkvitriol*, Germ.

Native ſulphate of zinc is generally met with either efflorеſcent or capillary, or in the form of ſmall ſtalactites, and of a white, grey, yellow, or reddiſh white colour, and ſtrongly ſtyptic taſte. When artificially cryſtalliſed, it aſſumes the form of rhomboidal priſms terminated by tetrahedral pyramids, ſoluble in about twice their weight of common water, and ſlowly efflorеſcent on expoſure to the air. In this ſtate a hundred parts contain, according to *Born*, Zinc 20, Sulphuric Acid 22, Water 58; according to *Kirwan*, Oxyde of Zinc 20, Metallic Zinc 26.4, Acid 12, Water 40; and according to

Bergman, Zinc 20, Acid 40, Water 40. The native ſulphate contains always a certain proportion both of Oxyde of Iron and of Copper. Under the blow-pipe it effervesces, but without becoming luminous; it effervesces alſo with borax, microcoſmic ſalt, and the fixed alkalis. It occurs in the zinc mines of the *Black Foreſt*, *Sweden*, *Bohemia*, *Auſtria* and *Hungary*, and is probably in moſt inſtances the reſult of the decompoſition of certain kinds of pyrites.

VARIETY I. *CRYSTALLISED.*

a. In rhomboidal priſms with tetrahedral pyramids.

b. Indeterminate.

VARIETY II. *OF PARTICULAR SHAPES.*

a. Stalactitic.

SPECIES IV. *BLENDE.*

Blende, Sulphure de Zinc, Fr. *Blende*, Germ.

By Mr. *Werner* and other German authors this ore is diſtinguiſhed into three ſpecies, viz. *Gelbe-braune-und ſchwarze Blende*, its colour being generally of different ſhades of yellow, brown, and black; as ſulphur, honey, or wax yellow, inclining often to yellowiſh green, or grey; yellowiſh or reddiſh brown, or blood red; or dark or browniſh black: theſe colours, however, paſs continually into each other by inſenſible degrees, and in the other properties of theſe different kinds of blende there is no important difference. It occurs either in lumps, interſperſed, or cryſtalliſed, and generally in tetrahedrons or octohedrons and their modifications. Its cryſtals are ſeldom diſtinct, on the contrary, for the moſt part, very confuſedly aggregated; their ſurface generally ſpecular, internally approaching to the vitreous or even diamond ſplendour. When cryſtalliſed it is generally more or leſs tranſparent in proportion to the lightneſs of its colour. Its texture is always foliated; hardneſs not ſufficient to give fire with ſteel; when ſcraped with the knife giving a lighter coloured ſtreak and ſulphureous ſmell, and ſometimes, more eſpecially the yellow, becoming phoſphoreſcent when rubbed in the dark. It is brittle; ſpecific gravity from 3.770 to 4.067. By *Bergman*'s analyſis a ſpecimen of the yellow phoſphoreſcent blende from *Scharfenberg* in *Saxony* yielded Zinc 64, Sulphur 20, Iron 5, Acid of Fluor 4, Silex 1, Water 6; another of a reddiſh brown colour from *Sahlberg* in *Sweden*, Zinc 44, Sulphur 17, Iron 5, Silex 24, Alumine 5, Water 5; and a third

of a black colour from *Dannemora*, Zinc 45, Sulphur 29, Iron 9, Lead 6, Arſenic 1, Silex 4, Water 6. The greater part of it is ſoluble in the nitric acid, much nitrous gas being evolved and the ſulphur remaining behind. The acids are ſaid by *Kirwan* to act on the black blende with efferveſcence, while the others are ſlowly ſoluble and do but ſlightly efferveſce unleſs heat be employed. Under the blow-pipe this ore decrepitates, emits a whitiſh ſmoke, but does not melt either *per ſe* or with glaſs of borax; by a continuance of the heat it is converted into a greyiſh oxyde. It is generally found aſſociated with galena, grey copper ore, pyrites, or native, vitreous and other ſilver ores, in a matrix of quartz, calcareous, pearl and fluor ſpar, at *Freyberg* and *Scharfenberg* in *Saxony*, at *Sahlberg* and *Dannemora* in *Sweden*, at *Schemnitz* and *Kremnitz* in *Hungary*, at *Ratiborſchitz*, *Kuttenberg* and *Przibram* in *Bohemia*; at *Stollberg* and *Klauſthal* in the *Hartz*; and alſo in the mines of *Upper* and *Lower Hungary*, *Tranſylvania*, *Norway*, &c. and very abundantly in *Cornwall*, *Derbyſhire*, *Northumberland*, *Cumberland*, and various other parts of *Great Britain*.

VARIETY I. *CRYSTALLISED.*

XXX. *a* 1. In tetrahedrons of a black colour, with tranſparent priſmatic quartz, on chlorite intermixed with yellow copper ore. *Cornwall.*

XXXI. *a* 2. In ſmaller tetrahedrons of a dull lead colour, with longer priſmatic quartz on white quartz, intermixed with pyrites. *Same place.*

XXXII. *a* 3. In large brilliant cryſtals deeply truncated at their ſummits, of a yellowiſh brown colour, irregularly aggregated and partially coated by minute cryſtals of priſmatic quartz. *Bohemia.*

XXXIII. *a* 4. In a large ſplendid ſolitary cryſtal truncated at the apex, encloſed in tranſparent cryſtalliſed quartz. *Hartz.*

XXXIV. *a* 5. In aggregated tetrahedrons, of a blackiſh brown colour, deeply truncated at all their ſolid angles. *Cornwall.*

R. de L. Pl. 1, *Fig.* 2.

XXXV. *a* 6. The ſame, of a lighter brown colour, on yellow copper ore. *Hartz.*

XXXVI. *a* 7. The ſame, in large ſplendid cryſtals, of a dark reddiſh brown colour, ſemitranſparent and irregular, aggregated on browniſh rhombic ſpathoſe iron ore. *Saxony.*

XXXVII. *b* 1. In large aggregated octohedrons, of a dark brown colour and iri-

 deſcent

deſcent on the ſurface, on galena, with minutely cryſtalliſed quartz and yellow pyrites.
Tranſylvania.

XXXVIII. *b* 2. In aggregated octohedrons truncated at all their ſolid angles, with priſmatic miſpickel. *Meiſſen.*
R. de L. Pl. 3, *Fig.* 4.

XXXIX. *b* 3. The ſame, in very brilliant cryſtals of a dark yellowiſh brown colour, on cryſtalliſed tuberous yellow copper ore, with cubic galena.
Kapnic, Tranſylvania.

XL. *b* 4. The ſame, with cubic cryſtals of galena, covered with a quartzy incruſtation, on cryſtalliſed quartz mixed with galena and blende. *Hartz.*

XLI. *b* 5. In large cuneiform octohedrons truncated in their angles, incruſted with minutely cryſtalliſed yellow pyrites and quartz, on an amorphous maſs of blende of a black colour and ſomewhat irideſcent. *Bannat.*
R. de L. Pl. 3, *Fig.* 5.

XLII. *b* 6. Of a light browniſh yellow colour and lamellar texture, in octohedral pyramids joined baſe to baſe and terminated obtuſely by tetrahedral ſummits, forming cryſtals of 24 ſides, with yellow cubic pyrites, on blende of the ſame kind.
R. de L. Pl. 4, *Fig.* 110. *Schneeberg.*

XLIII. *b* 7. In large aggregated reſin-like tranſparent polyhedral cryſtals, having 24 convex faces, with cryſtalliſed quartz, on grey indurated ſchiſtus. *Hartz.*
R. de L. Pl. 1, *Fig.* 29.

XLIV. *b* 8. The ſame, in large reddiſh brown cryſtals, partially incruſted with minutely cryſtalliſed quartz. *Hungary.*

XLV. *c* 1. In fragments of a light greeniſh yellow colour, on ochry calamine intermixed with brown blende. *Auvergne.*

XLVI. *c* 2. In indeterminate cryſtals, of a browniſh yellow colour inclining to red, with chryſtalliſed calcareous ſpar, on grey limeſtone. *Brittany.*

XLVII. *c* 3. In polyhedral cryſtals, black, ſplendid and confuſedly aggregated, with minutely cryſtalliſed yellow pyrites, on grey argillaceous quartz.
Alſton Moor, Cumberland.

XLVIII. *c* 4. The ſame, with rhomboidal pearl ſpar and cubic yellow pyrites, on a ſimilar matrix. *Same place.*

XLIX. *c* 5.

XLIX. *c* 5. The ſame, on a layer of tranſparent cryſtalliſed quartz. *Same place.*

L. *c* 6. The ſame, with tranſparent purple cubic fluor, on impure grey quartz. *Same place.*

LI. *c* 7. Fragment of a large tranſparent cryſtal, of a browniſh yellow colour and laminated texture. *Bohemia.*

Catal. de Raab. IV. A. a. *b.* 7.

VARIETY II. *AMORPHOUS.*

LII. *a* 1. Of a foliated texture and reddiſh yellow colour, mammillated and covered by an incruſtation of ſtriated yellow pyrites ſuperficially variegated, on grey indurated clay intermixed with white quartz. *Hungary.*

LIII. *a* 2. The ſame, of a pale brown colour, intermixed with purple fluor, on a layer of grey iron ore. *Lorraine.*

LIV. *a* 3. The ſame, of a reddiſh brown colour, intermixed with white quartz. *Staffordſhire.*

LV. *a* 4. The ſame, in larger ſcales and variegated on the ſurface, with white quartz, ſpathoſe iron ore and yellow pyrites. *Joachimſthal.*

LVI. *a* 5. Of a ſcaly texture and reddiſh brown colour, intermixed with grey ſilver ore, yellow pyrites and galena, in aſh-coloured ſand ſtone. *Scharfenberg.*

LVII. *a* 6. The ſame, of a reddiſh brown colour variegated with blue and purple, with veins of white quartz. *Paris Mine, Angleſea.*

LVIII. *a* 7. The ſame, encloſing a vein of tranſparent gypſum and ſaid to be rich in gold. *Bohemia.*

LIX. *a* 8. Of a large ſcaly texture and yellowiſh brown colour, with quartz and galena. *Altenberg.*

LX. *a* 9. The ſame, with grey ſilver ore and yellow pyrites. *Scharfenberg.*

LXI. *a* 10. The ſame, with galena and yellow pyrites, in opake whitiſh quartz. *China.*

LXII. *a* 11.

LXII. *a* 11. The ſame, of a reddiſh brown colour, having the ſurface variegated green and purple, and rendered irregular by numerous cryſtalline impreſſions.

