

Syllabus of a course of chemical lectures, read at Guy's Hospital / [William Babington].

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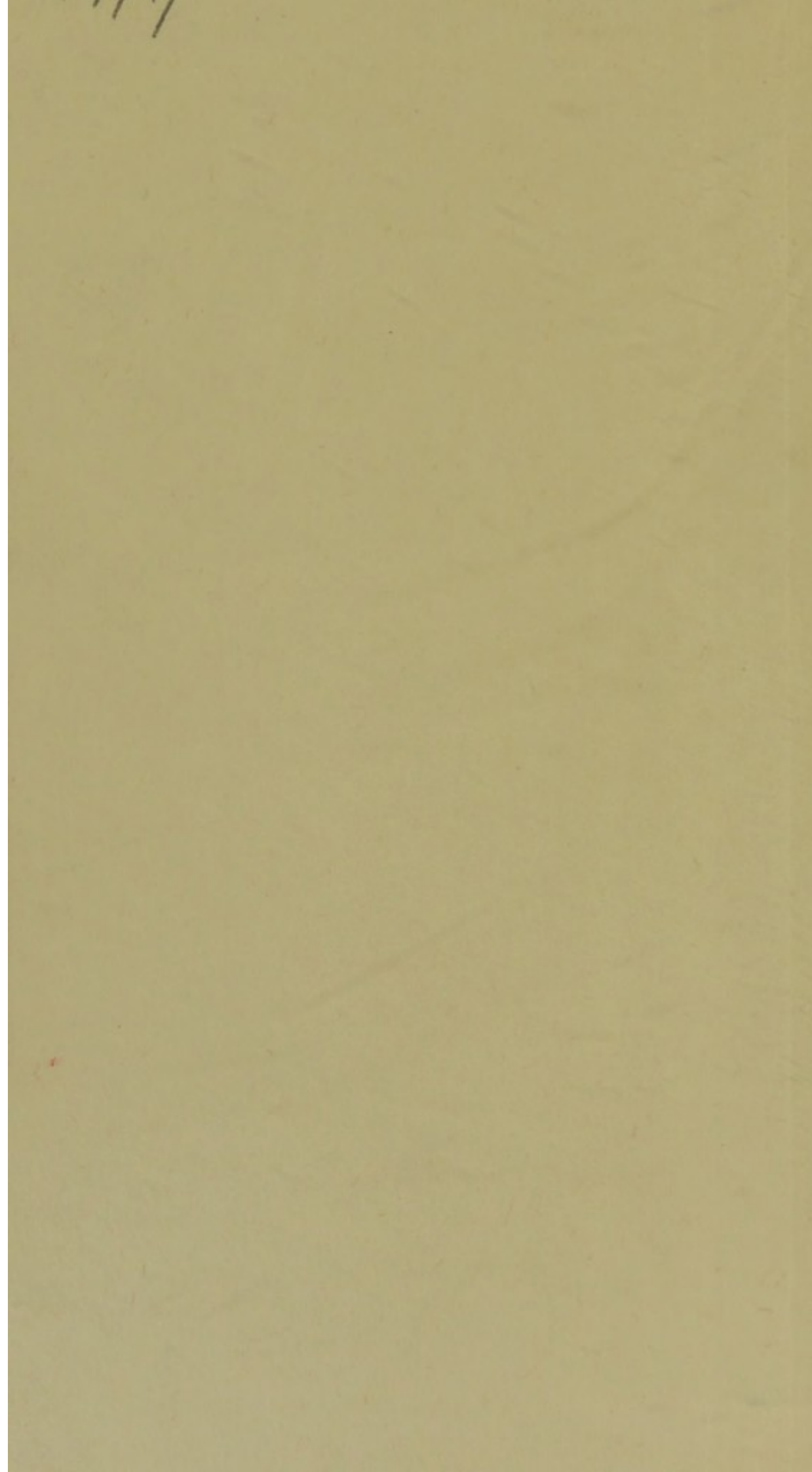
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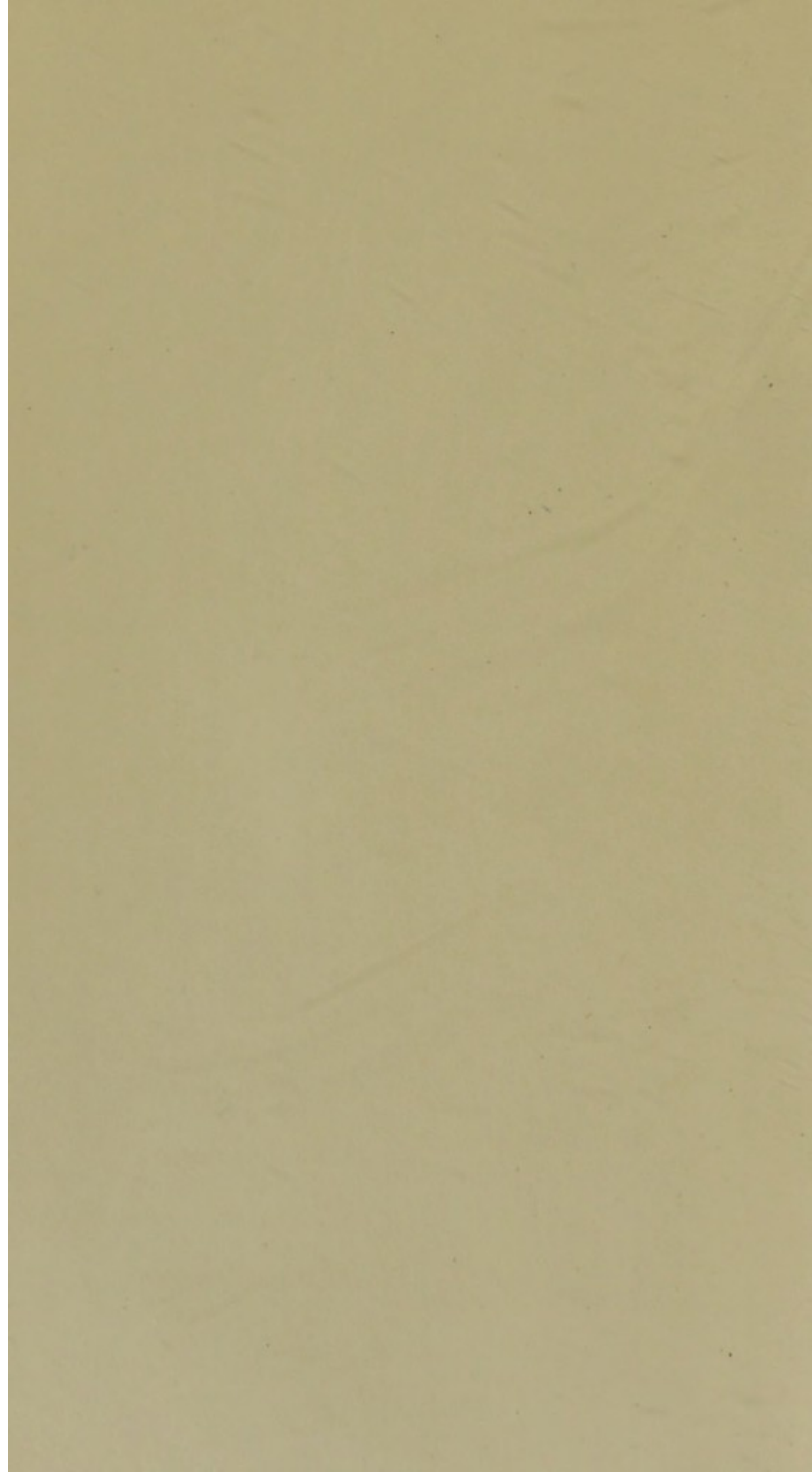