LXIII. *a* 12. Of a browniſh black colour and compact ſcaly texture, ſhining and ſtriated on the ſurface, without matrix. *Hartz.*

LXIV. *a* 13. In large ſcales, of a reddiſh brown colour, with white quartz. *Same place.*

LXV. *a* 14. Forming ſhining ſtriæ of a greyiſh brown colour in aſh-coloured indurated clay.

LXVI. *a* 15. In ſmall ſcales having a granular appearance, intermixed with reddiſh white feldſpar. *Hungary.*

LXVII. *a* 16. Of a ſcaly texture and browniſh red colour, with galena, imbedded in white calcareous ſpar.

LXVIII. *a* 17. In large laminæ, of a bright leaden colour, variouſly aggregated and converging towards different centres, having on the ſurface ſomewhat of a cockſcomb appearance, with reddiſh indurated clay.

GENUS VI. *ANTIMONY.*

Antimonium. Antimoine, Fr. *Spieſsglas*, Germ.

Regulus of antimony is of a brilliant tin, or rather ſilver white colour, of a foliated or ſcaly texture and very brittle. Its hardneſs ſuch as to admit of being pretty eaſily ſcratched by the knife; ſpecific gravity from 6.624 to 6.860. It melts at about 810 of *Farenh.* and if allowed to cool ſlowly, (from its diſpoſition to cryſtalliſe) exhibits a ſtellated appearance on the ſurface. In cloſe veſſels it ſublimes unchanged; when expoſed in the open fire to a melting heat, it riſes in a white ſmoke, which under condenſation aſſumes the form of delicate needles; by calcination it is readily converted into a greyiſh oxyde, which being vitrified produces a glaſs of a pale hyacinthine colour. It diſſolves moſt eaſily in the oxymuriatic acid, the ſulphuric and muriatic require the aſſiſtance of heat, and by the nitric it is corroded or changed, by the rapid decompoſition of the acid, into a white inſoluble oxyde. It combines with all the other metallic ſubſtances without exception, rendering ſome of them more brittle and ſome harder: it amalgamates difficultly however with quickſilver, and deſtroys the magnetic property of iron. With ſulphur it unites eaſily in all proportions, producing with it

it a grey ſtriated compound (*Common* or *Crude Antimony*) of the ſhops. It is employed in the compoſition of printers types and other metallic mixtures, but principally as the baſis of many important medical preparations.

SPECIES I. *NATIVE ANTIMONY.*

Antimoine natif, Fr. *Gediegen-Speiſglas*, Germ.

Mr. Kirwan follows the German mineralogiſts in conſidering this and the following ſpecies as of the ſame family: they differ however in the important circumſtance, that with the one there is a certain proportion of arſenic, which the other is entirely free from. The ſpecies here deſcribed was firſt diſcovered in the year 1748 by the celebrated *Swab* at *Salberg* in *Carls Ort*, *Sweden*, and is found either in lumps or interſperſed, of a tin white colour, metallic luſtre, and foliated or ſtriated texture. Upon expoſure to the air it becomes ſuperficially tarniſhed. It is eaſily ſcratched by the knife, is brittle and of conſiderable weight. Before the blow-pipe it fuſes eaſily, and is converted into a white vitrifiable oxyde. It is totally ſoluble in *Aqua Regia*, and amalgamates readily with mercury. It has hitherto only been found in the place above mentioned in a matrix of calcareous ſpar or limeſtone.

I. Pure regulus of antimony artificially cryſtalliſed.

VARIETY I. *AMORPHOUS.*

II. *a* 1. Of a tin white colour, interſperſed through ſtriated grey antimonial ore.
Magellan's Cronſtedt, Var. 2, *Pag.* 793. *Salberg.*

SPECIES II. *NATIVE ARSENICAL ANTIMONY.*

Antimoine arſenical, Fr.

The external characters of this, for the diſcovery of which we are indebted to Mr. *Shreiber*, very nearly correſpond with thoſe of the foregoing, being of a tin white colour, metallic luſtre, foliated texture, yielding readily to the knife, and ponderous. It occurs alſo in lumps or interſperſed, ſometimes reniform or mammillated. Under the blow-pipe it fuſes eaſily, emits an arſenical odour, and like the other, is converted into a white vitrifiable oxyde. *Mr. Sage* ſtates the Antimony in this ore to be alloyed with 16 per cent. of Arſenic; but according to the opinion of *Monge Jun.* the Arſenic contained in it ſeldom exceeds 3 per cent., and is rather to be conſidered as accidentally intermixed, than in a ſtate of chemical combination. It is found in the mountain of *Chalances* at *Allemont*

Allemont in *Dauphiné*, aſſociated with grey, white and red antimonial ores, white cobalt ore, &c.

VARIETY I. *OF PARTICULAR SHAPES.*

a. Reniform.

III. *b* 1. Of a ſilver white colour and very brilliant, compoſed of concentric conchoidal layers mammillated on the ſurface. *Allemont.*

VARIETY II. *AMORPHOUS.*

a. Foliated.

SPECIES III. *NATIVE OXYDE OF ANTIMONY.*

Antimonial Ochre, Kirw. *Oxide d'Antimoine*, Fr. *Spieſsglaſokker*, Germ.

Is generally of a ſtraw or lemon yellow colour, ſometimes yellowiſh or reddiſh brown. It is found occaſionally in lumps or interſperſed, but for the moſt part as a covering to other antimonial ores, more eſpecially the grey. It is without luſtre, ſemi-indurated, and of an earthy texture. Before the blow-pipe it ſublimes without fuſion in the form of a white ſmoke; with glaſs of borax it effervesces ſtrongly, and is partially reduced. The grey antimonial ore, with which it moſt frequently occurs, is that of *Braunſdorf* near *Freyberg*, and of *Hungary*. The white acicular cryſtals diſcovered by *Mongez Junr.* at *Chalances* in *Dauphiné*, which he calls *Chaux d'Antimoine native*, and of which he has given an account in the *Journ. de Phyſiq.* 1783, *Tom.* 23, *P.* 66, are now generally underſtood to be a variety of the native muriate of Antimony, SPECIES IV.

VARIETY I. *AMORPHOUS.*

a. Superficial.

b. Interſperſed.

c. Earthy.

SPECIES

SPECIES IV. *MURIATE OF ANTIMONY.*

Muriate d'Antimoine, Fr. *Weiſs-Spieſsglaſerz*, Germ.

This very rare ore of antimony, diſcovered by *Roſeler* in 1787, is for the moſt part ſuperficial; and occurs either in ſtellated acicular needles, or more frequently in rectangular tetrahedral laminæ, of a white colour, ſemitranſparent, and of a diamond or mother of pearl luſtre; the laminæ often ſet edgewiſe and mortiſed into or paſſing through each other ſo as to form cells. It is brittle, of a foliated texture and heavy. Under the blow-pipe it decrepitates if ſuddenly heated, but when reduced to powder it fuſes, and is afterwards diſſipated in the form of a white ſmoke. By fuſion with borax it effervesces ſtrongly and yields ſmall reguline grains. It is totally ſoluble in Aqua Regia, and by the analyſis of *Haquet* and *Klaproth* appears to conſiſt of Oxyde of Antimony in union with Muriatic Acid. At *Chalances* in *Dauphiné* it is ſometimes intermixed with laminæ of grey antimonial ore, and at *Przibram* in *Bohemia*, from whence the fineſt ſpecimens have been procured, it is found on galena accompanied with red blende.

VARIETY I. *CRYSTALLISED.*

IV. *a* 1. In rectangular tetrahedral laminæ, of a mother of pearl colour and ſemitranſparent, on cryſtalliſed galena. *Malazka, Hungary.*

V. *a* 2. The ſame, with red blende, on galena. *Przibram.*
Catal. de Raab. III. D. a 1.

b. In ſtellated needle-like cryſtals.

SPECIES V. *RED ANTIMONIAL ORE.*

Oxide d'Antimoine combiné avec l'Acid arſenique et le Souſre, Kermes mineral natif, Fr. *Roth-Spieſsglaſerz*, Germ.

This alſo rare ore of antimony, though ſaid to occur ſometimes in earthy lumps or interſperſed, is moſt generally met with in delicate priſmatic friable cryſtals, or flexible ſilk-like filaments, of a browniſh purple colour, ſometimes inclining to blue or ſteel grey. Its cryſtals or filaments are for the moſt part diverging or ſtellated, ſometimes faſciculated. They are opake; ſpecific gravity ſaid to be 4.7. Before the blow-pipe they melt very eaſily and emit a weak ſulphureous ſmell, and by degrees are entirely diſſipated. The compoſition of this ore has not as yet been accurately inveſtigated, but by *Born* it

is ſtated to conſiſt of Antimony, Acid of Arſenic and Sulphur; *Mr. Sage* conſiders it as a *Native Kermes Mineral*. It is found generally accompanied with grey antimonial ore in white quartz at *Malazka* and *Cremnitz* in *Hungary*; with muriate of antimony at *Braunſdorf* in *Saxony*, and alſo with native antimony at *Allemont* in *Dauphiné*.

VARIETY I. *CRYSTALLISED.*

VI. *a* 1. In delicate ſilky filaments, of a dark browniſh red colour, concentrated into ſtars, with white opake quartz, indurated clay and yellow pyrites. *Braunſdorf.*

VII. *a* 2. In numerous diverging faſciculi, inclining more to the purple, on white ſpongy quartz with ſtellated ſulphuret of antimony and yellow pyrites. *Same place.*

VARIETY II. *AMORPHOUS.*

a. Interſperſed.

b. Earthy.

SPECIES VI. *SULPHURET OF ANTIMONY.*

Grey antimonial ore. Antimoine ſulfuré, Fr. *Grau-Spieſsglaſerz*, Germ.

There are few ores more remarkable than this for ſplendour and variety of form, and of the ores of antimony it is by much the moſt general. Its colour is bluiſh or ſteel grey, correſponding to that of the common antimony of the ſhops, which is indeed nothing elſe than this ore ſeparated from its impurities by means of fuſion. It is of metallic luſtre, and often beautifully variegated on the ſurface. It occurs in lumps, interſperſed, or more or leſs delicately cryſtalliſed. In the maſs its texture is either compact, granular or foliated, more commonly however divergingly ſtriated or fibrous; when cryſtalliſed, its form, if determinate, is that of compreſſed hexhedral priſms with obtuſe tetrahedral pyramids, which are either comparatively large, maſſy and longitudinally grooved, or more frequently in lengthened needle-like or capillary priſms diverging from different centres and variouſly decuſſating each other. It is opake; brittle; very eaſily ſcratched by the knife, ſometimes even ſo ſoft as to ſoil the fingers; gives a blackiſh powder; ſpecific gravity from 4.194 to 4.516. Its metallic part is moſt eaſily ſoluble in aqua regia, from which it may be precipitated in the form of an oxyde by the effuſion of water. Under the blow-pipe it is very eaſily fuſible, giving out a white ſulphureous ſmoke; on the diſſipation of its ſulphur by a more gentle heat it leaves a grey

grey vitrifiable oxyde, equivalent, according to *Bergman*, to about 74 per cent. of regulus.

Though moſt commonly aſſociated with different forms of quartz, it is alſo not unfrequently found with limeſtone, fluor, indurated clay, iron pyrites, and ponderous ſpar, through the ſolid cryſtals of which laſt thoſe of this ore paſs frequently in various directions. It is met with very abundantly in the mines of *Bareuth*, the *Bannat*, *Saxony*, *Tranſylvania*, *Tuſcany*, *Corſica*, and of many other parts; but more eſpecially rich and beautiful from *Cornwall*, *Lubillac* in *Auvergne*, and *Felſobanya* in *Upper Hungary*.

VARIETY 1. *CRYSTALLISED.*

VIII. *a* 1. In long hexhedral priſms ſomewhat compreſſed, terminated ſome by tetrahedral, others by dihedral pyramids, the cryſtals very numerous and croſſing each other in various directions, an opake grey quartz. *Cremnitz, Hungary.*

R. de L. Pl. 7, *Fig.* 13.

IX. *a* 2. In flatted hexhedral priſms, very large, aggregated and diverging, of a ſplendid fracture, and laminated texture, deeply grooved on the ſurface and terminated by tetrahedral pyramids; from the ſides of the larger cryſtals project at acute angles numerous ſmaller ones, accompanied in many parts by an incruſtation of minutely cryſtalliſed quartz. *Lubillac, Auvergne.*

X. *a* 3. In ſhort hexhedral priſms terminated at both extremities by tetrahedral pyramids, on the ſurface of granular grey antimonial ore, with grey capillary antimonial ore and brown blende. *Cornwall.*

XI. *b* 1. In long priſms compreſſed and diverging, of a laminated texture and covered by a yellow antimonial oxyde, with browniſh ponderous ſpar. *Felſobanya.*

XII. *b* 2. The ſame, diverging from a common centre, and penetrating the ſubſtance of tranſparent rhomboidal ponderous ſpar. *Same place.*

XIII. *b* 3. In long ſlender needle-like cryſtals, diverging from different centres and entangling numerous minute cryſtals of white lenticular ponderous ſpar, on ſpongy white quartz. *Same place.*

XIV. *b* 4. In ſhorter and more aggregated needles, variouſly decuſſating each other, in cellular white quartz. *Cremnitz.*

XV. *b* 5. The ſame, in more delicate cryſtals, irideſcent on the ſurface. *Felſobanya.*

XVI. *b* 6. The ſame, the colour ſtill more lively. *Felſobanya.*

XVII. *b* 7. In irideſcent capillary filaments, delicate, flexible, and diverging from different centres, on ſpongy ferruginous quartz. *Same place.*

XVIII. *b* 8. In long compreſſed needle-like cryſtals, diverging alſo from different centres and cloſely interwoven at their extremities. *Cremnitz.*

XIX. *b* 9. The ſame, incruſted on the ſurface by a browniſh ochry oxyde. *Same place.*

XX. *b* 10. In priſmatic diverging cryſtals, with ſemitranſparent realgar, on compact ſtriated ſulphuret of antimony and opake white quartz. *Schemnitz.*

XXI. *b* 11. In ſplendid bar-like cryſtals, of a laminated texture, confuſedly aggregated and covered partly by a browniſh red, and partly by a yellowiſh incruſtation. *Pereta* near *Sienna, Tuſcany.*

VARIETY II. *AMORPHOUS.*

XXII. *a* 1. Of a compact fibrous texture, ſomewhat incurvated and of a dull leaden grey colour, incruſted with yellow oxyde of antimony. *Cornwall.*

XXIII. *b* 1. Of a ſtriated texture, forming ſtellæ in a mixture of calcareous ſpar and clay with yellow pyrites, having tranſparent lenticular calcareous ſpar on the ſurface. *Schemnitz.*

XXIV. *b* 2. Of a converging ſtriated texture, brilliant in its fracture. *Hungary.*

XXV. *b* 3. The ſame, in narrower ſtriæ. *Tranſylvania.*

XXVI. *b* 4. Compoſed of ſtriated laminæ, intermixed with yellow oxyde of antimony. *Savoy.*

XXVII. *b* 5. The ſame, intermixed with white quartz. *Ilefeld.*

XXVIII. *b* 6. The ſame, intermixed with pale red quartz, and covered on the ſurface by reddiſh yellow oxyde. *Corſica.*

XXIX. *b* 7. Of a ſtriated texture, intermixed with and incruſted by yellow oxyde. *Auvergne.*

c. Foliated. *Vide No.* 26, 27, 28.

XXX. *d* 1.

XXX. *d* 1. Of a granular texture, intermixed with white quartz. *Hungary.*

XXXI. *e* 1. Of a compact texture, light grey colour, and angular fracture. *Same place.*

SPECIES VII. *PLUMOSE ANTIMONIAL ORE.*

Federerz, Germ.

This takes its name from being generally found covering the ſurface of other mineral ſubſtances in delicate capillary cryſtals, which are confuſedly interwoven, and have a flocculent or lanuginous appearance. Its colour is intermediate between ſteel and bluiſh grey, ſometimes greyiſh black, often tarniſhed or variegated. Its fibres are brittle and of but little ſplendour; when compacted it is internally of a fibrous texture and for the moſt part of a metallic luſtre. Before the blow-pipe it gives out a thick white ſmoke and melts into a black ſlagg, which is ſometimes found to contain a ſmall proportion of ſilver; it is therefore by *Baron Born*, and many others, ranked with the ſilver ores (*Argent antimonial, Argent en Plumes*). According to *Bergman* it conſiſts of Antimony, Sulphur, Iron, Arſenic, and Silver. Its moſt common aſſociates are quartz, calcareous, pearl, and ponderous ſpars, galena, iron pyrites, and blende. It is found at *Freyberg* and *Braunſdorf* in *Saxony*, at *Stollberg* in the *Hartz*, *Schemnitz* in *Hungary*, &c.

VARIETY I. *CRYSTALLISED.*

a. In ſlender priſmatic needles.

b 1. In delicate filaments lying in flocculi, on the ſurface of dodecahedral quartz. *Felſobanya.*

GENUS VII. *MANGANESE.*

Magneſium. Manganeſe, Fr. *Braunſtein*, Germ.

This regulus, after perfect fuſion, is of a whitiſh ſteel grey colour, uneven fracture and granular texture, hard, brittle, and of perfect metallic ſplendour. Its ſpecific gravity from 6.85 *Berg.* to 7. *Hielm.* It is not attracted by the magnet except when reduced to powder, and then probably from the preſence of a ſmall proportion of iron. In general it is found to paſs readily on expoſure to moiſt air into a ſtate of oxyde, at firſt of a whitiſh and afterwards of a blackiſh brown colour; ſimilar changes are produced on it by torrefaction, but next to platina, it is of all the metallic bodies the moſt difficult

difficult of fuſion. It is ſoluble in all the mineral acids, but moſt readily in the nitric, in which, when free from iron, it affords a colourleſs ſolution. It may be united by fuſion with all the other metals, except quickſilver, rendering gold and iron more fuſible, and copper leſs ſo. It cannot be combined with ſulphur. In its metallic ſtate no uſeful application has as yet been made of it. Its ores are,

SPECIES I. *NATIVE MANGANESE.*

Manganeſe natif, Fr. *Gediegen-Braunſtein*, Germ.

It is found in ſmall ſomewhat flatted or reniform globules of a greyiſh white colour and metallic luſtre, having a divergingly foliated texture, and being in ſome degree malleable. It ſoils the fingers. In the maſs it is not obedient to the magnet. It was firſt diſcovered by *Mr. La Peyrouſe* in the valley of *Vicdeſſos* near *Sem* in the neighbourhood of *Foix, Pyrenees*, imbedded in native oxyde of manganeſe of a ſilver grey colour. *Journ. de Phyſ.* 1786, *Janvier*.

VARIETY I. *OF PARTICULAR SHAPES.*

a. Globular.

SPECIES II. *NATIVE OXYDE OF MANGANESE.*

Oxide de Manganeſe, Fr. *Grau-* und *Schwarz-Braunſteinerz*, Germ.