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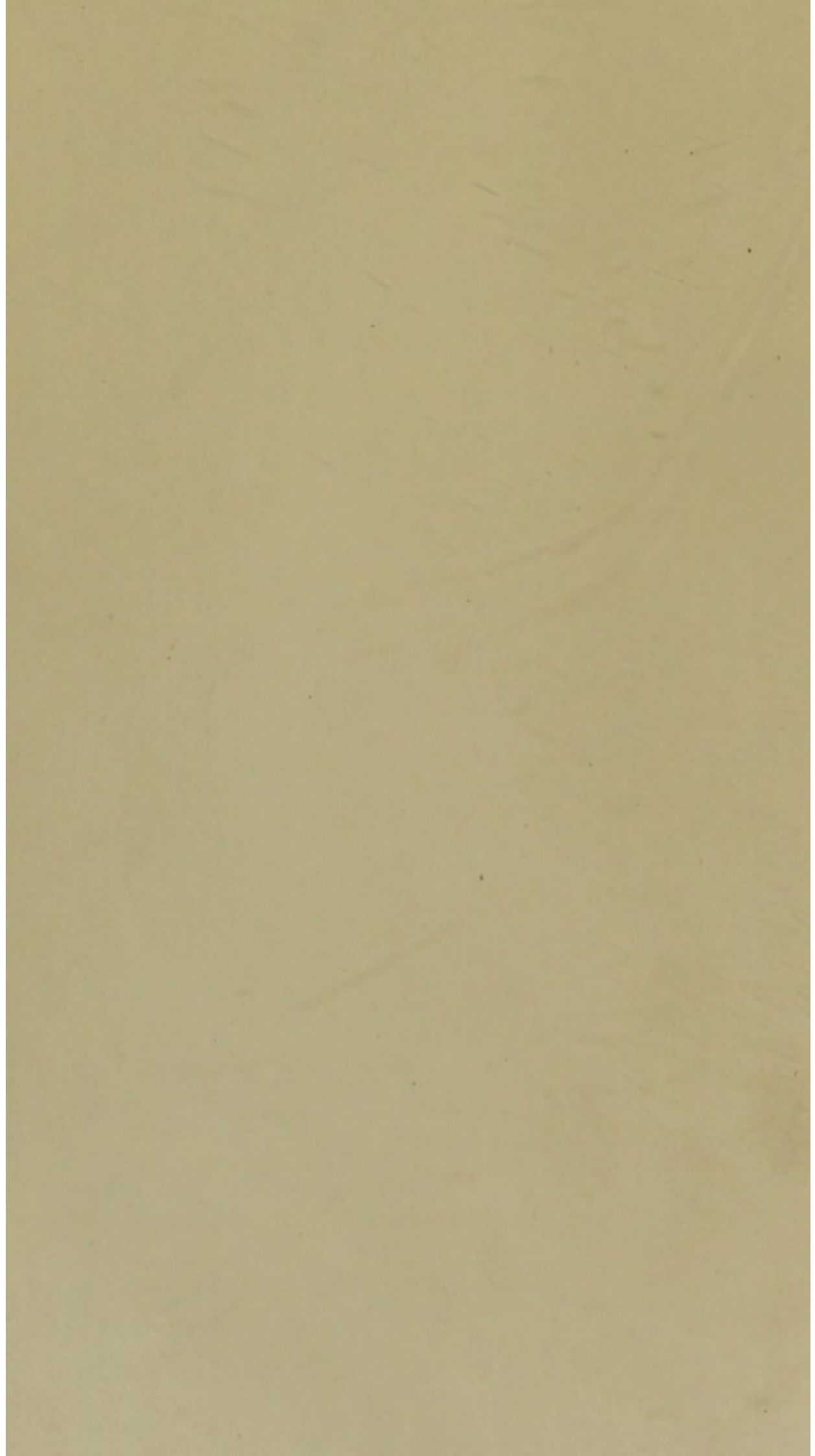
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SYLLABUS
OF
A COURSE
OF
CHEMICAL LECTURES,
READ AT
GUY'S HOSPITAL.