The degree of oxydation occaſions a remarkable difference, as in the caſe of iron, in the colour, luſtre, texture, and other properties of this ore; hence the diviſions of it by authors into grey, black, &c. ſtriated, foliated, &c. It occurs either amorphous, ſuperficial or interſperſed; or of particular ſhapes, as ſtalactitical, mammillated, &c. in aggregated diverging faſciculi; or more or leſs diſtinctly cryſtalliſed, and then in truncated tetrahedral rhomboidal priſms, theſe alſo frequently diverging, and often entangled in each other. When cryſtalliſed, or of a ſtriated or fibrous texture, or foliated and of metallic ſplendour, its colour is generally ſteel grey, inclining ſometimes to greyiſh, browniſh, or bluiſh black. It is opake; brittle; ſo ſoft as to ſoil the fingers; ſpecific gravity, according to *Briſſon*, from 4.18 to 4.81. When without ſplendour, it is generally greyiſh, bluiſh, or browniſh black, ſometimes liver brown or browniſh red; of different degrees of induration, and more or leſs of an earthy texture; forming ſometimes ſuperficially a kind of ſpumeſcence (*Braunſtein-ſchaum*) on other ores, particularly on hematite. The dull and ſplendid varieties of this ore are often intermixed. By calcination this oxyde acquires a darker colour, but does not become magnetic. To glaſs of borax it imparts a reddiſh brown colour inclining to violet. In pure nitric acid it is only ſoluble after long digeſtion, or on the acid being partially decompoſed by the addition of ſugar, gum arabic or

 other

other analogous ſubſtances. In the muriatic, on the contrary, it diſſolves with effervescence, converting a certain portion of it into oxymuriatic acid gas. The earthy variety of this ore, known by the name of *Black Wad*, poſſeſſes the remarkable property of taking fire ſpontaneouſly, when mixed with a fourth part of its weight of linſeed oil and expoſed to a gentle heat. According to *Bindheim*, the cryſtalliſed native oxyde of *Ilefeld* contains a ſmall proportion of Lime and Ponderous Spar, a ſmaller ſtill of Copper, but no Iron. *Wedgwood* found the black wad to contain Oxyde of Manganeſe 43, Oxyde of Iron 43, Lead 4.5, Mica 5. The varieties of this ore are commonly found with iron ochre, hematite, and ſpathoſe iron ore, in baryte or quartz, ſometimes alſo in hornſtone, jaſper, indurated clay, calcareous ſpar, &c. Its more ponderous and brilliant varieties are met with in *Bareuth*; at *Annaberg*, *Johngeorgenſtadt*, and *Eibenſtock*, *Saxony*; at *Sem* in the county of *Foix*, in *France*; at *Piedmont*, in *Italy*; at *Ilefeld* in the *Hartz*; at *Ilmenau* in *Thuringia*, and many other parts; and the earthy varieties in ſtill greater abundance in all the foregoing places and many others. It is found in large quantities in *Devonſhire*, *Cornwall*, *Derbyſhire*, *Somerſetſhire*, *Yorkſhire*, &c. and beſides its uſe as a pigment, it is extenſively employed in glaſs-making and in bleaching.

VARIETY I. *CRYSTALLISED.*

I. *a* 1. In faſciculi, compoſed of tetrahedral rhomboidal priſms truncated at their extremities, confuſedly aggregated and projecting in various directions from the ſurface of an aggregated maſs of the ſame. *Ilefeld?*

II. *a* 2. The ſame, of a brighter colour, and in ſomewhat larger cryſtals on the ſurface and in the cavities of compact ore of the ſame, intermixed with tranſparent quartz. *Ilefeld.*

III. *a* 3. The ſame, in diverging faſciculi, cloſely aggregated and croſſing each other in various directions. *Ilmenau.*

IV. *b* 1. In long needle-like cryſtals converging to different centres and forming faſciculi, in plated white opake baroſelenite. *Ilefeld.*

V. *b* 2. In very minute and numerous cryſtals, of a dark ſteel grey colour, lying on the ſurface of brown indurated ochre. *Germany.*

VARIETY II. *OF PARTICULAR SHAPES.*

VI. *a* 1. In cylindrical ſtalactites of a brown colour, indurated and botryoidal on the ſurface. *Naſſau Siegen.*

VII. *b* 1.

VII. *b* 1. In ſmall tuberculi of minute aggregated cryſtals, on the ſurface of tuberous and cavernous quartz. *Ilefeld.*

VIII. *b* 2. The ſame, on the ſurface of coarſe brown hematite. *North America.*

IX. *b* 3. In a compact irregular maſs of a greyiſh black colour, botroidal on the ſurface. *Mendip Hills, Somerſetſhire.*

X. *b* 4. The ſame, of a more compact texture and ſhining fracture, mammillated on the ſurface. *Ilefeld.*

VARIETY III. *AMORPHOUS.*

XI. *a* 1. In an irregular maſs, compoſed of diverging ſtriæ of a dark brown colour, with a mixture of ſteel grey. *Mont Sivelina, Venice.*

XII. *a* 2. In radiating fibres, compact, and intermixed with compact radiating greeniſh white ſilicious manganeſe. *Piedmont?*

b. Granular.

XIII. *c* 1. In an irregular angular maſs, compact, ponderous, and of a dark brown colour, with an ochry incruſtation on the ſurface, *(Pierre de Perigord).* *Perigueux, France.*

XIV. *d* 1. In a flatted indurated earthy piece, of a dark brown colour, with numerous ſmall cryſtals of rhomboidal tabular barofelenite on the ſurface. *Switzerland.*

XV. *d* 2. In an irregular piece, indurated, earthy and ponderous, of a yellowiſh brown colour. *Hungary.*

XVI. *d* 3. In a light compact irregular maſs, of a liver brown colour and indurated earthy texture. *Devonſhire.*

XVII. *d* 4. The ſame, of a lighter colour and more ponderous. *Somerſetſhire.*
This is the ſort made uſe of at glaſs-houſes.

XVIII. *d* 5. In ſmall looſe indurated earthy fragments, of a dark brown colour inclining to black, more ponderous than the laſt. *Same place.*

XIX. *d* 6.

XIX. *d* 6. In a ſlightly cohering maſs, very light, of an earthy texture and blackiſh brown colour. *(Black Wad.)* *Derbyſhire.*

XX. *d* 7. The ſame, of a dun colour, and ſo light as to ſwim on water. *Hartz.*

SPECIES III. *SILICEOUS ORE OF MANGANESE.*

Manganeſe blanc, Oxide de Manganeſe d'un blanc rougeâtre, Fr. *Roth-Braunſteinerz*, Germ.

This occurs either of a white, or more frequently of a paler or deeper roſe red colour, ſometimes tarniſhed externally browniſh or yellowiſh. It is found either amorphous, interſperſed, or of particular ſhapes, as ſtalactitic, mammillated, botryoidal, &c. or cryſtalliſed in rhomboidal parallelopepids. It has little or no ſplendour or tranſparency; its fracture generally fine grained or uneven, inclining ſomewhat to the foliated; its fragments indeterminately angular and ſharp edged; nearly of ſufficient hardneſs to give fire with ſteel; ſpecific gravity according to *Kirwan* 3.233. In the nitric acid it is ſoluble with effervescence and yields a colourleſs ſolution. Under the blow-pipe it reſiſts fuſion, but becomes black; to glaſs of borax it imparts a violet colour. According to the analyſis of *Ruprecht* it contains Oxyde of Manganeſe 35, Silex 55, Iron 5, and Alumine 5. It has been met with at *Offenbanya*, *Kapnic* and *Nagyag* in *Tranſylvania*, where it forms the matrix of the grey gold ore, accompanied by quartz, blende, galena, fahlerz, copper pyrites, &c. &c.

By many it is juſtly conſidered as bearing a cloſe analogy to pearl ſpar.

VARIETY I. *CRYSTALLISED.*

a. In rhomboidal parallelopepids.

b. Indeterminate.

VARIETY II. *OF PARTICULAR SHAPES.*

a. Stalactitic.

XXI. *b* 1. In an irregular maſs, intermixed with grey gold ore, mammillated and ochry on the ſurface. *Nagyag.*

XXII. *b* 2. In an irregular plate, of a reddiſh white colour, tuberculated and minutely cryſtalliſed on the ſurface. *Same place.*

c. Botryoidal, &c.

VARIETY III. *AMORPHOUS.*

a. Striated.

XXIII. *b* 1. In an irregular ſhattery maſs, of a reddiſh white colour, intermixed with auriferous pyrites. *Nagyag.*

c. Earthy.

GENUS VIII. *SCHEELE.*

Scheelium. Tungſtenite, Kirw. *Scheel,* Germ.

A new ſemimetal, which has hitherto been procured only in ſmall globules, externally of a brown colour, internally ſteel grey with metallic luſtre. In this ſtate it is brittle and of great weight, being according to *Meſſrs. Elhuyart,* 17.600. It is more difficultly fuſible than the regulus either of manganeſe or of uranite, but on being expoſed to the combined action of heat and air is converted into a yellow oxyde, which exceeds the original weight of the regulus in the proportion of 124 to 100. A ſimilar oxyde *(Acid of Tungſten)* may be obtained from it by treatment with the nitric or with the oxy-muriatic acid, in both which however as well as in the other mineral acids it is inſoluble. It produces no diminution in the ductility either of ſilver or of copper, but increaſes the hardneſs of iron, tin, antimony, biſmuth and manganeſe. The ores of this ſemimetal are,

SPECIES I. *TUNGSTATE OF LIME.*

Tungſten. Lapis ponderoſus. Tungſtene, Fr. *Schwerſtein, Weiſſer Zinnſtein,* Germ.

Is for the moſt part of a yellowiſh or greyiſh white colour, changing not unfrequently into yellowiſh grey, and ſometimes ſuperficially into pearl grey or yellowiſh brown. It is generally found in lumps or interſperſed, alſo occaſionally cryſtalliſed and then always in octohedrons and their modifications. It is ſemitranſparent; its fracture foliated inclining to the conchoidal, and having an unctuous or diamond ſplendour; ſeldom of ſufficient hardneſs to give fire with ſteel; brittle; ſpecific gravity according to *Briſſon* 6 c66. It is not ſoluble in water, and but partially ſo in acids even by the aſſiſtance of heat; with the nitric or muriatic it aſſumes a yellow colour. Under the blow-pipe it decrepitates and is infuſible *per ſe,* but with microcoſmic ſalt it effervesces and melts into a bluiſh globule. According to the analyſis of *Scheele* it conſiſts of Tungſtenic Acid 44, Lime 56. It has been chiefly met with at *Schlakenwald, Schönfeld* and *Platten* in *Bohemia, Ebersfriedersdorf*

Ehrenfriedersdorf in *Saxony*, and *Bilsberg* in *Sweden*, associated with spathose tin ore (with which it was long confounded), quartz, mica, steatite, talc, iron ochre, &c.

VARIETY I. *CRYSTALLISED.*

I. *a* 1. In semitransparent white aluminiform octohedrons, on a mixture of mispickel and wolfram. *Schonfeld, Bohemia.*

Catal. de Raab IX. C. b. 1.

II. *a* 2. In dull white opake aggregated octohedrons having the apices of both pyramids deeply truncated, on brown spathose tin ore in large irregular compounded crystals with white quartz. *Bohemia.*

R. de L. Pl. III. *Fig.* 3.

b. Indeterminate.

VARIETY II. *AMORPHOUS.*

III. *a* 1. In a small semitransparent mass, irregularly rounded. *Bohemia.*

IV. *a* 2. The same, in an irregular piece, with brownish indurated clay on the surface. *Same place.*

SPECIES II. *WOLFRAM.*

Wolfram, Ecume de Loup, Fr. *Wolfram*, Germ.

Is of a dark brownish black colour, sometimes superficially variegated or tarnished of a bluish grey. It is found in lumps, interspersed, in plates, or crystallised in compressed hexhedral prisms with tetrahedral pyramids. It is always opake. Externally it has little splendour, internally its lustre approaches to the metallic. Its fracture is longitudinally foliated, transversely uneven; fragments indeterminately angular; when scratched with the knife, to which it yields pretty readily, it gives a reddish brown streak. Specific gravity, according to *Brisson*, 7.119. By the mineral acids it is affected nearly in the same manner as tungsten. Under the blow-pipe it decrepitates without fusion; with borax it effervesces and communicates to it a greenish yellow colour by the application of the interior and a reddish by that of the exterior flame: it effervesces also with microcosmic salt and tinges it by the exterior of a pale and by the interior of a darker red colour. By the analysis of *Messrs. d'Elhuyart* it is stated to consist of Tungstic Acid 76, Oxyde of Manganese 22, Oxyde of Iron 13, Silex and Tin 2. The wolfram of [illegible]

dice in *Cornwall* yielded *Mr. Klaproth* Tungſtenic Acid 46.9, Oxyde of Iron 31.2, and ſome Arſenic.

Wolfram, like Tungſten, is found only in primitive mountains. It is principally met with in the mines of *Bohemia*, *Saxony*, and *Cornwall*. It was formerly conſidered by ſome as an ore of iron, by others as a particular ſpecies of manganeſe, and by many as a variety of the common tin ore, by which it is almoſt always accompanied together with quartz and mica.

VARIETY I. *CRYSTALLISED.*

a. In compreſſed hexhedral priſms with tetrahedral pyramids.

b. Indeterminate.

VARIETY II. *AMORPHOUS.*

V. *a* 1. In long and narrow converging ſtriæ, ſhining in their fracture, in coarſe-brown indurated ſteatite. *Bohemia.*

VI. *b* 1. In broad laminæ, of a ſcaly texture and dark browniſh black colour, with green carbonate of copper and white quartz. *Cornwall.*

VII. *b* 2. In maſſes of a laminated texture compoſed of confuſed cryſtals, with brown ſpathoſe tin ore and white quartz, on gneiſs. *Bohemia.*

VIII. *b* 3. Of a laminated texture and ſomewat ſpecular on t heſurface, with tranſparent greyiſh quartz. *Altenberg.*

IX. *b* 4. The ſame. *Bohemia.*

X. *b* 5. The ſame, in narrow ſtriated laminæ, imbedded in whitiſh quartz. *Johngeorgenſtadt.*

XI. *b* 6. The ſame, of a dark brown colour, with blue indurated clay on white quartz. *Same place.*

XII. *b* 7. Of a dark brown colour in cloſely compacted laminæ, having a divergingly ſtriated appearance, with quartz and grey indurated micaceous clay. *Same place.*

XIII. *c* 1. Of a cloſe granular texture and brown colour, with yellowiſh mica in large plates. *Altenberg.*

GENUS

GENUS IX. *URANITE.*

Uranium. Uranit, Fr. *Uran*, Germ.

The properties given to this ſemimetal by *Mr. Klaproth*, by whom it was diſcovered in 1789, are the following. Its colour, dark ſteel or iron grey inclining internally to brown; luſtre weakly metallic; hardneſs nearly the ſame with that of tin; brittle; ſpecific gravity 6.440.

As yet it has been obtained only in ſmall imperfectly cohering globules, being extremely difficult of fuſion. It is ſoluble both in the nitric and oxy-muriatic acids. Its oxyde, which is of a yellow colour and is alſo ſoluble in theſe and in moſt other acids, communicates to microcoſmic ſalt and to the concrete phoſphoric acid a graſs green colour, but with ſoda or borax it melts into a greyiſh or browniſh opake porous or ſcoriaceous bead. Its effects upon the other metallic bodies are not yet known. The ores of this new ſemimetal are,

SPECIES I. *NATIVE OXYDE OF URANITE.*

Which occurs either in ſmall quadrangular tables or cubes, generally of a deep or yellowiſh green colour *(Calcolite. Gruner-Glimmer, Grun Uranerz*, Germ.) or in lumps, diſſeminated or incruſting other ſubſtances, and of a lemon yellow colour inclining ſometimes to red or green, *(Uranokker*, Germ.) When cryſtalliſed it is tranſparent and of conſiderable luſtre, its fracture foliated, ſtreak greeniſh white, not brittle nor particularly heavy. The amorphous, on the other hand, is without either luſtre or tranſparency, of an earthy fracture, and, in general, eaſily friable. In either form it is ſoluble in the nitric acid and precipitable by the Pruſſian alkali. By a ſtrong heat the yellow changes its colour to a browniſh grey, but is infuſible; the green is infuſible by alkalies. According to the experiments of *Klaproth*, the green colour of the cryſtalliſed and the reddiſh colour of ſome varieties of the ſemi-indurated, depends on the accidental preſence, in the former of a ſmall proportion of Oxyde of Copper, and in the latter of Oxyde of Iron. The reſt he conſiders as Uranite in union with Carbonic Acid, or more probably in a ſtate of Oxyde, as ſeems now to be the general opinion.

The general aſſociates of this rare ore are, compact brown and red iron ſtone, iron ochre, quartz, hornſtone, and indurated clay; it is alſo very frequently accompanied by pech-blende and ſometimes, the ſemi-indurated more eſpecially, by a bluiſh mineral ſubſtance, which, according to *Mr. Karſten's* deſcription, reſembles the variegated ore of copper. The mines, from whence the native oxyde of uranite has been almoſt excluſively obtained,

obtained, are thoſe of *Saſka* in the *Bannat*, *Johngeorgenſtadt* and *Eibenſtock* in *Saxony*, and *Joachimſthal* in *Bohemia*.

VARIETY I. *CRYSTALLISED.*

I. *a* 1. In thin rectangular plates, of a ſtraw yellow colour, on an ochry micaceous indurated ſchiſtus. *Johngeorgenſtadt.*

II. *a* 2. The ſame, in more minute plates of a graſs green colour changing to a greeniſh yellow, on coarſe ferruginous quartz. *Same place.*

III. *a* 3. The ſame, of a perfect graſs green colour, ſome of the cryſtals of ſufficient thickneſs to become cubic, on an ochry indurated clay intermixed with quartz and mica. *Same place.*

IV. *b* 1. In indeterminate cryſtals of the ſame colour, on black compact ſcaly pechblende ſomewhat ſhining in its fracture. *Same place.*

VARIETY II. *AMORPHOUS.*

V. *a* 1. Of an earthy texture and yellowiſh white colour, on the ſurface of pechblende. *Georgewagsford, Saxony.*

SPECIES II. *SULPHURET OF URANITE.*

Pechblende, Fr. *Schwarz-Uranerz*, Emmerling.

There is but little variety in the colours and forms of this ore, being generally of different ſhades of greyiſh black, and found for the moſt part in lumps, or interſperſed, ſometimes cellular, very rarely reniform, and never cryſtalliſed. It is ſometimes irideſcently tarniſhed on the ſurface; always opake. Its luſtre internally ſemi-metallic inclining to the unctuous and ſometimes to that of the diamond. Its fracture conchoidal approaching to the uneven; brittle; not of ſufficient hardneſs to give fire with ſteel; ſtreak darker coloured; ſpecific gravity 7.500. Its metallic part diſſolves moſt readily in the nitric acid or in aqua regia, yielding ſolutions of a pale yellow colour. Under the blowpipe it is infuſible *per ſe*; with ſoda or borax it gives a grey opake flag, and with microcoſmic ſalt a clear glaſs of a graſs green colour. According to *Klaproth* when ſeparated from its ferruginous and other heterogeneous matter it conſiſts of Oxyde of Uranite in union with a ſmall portion of Sulphur, which, in the ſolutions above mentioned, remains

 undiſſolved.

undiſſolved. It has hitherto been found only at *Joachimſthal* in *Bohemia*, and at *Johngeorgenſtadt* and *Schneeberg* in *Saxony*.

VARIETY I. *OF PARTICULAR SHAPES.*

a. Reniform.

b. Cellular.

VARIETY II. *AMORPHOUS.*

VI. *a* 1. In a compact irregular maſs of a dark brown colour and angular fracture. *Johngeorgenſtadt.*

VII. *a* 2. The ſame, of a pitch colour and ſolid texture, covered by dark grey indurated clay intermixed with decompoſing yellow pyrites. *Same place.*

VIII. *a* 3. The ſame, in opake grey quartz, with yellow pyrites and red arſeniate of cobalt. *Same place.*

IX. *a* 4. The ſame, compoſed of thick layers intermixed with galena. *Saxony.*

GENUS X. *MOLYBDENA.*

Molybdenum. Molybdene, Fr. *Molybdän*, Germ.

Takes its name from the common molybdena, from which it was firſt obtained by *Mr. Hielm* in ſmall agglutinated maſſes. It is externally of a whitiſh yellow colour, internally whitiſh grey, with a weak metallic luſtre. It is brittle and not obedient to the magnet. Its ſpecific gravity, according to *Heidinger*, 6.963, after ſome days immerſion in water 7.500, *Kirwan*. Of the mineral acids it is moſt readily acted on by the nitric, by which it is converted into a white ſaline maſs poſſeſſing properties ſimilar to thoſe of the acid of molybdena. Under expoſure in the open fire to a red heat it is converted into a white flocculent oxyde, which is alſo acid to the taſte and ſoluble in water; in cloſe veſſels it is nearly infuſible. *Mr. Hielm* has ſucceeded in combining it with all the other metals, in each of which it produces an alteration of properties. The only ore of this new ſemimetal is,

SPECIES

SPECIES I. *MOLYBDENA.*

Molybdene, Fr. *Waſſerblei*, Germ.