BY
WILLIAM BABINGTON, M.D.
ASSISTANT PHYSICIAN.

LONDON:
PRINTED IN THE YEAR
1797.

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(vi)

P R E F A C E.

IN every Science taught by lectures, a Syllabus of the Course has been found useful to the student. He is thereby furnished with a concise statement of the several divisions of the subject, and of its general arrangement. He is supplied with definitions of scientific terms, and is enabled to connect, and retain with facility, the information he receives.

The objects of Chemistry being various, its views extensive, its principles

A 2

ciples of union as a science, subtle, and its investigations minute, the aid of such a synopsis was as necessary to it as to any other branch of Natural Philosophy. Modern improvements as they have enlarged the scope of this science, have added to the uses of a prospectus to explain it. The discoveries which have been recently made are so various and important, the Nomenclature has undergone, within these few years, such a complete and essential change, that the Chemistry of the present day may be not improperly considered—as a new science expressed in a new language.

It is on these grounds, that the author has thought it his duty to draw
up

up the following Syllabus of the lectures which he reads at Guy's Hospital.

As his course is necessarily designed for Medical Students, he has bestowed particular attention on those parts which relate to their profession. He has not, however, by any means confined his views to this object alone, knowing that there is scarcely a science or an art, scarcely a manufacture or an occupation, in which an acquaintance with chemical research is not productive of advantage; that although the scholar, the artist, and the gentleman, may approach it with different views, each will obtain information more than sufficient to reward him for the pursuit.

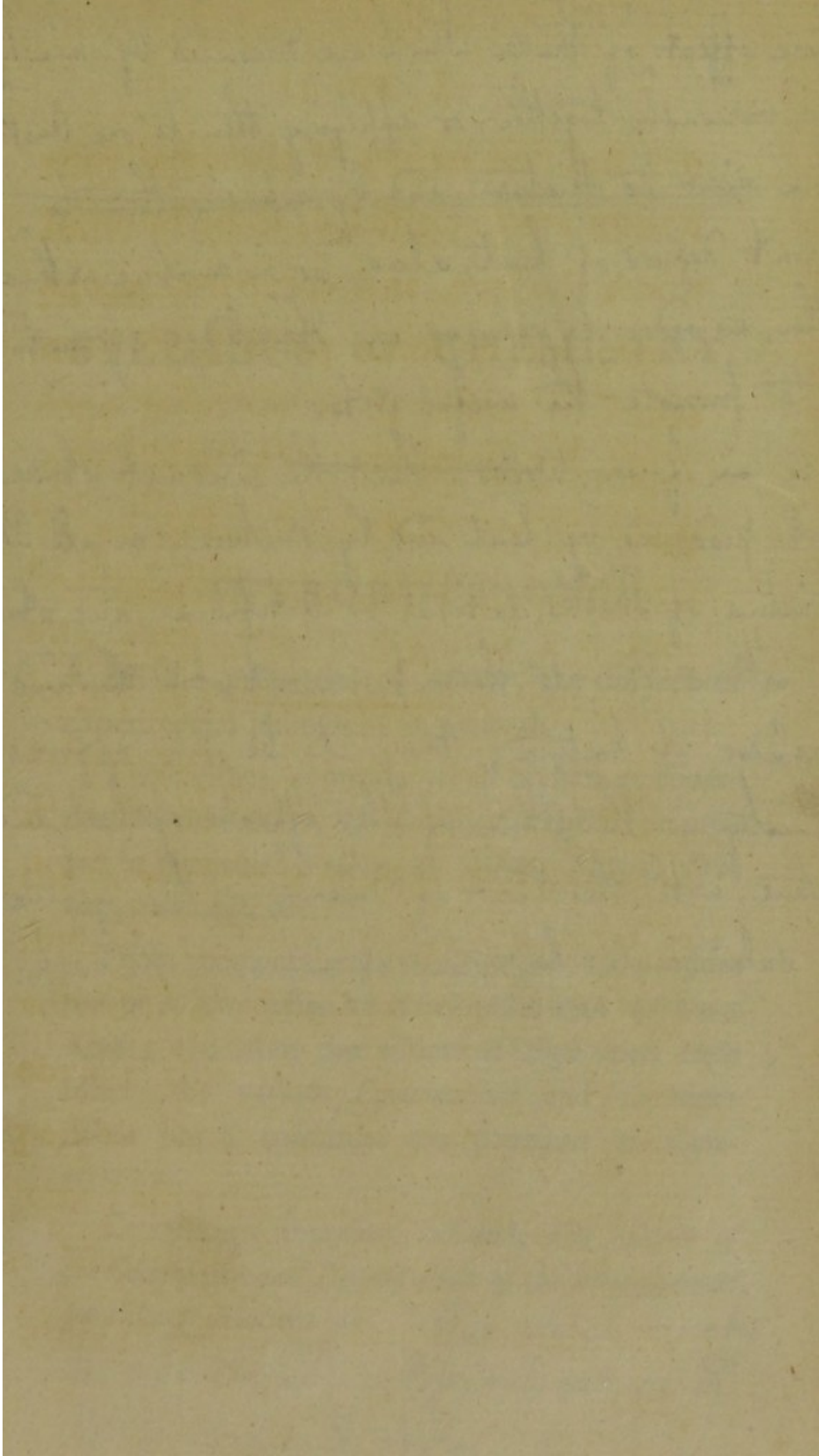
The author has, on this account, endeavoured to arrange the elementary principles of the science, so as to render them applicable not only to medical purposes, but to every other to which Chemistry is adapted; and in doing thus much, he is not without hope, that, independent of present advantage, he shall have made himself useful to his pupils when they have ceased to attend him; that by future perusals of this Syllabus, they may recall some valuable information which length of time or diversity of employment had erased from their memories; that it may serve as a general outline of the science, which they may fill up at their leisure,—as a systematic arrangement, to which they