Which occurs in lumps, or interſperſed, or, though leſs frequently, cryſtalliſed in hexhedral laminæ, ſometimes accumulated on each other ſo as to form ſhort hexhedral columns. Its colour leaden grey, inclining to red; its ſurface ſplendid, ſmooth and unctuous; its fracture curved-foliated; its laminæ flexible and opake; ſo ſoft as to ſoil the fingers; ſpecific gravity from 4.569 to 4.848. It is inſoluble both in the ſulphuric and marine acids; in the warm nitric acid it effervesces, leaving a greyiſh oxyde (*Acid of Molybdena*) which is ſoluble in about 570 times its weight of common water. In cloſe veſſels it is not affected by heat; in a ſtrong open fire it emits a ſulphureous ſmell and yields a greyiſh white flocculent oxyde and a yellowiſh ſemivitrified reſiduum. It is but little altered under the blow-pipe either by borax or microcoſmic ſalt, but it effervesces with the fixed alkalis and communicates to them a reddiſh pearl colour. According to the analyſis of *Klaproth* it conſiſts of Molybdic Acid 60, Sulphur 40. It is found ſolely in primitive mountains at *Schakenwalde* and *Zinnwald* in *Bohemia*, at *Altenberg*, *Geir*, *Ehrenfriederſdorf* and other parts of *Saxony*, and at *Norberg* and *Gerdſrum* in *Sweden*, frequently aſſociated with or in the neighbourhood of ſpathoſe tin ore, and generally accompanied by wolfram, quartz and mica, more rarely by native arſenic, ponderous ſpar, fluor, topaz, &c.

VARIETY I. *CRYSTALLISED.*

a. In hexhedral laminæ.

VARIETY II. *AMORPHOUS.*

I. *a*. 1. In broad thin and ſhining laminæ, of a leaden grey colour, lying on each other in a parallel direction and intermixed with a ſmall proportion of ferruginous quartz. *Scotland.*

II. *a* 2. In thinner and more compacted laminæ, on impure indurated clay with white quartz. *Altenberg.*

III. *a* 3. The ſame, diſſeminated through a coarſe mixture of miſpickel, white quartz, cryſtalliſed mica and wolfram. *Same place.*

IV. *a* 4.

IV. *a* 4. The ſame, alſo diſſeminated in red copper ore, on white quartz and incruſted with green malachite. *Levant Iſland, Spaniſh Town, America.*

GENUS XI. *TITANIUM.*

This denomination is given by *Mr. Klaproth* to another new ſemimetal, the oxyde of which, according to his late experiments, is ſaid to be contained in the red ſchorl of *Boinik* in *Hungary*, and of ſeveral other analogous ſubſtances. This ſuppoſed oxyde, when pure, is of a white colour, and by calcination changes to a yellow and afterwards to a red, and in contact with charcoal, to a blue. It affords a yellow enamel. From the mineral acids, in all of which it is ſoluble, it may be precipitated by the pruſſian alkali, the acid of galls and ſulphuret of ammoniac; it is alſo thrown down by zinc of an indigo blue, and by tin of a pale red colour changing to that of the ruby: no means however, hitherto deviſed, have ſucceeded in reducing it to a perfect regulus.

The red ſchorl of *Boinik* above mentioned, which occurs in ſtriated priſmatic cryſtals of a light browniſh red colour, imbedded in quartz intermixed with veins of micaceous ſchiſtus, by the analyſis of *Klaproth* conſiſts of Oxyde of Titanium with a ſmall portion of Silex and Alumine; and by the analyſis of *M. Vanquelin* and *Hecht*, the red ſchorl of *St. Yrieux* in *France*, found alſo of a reddiſh brown colour, in hexhedral priſms or rounded maſſes, appears to be of a ſimilar nature. Oxyde of Titanium has likewiſe been diſcovered, by the foregoing chemiſts, in a blackiſh brown mineral met with at *Paſſau* in *Germany*, in tetrahedral priſms with ſmooth and ſhining ſurfaces, and more or leſs tranſparent; in reddiſh brown hexhedral priſms with hexhedral pyramids, from *Cajuelo* near *Vuitrage* in the province of *Burgos*; in another of the ſame kind found in the year 1787 by *Prince Dimitri von Gallitzin* in the granite of *Speſſart* near *Aſchaffenburg*; in rounded laminated grains of a greyiſh black colour, inclining to browniſh red, mixed with the auriferous ſand of *Oblapian* in *Tranſylvania*, and in the *Menachanite* diſcovered ſome years ſince by *Mr. Gregor* in a valley of the pariſh of *Menachan* in *Cornwall*.

GENUS XII. *SILVANITE.*

By *Mr. Kirwan* this name has been given to the new ſemi-metal diſcovered in the *White Gold ore* of *Facebay* by *Mr. Muller*, and poſſeſſed of the following properties.

Its colour greyiſh white, luſtre metallic, fracture granularly foliated, very brittle, ſpecific gravity after fuſion 6.343. It melts eaſily, and in the open fire is converted into a volatile white oxyde, approaching to the nature of an acid. It is moſt readily ſoluble in aqua regia, in which it yields a yellowiſh ſolution. By fuſion it combines with

 ſulphur

ſulphur and forms with it a ſtriated maſs. With mercury it may be amalgamated by ſimple trituration. In the ore above mentioned, according to *Mr. Muller's* analyſis, it is united in its Reguline ſtate with Native Gold, together with a ſmall proportion of Arſenic and Nickel. *Vide* GOLD, SPECIES III.

The exiſtence of this as a new ſemi-metal has been farther confirmed by the late experiments of *Mr. Klaproth*, who has aſcertained its properties more accurately, and given to it the name TELLURIUM. According to his analyſis the *White Gold ore* of *Facebay* contains Tellurium 92.55, Iron 7.20, Gold 2.5; the *Graphic Gold ore* of *Offenbanya*, Tellurium 60, Gold 30, Silver 10; the *Yellow Gold ore* of *Nagyag*, Tellurium 45, Gold 27, Lead 19.5, Silver 8.5, and a minute quantity of ſulphur; and the *Foliated Grey Gold ore* of *Nagyag*, Tellurium 33, Gold 8.5, Lead 50, Sulphur 7.5, Silver and Copper 1. Vide *Annales de Chimie, Tom. XXV. P.* 273.

GENUS XIII. *CROME.*

Lately diſcovered by *M. Vauquelin* in the red lead ore of *Siberia*, which he conſiders as compoſed of the Acid of this metal in combination with Oxyde of Lead. The metal itſelf he ſtates to be of a greyiſh white colour, and in the form of needles entangled in each other, very brittle and very difficult of fuſion. Under the blow-pipe it acquires a lilac cruſt, which in cooling becomes green, and communicates this colour to glaſs of borax. The nitric acid is the only one which has any remarkable action on it. By repeated diſtillation with this it is converted into a greenith and at length into an orange yellow powder, ſoluble in water and having an acid taſte, combinable alſo with the alkalis, and having farther the remarkable property of precipitating the nitrate of ſilver of a cinnabar red, nitrate of lead of an orange yellow, and nitrate of copper of a cheſnut red colour.

From theſe and other circumſtances *M. Vauquelin* thinks himſelf authoriſed to conſider this ſubſtance as a new ſemi-metal. Vide *Annales de Chimie, Tom. XXV. Pag.* 21 and 194.

CLASS

CLASS IV. *INFLAMMABLES.*

Theſe are ſuch mineral ſubſtances as are more eſpecially remarkable for exhibiting the phenomena of combuſtion, by which, like other inflammable bodies, they undergo an entire change in their properties, and with a few exceptions furniſh, in the opinion of the modern chemiſt, the baſis of particular acids. They are comparatively of leſs ſpecific gravity and hardneſs than moſt of the other bodies of the mineral kingdom. They are inſoluble in water, and almoſt as generally ſo in ſpirits of wine. Many however are ſoluble in oils, more eſpecially in the eſſential oils. Such as contain charcoal are capable of decompoſing, by the aſſiſtance of heat, both the ſulphuric and nitric acids and their ſaline compounds, and of effecting the reduction of the metallic oxydes.

In medicine and in the arts, and as articles of fuel, they are ſubſtances of general utility.

ORDER I. *AERIFORM.*

GENUS I. *HYDROGEN GAS.*

Inflammable Air. Gaz hydrogene, Fr.

Takes the name of hydrogen from the remarkable property of producing water under combuſtion with oxygen gas. It is the lighteſt of all the permanently elaſtic fluids, being when pure, according to *Lavoiſier,* to atmoſpheric air in the proportion of 0.094 to 1.000.

SPECIES I. *COMMON HYDROGEN GAS.*

This is generally found in coal mines, and for the moſt part in mixture with bituminous or coaly matter, and alſo with carbonic acid gas, by which laſt its ſpecific gravity is conſiderably increaſed. It burns with a blue flame, and is often productive of dangerous exploſions.

SPECIES II. *SULPHURATED HYDROGEN GAS.*

Hepatic Gas. Gaz hepatique, Fr.

Common Hydrogen Gas holding Sulphur in ſolution. This burns with a light blue flame, has an offenſive ſmell, and is ſomewhat heavier than common air; it is alſo ſometimes found in coal mines, but moſt frequently in mineral waters or in caverns adjacent to volcanos, and is often the reſult of the decompoſition of certain kinds of pyrites.

ORDER II. *LIQUID.*

GENUS I. *LIQUID BITUMEN.*

Erdoel, Germ.

The ſpecies of this genus are generally believed to be of an animal or vegetable origin, and to differ from each other principally in their colour and degrees of conſiſtence.

SPECIES I. *NAPTHA.*

Napthe native, Fr. *Naphta*, Germ.

Found on the ſurface of certain ſprings, or iſſuing from certain ſtrata, in the form of a light thin yelloviſh, often colourleſs oil, highly odoriferous and inflammable. Its ſpecific gravity from 0.708 to 0.847. It is inſoluble in ſpirits of wine, and by the nitric acid is thickened, but not inflamed. In diſtillation it riſes without being decompoſed. When expoſed to the air it becomes at firſt of a darker yellow colour, and afterwards brown and of a greater degree of conſiſtence. It is found in *Perſia*, on the borders of the *Caſpian ſea*; in *Calabria*, *Sicily*, *Modena*, and *America*.

I. *a* 1. Tranſparent and of a yelloviſh colour. *Perſia.*

II. *a* 2. The ſame, of a deeper colour. *Same place.*

III. *a* 3. The ſame, of a ſtill deeper colour. *Italy.*

SPECIES

SPECIES II. *PETROLEUM.*

Petrol, Fr. *Gemeines Erdoel*, Germ.

Is generally of a dark blackiſh brown colour, of leſs tenuity and tranſparency than naptha, not ſo inflammable, and of a leſs agreeable odour; ſpecific gravity from 0.847 to 0.878. It is in a ſlight degree ſoluble in ſpirits of wine, and in burning affords a ſooty flame, leaving a ſmall quantity of coaly reſiduum. In diſtillation it yields a thin colourleſs oil ſimilar to naptha, an empyreumatic acid, a brown empyreumatic oil and a certain quantity of carbonic acid gas. It is generally the produce of ſtrata of ſecondary formation, more particularly ſuch as abound in coal, from which it frequently exudes. It is met with ſometimes in conſiderable quantity in the coal mines of *Shropſhire*, in *Lancaſhire*, in the neighbourhood of *Edinburgh*, and other parts of *Great Britain*; in *Perſia* and the *Eaſt Indies*; in different parts of *Italy*, *France*, *Switzerland*, and *Germany*; in *Sweden* and *Siberia*, and alſo in *North America*.

IV. *a* 1. In a fluid ſtate, opake and of a reddiſh black colour. *Gabion.*

V. *a* 2. The ſame, of a darker colour and thicker conſiſtence. *Sumatra.*

VI. *a* 3. The ſame, of the conſiſtence of treacle. *India.*

SPECIES III. *BARBADOES TAR.*

Petrol tenace, Fr. *Bergtheer, Zähes Erdpech*, Germ.

This is of a dark reddiſh or browniſh black colour, nearly of the conſiſtence and tenacity of common tar and having a bituminous ſmell; ſpecific gravity 1.1. It burns with a thick ſmoke, and is partially ſoluble in ſpirits of wine. The moſt common kind with us is that from the *Iſland of Barbadoes*. It is found alſo in different parts of *Perſia*, *France*, *Norway*, *Sweden*, *Siberia*, &c.

VII. *a* 1. Of a deep reddiſh black colour, of the conſiſtence of tar. *Barbadoes.*

VIII. *a* 2. The ſame, of the conſiſtence of honey. *Auvergne.*

ORDER III. *SOLID.*

GENUS

GENUS I. *SOLID BITUMEN.*

Erdpech, Germ.

This genus is in reality little more than a continuation of the former, the characteriſtic properties of which paſs inſenſibly into thoſe of ſolid or concrete bitumen, in which the nature and proportion of extraneous admixture conſtitutes the chief diſtinctions.

SPECIES I. *ASPHALTUM.*

Maltha. Aſphalte, Fr.

Is either of the colour and conſiſtence of common pitch *(Mineral Pitch)* or completely indurated, of a conchoidal fracture and glaſſy luſtre *(Indurated Petroleum)*. When heated it has a bitumous odour, it melts eaſily, is very inflammable, and when pure burns without leaving any aſhes; ſpecific gravity from 1.4 to 2. It is ſaid to be found floating on the lake *Aſphaltes*, whence its name; ſpecimens are alſo brought from *Auvergne* in *France*, the *Iſland of Trinidad*, and various other parts.

Mr. Hatchet is juſtly of opinion, that the progreſſive changes of naptha into petroleum, mineral tar, mineral pitch, and aſphaltum, are cauſed by the gradual diſſipation of part of the hydrogen of the bitumen and the conſequent diſengagement of carbon. Vide *Tranſ. of the Linn. Soc. Vol. IV. P.* 132.

I. In an irregular piece of a black colour, brilliant luſtre, and conchoidal fracture. *Auvergne.*

II. The ſame. *Derbyſhire.*

III. In detached fragments of a greyiſh colour, found in the cinnabar mines of *The Duchy of Deux Ponts.*

IV. In an irregular portion, with cryſtalliſed calcareous ſpar. *Auvergne.*

SPECIES II. *JET.*

Bitume de Judée, Fr. *Schlackiges Erdpech*, Germ.

Is of a deep black colour, ſometimes inclining to brown, but conſiderably harder and leſs brittle than aſphaltum. It breaks with a conchoidal fracture and is internally of a glaſſy

a glaſſy luſtre. It has no odour except when heated; ſpecific gravity 1.104. It melts in a ſtrong heat, and when burned leaves an earthy ferruginous reſiduum. It is partially ſoluble in ſpirits of wine; with unctuous oils it melts into a black varniſh. It occurs in moſt of the places already mentioned as productive of the other forms of bitumen.

V. Compact, of a ſhining vitreous fracture and ſuſceptible of a fine poliſh.
County of Foix in France.

VI. In irregular ſhattery layers interpoſed between plates of white calcareous ſpar.
Saxony.

SPECIES III. *COAL.*

Charbon de Terre, Fr. *Steinkohle*, Germ.

Coal, in the opinion both of *Mr. Kirwan* and *Mr. Hatchet*, is to be conſidered as compoſed of Bitumen intimately mixed or rather combined with various proportions of earthy or ſtony matter; it is in moſt inſtances alſo impregnated with pyrites. The common properties of this ſubſtance are univerſally known. It always occurs in beds more or leſs horizontal, of different degrees of thickneſs and at different depths; moſt commonly in ſtrata of grit, or of argillaceous ſchiſtus. It is found in conſiderable abundance in the northern, weſtern, and ſouthern parts of *France*, in the *Netherlands*, *Weſtphalia*, *Duchy of Deux Ponts*, and many other parts of the continent; in *China*, the northern parts of *America*, and in inexhauſtible quantities in moſt of the counties of *Great Britain* and *Ireland*.

VARIETY I. *COMPACT.*

VII. Of a ſhattery fracture and very irideſcent. *Bannat.*

VIII. In a flatted portion ſtriated on the ſurface. *Maeſtricht.*

IX. Of a black colour, foliated fracture, and very ſplendid. *Kilkenny.*
Vide *Kirwan Elem. of Mineral.* Vol. II. P. 50 and 520

X. Of a black colour, rather leſs ſplendid, but more brittle *(Culm)*. *South Wales.*
Kirwan, Vol. II. P. 51.

XI. Of a black colour and common luſtre, in its croſs fracture conchoidal *(Cannel Coal)*. *Lancaſhire.*
Kirwan, Vol. II. P. 52 & 523.

XII. Of

XII. Of a black colour, greaſy luſtre and foliated fracture. *Whitehaven.*
Kirwan, Vol. II. P. 54 & 525.

XIII. Of a black colour, foliated fracture, and but little luſtre. *Swanſea.*
Kirwan, Vol. II. P. 55 & 526.

XIV. Of a black colour, compoſed of layers varying alternately in their luſtre *(Ribband Coal).* *Irwine, Scotland.*
Kirwan, Vol. II. P. 56.

VARIETY II. *SLATY.*

XV. Of a greyiſh black colour, little luſtre, fracture partly ſlaty, partly imperfectly conchoidal *(Splent Coal).* *Argyleſhire, Scotland.*
Kirwan, Vol. II. P. 524.

VARIETY III. *BITUMINOUS WOOD.*

XVI. *a* 1. In a flatted piece of a brown colour and without luſtre. *(Surtur-brand, Bituminöſes Holz.)* *Iceland.*

XVII. *b* 1. Of a browniſh black colour and lamellated texture.
Obſ. et Mem. ſur la Phyſiq. Tom. XXXVII, Pag. 275. *Utznack, Swiſſerland.*

XVIII. *c* 1. Of a browniſh black colour and cloſe ſlaty texture.
Phil. Tranſ. Vol. LI. & XLIX. *Bovey Heath, Devonſhire.*

VARIETY IV. *PEAT.*

SPECIES IV. *MINERAL ELASTIC GUM.*

Elaſtic Bitumen. Caboutchou foſſile, Fr.

Is generally of a yellowiſh, reddiſh, or blackiſh brown colour, inclining ſometimes to green, and of an elaſticity and conſiſtence intermediate between thoſe of ſoftened cahoutchou and the finer kinds of cork-wood. In ſome inſtances it is nearly liquid and adheres readily to the fingers, in others indurated and friable. The ſpecific gravity of the more elaſtic is, according to *Mr. Hatchet*, 0.9053. When heated it inflames and emits an unpleaſant odour. It diſſolves in unctuous oil, but is inſoluble in ſpirit of wine, æther and oil of turpentine, and is not affected by the nitric acid. Under diſtillation it yields an

empyreumatic oil and a carbonaceous reſiduum. By *Mr. Hatchett* the elaſtic bitumen is conſidered as a modification of naptha or petroleum, ſuſceptible of a further alteration of property, by maceration in water and long expoſure to air. It was firſt diſcovered in the year 1789, in a vein of the *Odin Lead Mine* near *Caſtleton, Derbyſhire*, aſſociated with galena, fluor, calcareous and ponderous ſpar, quartz, blende, calamine, ſelenite, and aſphaltum.

XVII. Of a ſhining black colour and compact, with cubic fluor and calcareous ſpar on grey limeſtone. *Odin Mine.*

XVIII. Of a greyiſh black colour, ſoft and elaſtic to the touch and of a conchoidal fracture, without matrix. *Same place.*

GENUS II. *AMBER.*

Electrum, Succinum. Succin, Fr. *Bernſtein*, Germ.

The uſual appearances of this ſubſtance authoriſe the appropriation of its title to two ſpecies, viz.

SPECIES I. *HONEY-STONE.*

Pierre de Miel, Fr. *Honigſtein*, Germ.

Found near *Artern* in *Thuringia* in the fiſſures of bituminous wood, in inſular or aggregated octohedral cryſtals, of a honey yellow colour inclining to hyacinth red; ſemitranſparent; brittle; of a conchoidal fracture and vitreous ſplendour; eaſily ſcratched by the knife; ſpecific gravity 1.666. It is not electric upon friction. When heated it becomes partly black and partly of a white colour, fumes and falls into powder, but does not inflame, nor is it ſoluble either in ſpirit of wine or unctuous oils. According to the late analyſis of *M. Abich* it conſiſts of Carbonate of Alumine 16, Carbon 4, Oxyde of Iron 3, Carbonic Acid 40, Water of cryſtalliſation 28, Naptha 5.5. Vide *Annal. de Chim. Tom. XXVIII. Pag.* 76.

VARIETY I. *CRYSTALLISED.*

a. In octohedrons, or double tetrahedral pyramids joined baſe to baſe. *Catal. de Raab. T. II. P.* 90. III. A. 4.

b. Indeterminate.

SPECIES II. *COMMON AMBER.*

Succin, Fr. *Bernſtein*, Germ.