they may refer whatever they can learn of others or discover of themselves.

Although the systems of the older chemists are now exploded, and many of their principles shewn to be fallacious, their works are still acknowledged to contain valuable sources of information. But as the ancient Nomenclature differs so essentially from the modern, the young student often finds the meaning of these authors involved in considerable obscurity. To obviate this difficulty as much as possible for the learner, tables are subjoined after the manner of the *Tabl. de la Nomenclat. Chim. propos. par M. M. Morveau Lavoisier, &c.* in which the
old

old and new names of chemical substances are so classed, as to be brought under the eye, and compared at one view; and as some pains have been taken to render these tables at once copious and correct, it is hoped that they will, on most occasions, be found to answer their intended purpose.

The properties of Light, so far as it is fit to consider them in a chemical point of view, are comprehended under the head of the opinions regarding Caloric.



Introduction

Dr Black defines Chemistry to be the Science or Study of those effects ^{Qualities} of Matter which are discovered by mixing Bodies variously together, or applying them to one Another with a view to Mixture, and by exposing them to different Degrees of heat, alone, or in mixture with one Another, in order to enlarge our Knowledge of nature, and to promote the useful Arts.

Or, in ~~in~~ fewer words, that the Chemist studies the effects produced by heat and by Mixture, in all Bodies or Mixture of Bodies, natural or Artificial, and studies them with a View to the improvement of Arts, and the Knowledge of Nature; May it be thus defined?

Chemistry is the Study of the effects of heat and Mixture, with the View of Discovering their general and subordinate laws, and of improving the useful Arts.

SYLLABUS OF CHEMISTRY.

INTRODUCTION.

OF the properties of *Matter*, the subject of experimental philosophy in general.

These either common to all bodies, as *Extension*, *Impenetrability*, *Divisibility*, *Weight*; or proper to particular bodies, as *Colour*, *Figure*, *Texture*, *Solubility*, &c.

From the consideration of the peculiar properties of *Matter* arises its distribution into different *Kinds*; and from the action of *these* upon each other, the various *Combinations* and *Decompositions* which constitute the province of CHEMISTRY.

CHEMISTRY therefore defined, *The Science of the Composition and Decomposition of the heterogeneous particles of Matter: or, "that which teaches the intimate and reciprocal action of Bodies upon each other.*

Of the distinction between this, and other branches of natural knowledge, more especially *Natural History* and *Natural Philosophy*.

What is generally understood by the *Vis Inertiæ* of matter.

Of the *Motion* of bodies, as communicated to them by *external Impulse*, or excited in them by their disposition to *attract*, or *repel* each other.

Of the different species of *Attraction* which originate from this disposition, viz. of *Magnetism*—of *Electricity*—*Capillary Attraction*—*Attraction of Gravitation*—*Attraction of* ^{*Aggregation or*} *Cohesion* and *Chemical Attraction*.

OF CHEMICAL ATTRACTION.

This found to operate exclusively between such particles of matter as are *dissimilar*, or *heterogeneous*.

It takes place amongst the *more minute Particles* of matter, and at *insensible Distances*.

It requires that these should possess a certain degree of *Fluidity*.

It

*The greatest degree of Cold that can be produced is from a mixture of muriate of Lime with ~~ice~~ powdered Snow or Ice.

Introduction

Of the Attraction of Aggregation

The homogeneous ^{particles of} Bodies united by this Attraction with different degrees of force: hence hardness, softness, fluidity, State of Vapour, and of Air or Gas. —

Also affected by it in different modes: hence Brittleness, Ductility, Malleability, Texture, and External Figure. —

Of Chemical Attraction

Chemical attraction can only take place by immediate contact, and the particles of matter must also possess a certain degree of fluidity. For example take Nitrate of Copper, and Oxyd of Lin, mixed together and laid upon Tin foil without moisture, they will remain for any length of time unchanged, but by the addition of a little water they immediately go into a state of combustion, and this shows a change of Temperature which a priori always takes place more or less, as is further seen, if you take a certain quantity of Muriate of Ammoniac, and ^{Carbonate of Potash} water, mix these (the separate temperature being between 50 and 60) you will find them reduced below the freezing point, and by mixing Spirits of Wine with water you will have an increase of Temperature with a diminution of bulk —

Of Chemical Attraction

The consistence is also altered, as is remarkable seen in the union of Carbonate of Potash with a solution of Sulphate of Magnesia —

The colour is also changed as is seen by taking a quantity of water and adding a few Drops of the Sulphate of Iron and also a few Drops of the Sulphuric Acid to render the solution colourless, then by the addition of a single Drop of the Prussiate of Lime you will have a beautiful Blue appearance —

Single Elective attraction is when you employ simple substances, as for Example take Nitrate of Quicksilver and add to it a little copper, you will have Nitrate of Copper, because the Nitric Acid has a greater affinity to the Copper than the Quicksilver, therefore leaves it and combines with the Copper —

Double Elective attraction is when you employ compounds, so as to produce substances of a different nature from those you employ, as for Example take Muriate of Ammoniac, and Carbonate of Lime, put them into a Florence flask and expose them to a necessary degree of heat, and you will have Muriate of Lime and Carbonate of Ammoniac —

When water is saturated with one substance it is capable of taking up an additional quantity of another, so that you may have two substances compleatly saturated, so as to produce different Crystals when evaporated —

It produces in their properties very remarkable changes, of *Temperature*, *Specific Gravity*, *Texture*, *Colour*, *Taste*, *Smell*, &c. so that the properties of the compound can seldom be deduced from those of its component parts.

This attraction exerts itself between different bodies with different degrees of *Force*; hence the important doctrine of *Chemical Affinity*.

Of the construction of tables of *Simple* and *Compound Affinity*, called also tables of *Single* and *Double Elective Attraction*.

Of *Saturation*, or the limitation to the proportions in which certain bodies *chemically* unite.

Of the means by which the power of *Chemical Attraction* may be increased or diminished

The influence of *Heat* on it more especially remarkable.

OF CALORIC.

How the terms *Caloric*, *Matter of Heat* or *Fire*, *Temperature*, &c. are philosophically to be understood.

Of the various opinions which have been entertained with regard to the nature of *Caloric*.

It exists either in a *loose* state, producing in different bodies *Warmth*, *Expansion*, *Fluidity*, *Volatility*, &c. in proportion to its quantity; or in a state of *Combination* in which its properties cease to be evident; in the one case called *sensible*, in the other *latent*.

Caloric in a *sensible* or *loose* state has a tendency to diffuse itself among contiguous substances, so as to maintain an uniformity of temperature.

It passes from one body to another with more or less celerity according to its intensity. *Dense* bodies also transmit it more readily, than *rare*; hence the distinction between more or less perfect *Conductors of Caloric*.

In *fluid* bodies it keeps up a perpetual circulation of their particles.

Equal quantities of *Caloric* produce unequal temperatures in equal quantities of dissimilar substances. Bodies therefore said to have different *Capacities for Caloric*, or to differ in their *specific* or *comparative Heats*.