Found in irregular lumps generally of a yellow colour, ſometimes inclining to red, brown or black, more rarely to green or white, and with more or leſs tranſparency. Its fracture conchoidal; luſtre unctuous; eaſily ſcratched by the knife. Specific gravity from 1.078 to 1.085. By friction it becomes electric and emits an agreeable odour, more eſpecially if heated. In ſpirits of wine, æther, eſſential oils, alkaline ſolutions and in all the acids, except the ſulphuric, it is nearly or altogether inſoluble, but in the native balſams and unctuous oils it completely diſſolves and forms different kinds of varniſh. Heated in contact with air it inflames, and gives out a thick white highly odorous ſmoke leaving a black brilliant ſpongy coal. In diſtillation it yields a reddiſh acid phlegm, a light whitiſh or yellowiſh oil, a volatile concrete acid ſalt (*Acid of Amber*), and a compact coaly reſiduum amounting to about $\frac{1}{7\frac{1}{2}}$ of the whole. According to the analyſis of *Baumer* it conſiſts of Petroleum 72, Acid of Amber 4.5, and Water. Amber is univerſally ſuppoſed to be of vegetable origin. That it muſt once have been fluid is ſhewn by the inſects and other foreign bodies, which it ſo frequently contains. It is found in different countries, more particularly in *Pruſſia*, at conſiderable depths in the neighbourhood of or reſting on bituminous wood, often alſo at the bottom of the *Baltic* ſea intermixed with ſand or gravel, or caſt on ſhore, particularly after ſtorms.

VARIETY I. *AMORPHOUS.*

I. *a* 1. In rounded tranſparent portions of different colours, incloſing inſects and other heterogeneous bodies. *Coaſt of Pruſſia.*

II. *a* 2. Larger portions of the ſame. *Same place.*

III. *a* 3. In a tranſparent nodule of a pale yellow colour. *Coaſt of Suffolk.*

IV. *a* 4. In a round piece, rough on the ſurface.

V. *a* 5. In looſe irregular pieces.

VI. *a* 6. Semitranſparent, of a yellowiſh colour with opake white veins.

VII. *b* 1. Of a yellowiſh white colour and opake with reddiſh veins.

VIII. *b* 2. Of a browniſh black colour. *Sicily.*

GENUS III. *MINERAL TALLOW.*

Bergfet, Germ.

According to the deſcription of *Mr. Kirwan*, is of a white colour, of the feel and conſiſtence of tallow, ſtains paper and melts on the application of heat, and burns with a blue flame accompanied with much ſmoke. Specific gravity 0.770. It is imperfectly ſoluble in alcohol, but is ſaid to diſſolve in oil of almonds. It was firſt diſcovered in *Finland* in 1736, afterwards in a lake in *Sweden*, and ſince by *Dr. Herman* in a fountain near *Straſburgh*. Specimens of this ſubſtance of a dull or browniſh white colour with a ſhade of green, and of greater ſpecific gravity than the above, viz. 1.014, have been lately brought from *New Holland*, where it is ſaid to occur in large quantities.

I. In a rounded portion of a white colour, ſoft texture, and ſoapy feel?

Weſt Florida.

GENUS IV. *SULPHUR.*

Sulphur. Soufre, Fr. *Schwefel*, Germ.

When free from earthy and other impurities, is of a pale greeniſh yellow colour, inſipid, inſoluble, burns with a blue flame and ſuffocating odour, in cloſe veſſels ſublimes unchanged, is converted under combuſtion into ſulphuric acid by the abſorption of oxygen, and has many other properties too generally known to require enumeration. Its combinations with the metallic and other bodies have been already mentioned. In a ſeparate ſtate it is met with either in the neighbourhood of volcanos or mineral hepatic ſprings, or in veins or beds moſt frequently of gypſeous or argillaceous ſtrata. Hence the following diſtinction.

SPECIES I. *COMMON SULPHUR.*

Gemeiner natürlicher Schwefel, Germ.

It occurs either in lumps, interſperſed, ſuperficial, or cryſtallifed, in ſemitranſparent rhomboidal octohedrons and their varieties, and generally aſſociated with calcareous ſpar or gypſum. It is found in different parts of the world, as at *Guadaloupe*, *Wiliczka* in *Poland*, *Launſtein* in *Hanover*, *Italy*, *Bevieux* in the *Canton* of *Berne*, *Orenberg*, *Catharinenberg* and other parts of *Siberia*, and in ſpecimens more particularly rich and beautiful from *Conilla* near *Cadiz* in *Spain*.

VARIETY I. *CRYSTALLISED.*

I. Pure ſulphur artificially cryſtalliſed.

II. *a* 1. In rhomboidal octohedrons, tranſparent and of a citron colour with minutely cryſtalliſed calcareous ſpar, on bluiſh indurated clay. *Conilla.*
R. de L. Pl. V. *Fig.* 1 & 4.

III. *a* 2. The ſame, with confuſedly aggregated cryſtals of different figures, on the ſurface of pyramidal calcareous ſpar, on bluiſh indurated clay. *Same place.*
R. de L. Pl. V. *Fig.* 8 & 9.

IV. *b* 1. In ſmall brilliant polyhedral cryſtals, perfectly tranſparent, with very minute cryſtalliſed calcareous ſpar, on bluiſh indurated clay intermixed with ſulphur. *Same place.*

VARIETY II. *AMORPHOUS.*

V. *a* 1. In irregular pieces, of a foliated texture and bright citron colour, intermixed with calcareous ſpar, on bluiſh indurated clay. *Conilla.*

VI. *a* 2. Semitranſparent, of a foliated texture, and browniſh yellow colour. *Cape de Verd Iſle.*

Of a bright citron colour and tranſparent, with white calcareous ſpar, on grey limeſtone. *Bevieux.*

VII. *a* 3. Of a light yellow colour, in laminated gypſum. *Hartz.*

VIII. *a* 4. In irregular fragments of a pale yellow colour and foliated texture. *Bohemia.*

IX. *a* 5. The ſame, leſs tranſparent. *Hungary.*

X. *b* 1. Of a light yellow colour and granular texture. *Kamtſchatka.*

XI. *c* 1. Of a mealy appearance, covering the internal ſurface of a portion of hollow flint. *Auvergne.*

XII. *c* 2. In a powdery form, of a yellowiſh white colour, ſeparated from the waters of *Aix la Chapelle.*

SPECIES

SPECIES II. *VOLCANIC SULPHUR.*

Vulcaniſcher natürlicher Schwefel, Germ.

This alſo occurs in various forms as ſuperficial, interſperſed, ſtalactitic, cellular, &c. and ſometimes, though leſs frequently, cryſtalliſed. It is found in large quantities in moſt volcanic countries, as at *Teneriffe*, Iſlands of *Java* and *Iceland*, *Italy*, *Sicily*, &c.

VARIETY I. *CRYSTALLISED.*

XIII. *a* 1. In delicate plumoſe cryſtals, of a light yellow colour, lining cavities, in an irregular cellular maſs of dark ſhining native ſulphur. *Italy.*

VARIETY II. *OF PARTICULAR SHAPES.*

a. Stalactitic.

b. Cellular, &c.

VARIETY III. *AMORPHOUS.*

XIV. *a* 1. In ſmall ſemitranſparent yellow grains. *Teneriffe.*

b. Compact.

XV. *c* 1. Of a ſpongy texture and yellowiſh white colour.

XVI. *c* 2. The ſame, of a pale yellow colour, but more compact.

GENUS V. *PLUMBAGO.*

SPECIES I. *COMMON PLUMBAGO.*

Black Lead. Plombagine, Fr. *Graphit*, Germ.

Is found either in lumps or interſperſed, of a colour intermediate between bluiſh and light iron black, inclining ſometimes to ſteel grey, and ſometimes to browniſh black, of a weak metallic ſplendour, opake, fracture ſomewhat ſlaty or indiſtinctly foliated, of a fine

fine or coarſe grain; yields eaſily to the nail; has an unctuous feel; ſoils the fingers, and gives a ſplendid ſtreak; ſpecific gravity according to *Kirwan*, from 1.987 to 2.089. It is inſoluble in water and unalterable on expoſure to air. When ignited in the open fire it undergoes ſlow combuſtion, leaving behind only a ſmall portion of oxyde of iron. In cloſe veſſels it ſuffers no change, nor is it altered under the blow-pipe by borax or microcoſmic ſalt, neither does it effervеſce or unite with fixed alkalis. By deflagration with nitre it produces carbonate of potaſh. In the mineral acids it is inſoluble. By the experiments of *Mr. Scheele* it has been proved to be a mineral charcoal combined with a ſmall portion of Iron. It is found in different parts of *France*, *Germany*, *Spain*, and many other countries, but of the greateſt purity at *Borrowdale* near *Keſwick* in *Cumberland*, where it is found in ſiliceous limeſtone.

VARIETY I. *AMORPHOUS.*

I. *a* 1. In a flatted piece of a dark leaden grey colour. *Borrowdale.*

II. *a* 2. In an irregular piece of the ſame colour, with iron ochre. *North America.*

III. *a* 3. The ſame, alſo with iron ochre. *Cape of Good Hope.*

IV. *a* 4. In a larger and more irregular piece. *Bohemia.*

V. *a* 5. In an irregular piece intermixed with quartz. *Same place.*

VI. *a* 6. The ſame, of a bluiſh colour on the ſurface. *Scotland.*

VII. *a* 7. Another ſpecimen of the ſame. *Stiria.*

VIII. *a* 8. In rounded portions imbedded in brown ſiliceous limeſtone. *Borrowdale.*

IX. *b* 1. Of a plated texture intermixed with quartz. *Stiria.*

X. *c* 1. Of a fine granular texture, intermixed with ochry white indurated clay. *America.*

SPECIES

SPECIES II. *ANTHRACOLITH.*

Plombagine Charbonneuſe, Born.

According to *Baron Born*, the anthracolith diſcovered lately at *Schemnitz* in *Hungary*, differs from common plumbago, in being very light and compact, of a ſhining conchoidal fracture, neither ſoiling the fingers nor ſtaining paper, and in being eaſily broken, but without yielding to the knife. Under the muffle it gradually loſes 90 per cent of its weight, and by analyſis contains Carbon 90, Alumine 5, Iron 3, Silex 2. Vide *Catal. de Raab. Tom. II. P.* 296.

VOLCANIC PRODUCTIONS.

For the diſtribution of theſe, ſee the Appendix to the Syſtematic Arrangement, Page 26.

INDEX.

INDEX.

Kermes

THE END.

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