A variation

Of Caloric

Bodies alter in their dilatation and contraction according to their temperature, and on this principle it is that the Cooper heats the hoop before he applies it to the Tub, for in cooling its application becomes more close than the greatest mechanical pressure could possibly produce, Now whether you take them in their solid form, as Iron, or in the liquid form as Quicksilver or ~~off~~ ^{off} Vini Recti or in the Aëiform; in the common atmosphere, their dilatation and contraction are according to their degree of heat or coldness —

In the application of the Thermometer to Liquids it is the medium of temperature that is given you, and not the temperature abstractedly —

It appears to have for different Bodies different degrees of elective attraction —

The Specific Caloric of Bodies must be measured by the quantity of Ice or Snow which they are found capable of melting. — Justly considered as a fluid of universal agency. —

you take equal quantities of quicksilver and water, the temperature of the quicksilver being 60 degrees and the water 140. mix these and instead of a liquor being of 100 degrees the Arithmetic mean, you will have it about 105. but the effect will be quite the opposite if you take the quicksilver at 140 degrees and the water at 60 degrees the Arithmetic mean would be 89. but instead of which it will only be 82 degree — If you put a pint of boiling water on a pint of Ice instead of being at the temperature of 90½ degrees will be as low as 60 and if the water was not sufficient to melt the Ice the temperature would hardly be below the freezing point

Of Caloric

The capacity of Bodies for Caloric varies according to their state of aggregation —

The Caloric which a Body gives out in passing from a state of Aggregation to another, it will again absorb in resuming its original state —

A variation in the *Temperature* of bodies universally accompanied by a variation in their *Bulk*.

In some the dilatation and contraction appear to correspond with the quantity of *Caloric* by which they are occasioned. Hence the construction of the *Thermometer*.

Of the precautions to be observed in the application of this useful instrument.

Of the *Liquefaction*, *Melting*, or *Fusion* of bodies.

Of their *Volatilization*, or conversion into vapour by *Caloric*.

In this state ^(of Gaseous) they possess a high degree of *Elasticity*. Upon the expansive power of volatized water depends the effects of the *Steam Engine*.

To the head of *Evaporation* may also be referred the processes of *Distillation*, and *Sublimation*.

By accumulated *Caloric* bodies may be either rendered *luminous*, without suffering any other essential change; or they may be entirely altered in their properties, producing at the same time *Light* and *Heat*.—In the one case they are said to be *ignited*, in the other *inflamed*. Hence the distinction between *combustible* and *incombustible* substances.

The *Inflammation*, or *Combustion* of bodies takes place only when they are exposed to *Air*. The subjects of *Caloric* and *Air* therefore naturally connected.

OF ATMOSPHERICAL OR COMMON AIR.

Of the *Weight*, *Elasticity*, and other general properties of this fluid.

Subject to various changes from vicissitude of temperature and other accidental causes.

Of the *chemical* properties of the inferior stratum of the *Atmosphere*.

Shewn both by *Analysis* and *Synthesis* to be composed of two parts.

One by which *Respiration* and *Combustion* can alone be supported, *Oxygen Gas*.

The other in which both *Life* and *Flame* are immediately extinguished, *Azotic*, or *Nitrogen Gas*.

Of Atmospheric Air

For a series of time Atmospheric Air was considered homogeneous, or simple in its nature, and one of Elements, but it is now found that this fluid capable of being resolved into constituent parts Elements —

The quantity of water which it holds in solution depends, not only upon its temperature, but also upon its density.

Of Oxygen Gas

Dr Priestley and Mr Shields were the first who discovered its curious and important properties; the cheapest way of procuring it is from the oxyd of manganese; but the substance which furnishes it in the greatest quantity and purity is the oxy: muriate of Potash —

In diminishing the bulk of Atmospheric air it is the Oxygen which is absorbed, therefore the extent of the diminution depends upon the quantity of Oxygen it contains. Therefore if you expose this air to the Nitrous gas you may tell the purity of it, by the diminution which takes place. But the most accurate way of telling this is by adding it, to a solution of the Sulphate of Iron in the Nitrous Gas. The colour and consistence is remarkably changed in some bodies which are exposed to it, as is seen in exposing some oils and balsams, they becoming in time Resins and Gums. —

It serves the purpose of combustion, as is beautifully seen upon exposing lighted charcoal or a piece of Steel to this air, it being inclosed in a bottle — also phosphorus. Charcoal upon being burnt in Oxygen Gas produces Carbonic acid Gas; this is also produced in Respiration by the Oxygen which is absorbed, going into union with the Carbone contained in the Blood, thus forming Carbonic Acid Gas. —

The combustion of bodies are various as are substances you employ, and there is also a remarkable difference in the result according to the manner in which the combustion is conducted —

Of Oxygen Gas.
Called formerly, Dephlogisticated, Pure, Imperial or Vital Air.

Obtained in a separate state from *metallic Oxyds* and compounds of the *Nitric* and other acids by the application of heat.

Its purity ascertained ^{by exposure to a solution of Green Sulphate} by mixture with *Nitrous* or *Muriatic* Gas. ^{of Iron} *Eudiometer.* ^{Saturated with}

Somewhat heavier than *Common Air.* ^{nitrous Gas}

Is absorbed by many bodies upon simple exposure, as in *Fermentation, Bleaching, &c.* ^{or x}

Serves the purposes of *Respiration* and *Combustion* in an eminent degree.

In *Respiration* is diminished in bulk, and produces *Carbonic Acid Gas*; hence the ^{supposed} function of the *Lungs* and origin of *Animal Heat*.

By combustion with *Hydrogen Gas* (so named from this property) it forms *Water*, ^{together with a portion of nitric acid, if the combustion be rapid.}
 In the combustion of many other bodies, as *Sulphur, Phosphorus, Charcoal, &c.* whilst *Heat* and *Light* are given out, it communicates to them the properties of *Acids*. The gas itself disappears, but produces in the acid *Residua* an increase of weight proportional to the quantity

consumed; hence the modern theories of *Combustion* and *Acidification*, as depending on the decomposition of *Oxygen Gas* and the consequent union of its *Base* with the substances employed to effect it; and hence the terms *Oxygen* and *Oxygenation*.

Metals by combustion approach to an acid state, to which some may be brought by a further accession of *Oxygen*; hence the terms *Oxyd* and *Oxydation*.

Of Azotic Gas.

Called formerly Phlogisticated Air, and Mofete.—

Remains after the abstraction of *Oxygen Gas* from *Atmospherical Air* on its exposure to *Sulphuret of Potash*, a mixture of *Iron Filings* and *Sulphur*, &c.

Obtained in its purest state from a mixture of *Oxy-muriatic acid* and *Ammoniacal gasses*.

Lighter than *Atmospherical Air*. *When pure no smell or*

Noxious to *Life* and *Flame*, but not to *Vegetation*.

* Forms a constituent part of *Animal Matter*.

* If you add *nitric acid* to a piece of *More* *muscle*, *azotic gas* will be evolved in considerable quantities.

Of Oxygen Gas

Of Azotic Gas, Or Nitrogen Gas.

As gas has never been found in an uncombined state, it is therefore reasonable to think that a Chemical union exists between it and Oxygen, their specific gravity being so widely different, it is also impossible of being absorbed by Water, Acids, or Alkalies therefore readily decomposed. —

It differs from most other gases in being incapable of absorption by Water, or by the Liquid forms either Acids or Alkalies.

It is produced in the decomposition of Animal and Vegetable substances, of which it is therefore generally thought to form a constituent part. —

Of Azotic Gas

By taking certain quantities of Oxygen and Azotic Gas and submitting these to the Electric Spark, Nitric Acid is formed —

Oxygen is supplied by Vegetables under the influence of Light —

Of Water

At a middle temperature a Cubic foot of Water weighs nearly 1000 Ounces avoirdupois. —

It enters into most Bodies as a constituent part, and its freezing is facilitated both by access of Air and agitation —

Ice at the freezing point absorbs, in melting, a quantity of Caloric sufficient to raise an equal portion of Water at the same temperature, to above 167° of Fahrenheit —

Under the ordinary pressure of the Atmosphere, its Volume in the state of Vapour is that of Liquid Water as 800 to 1; and the quantity of Caloric which it contains in this state also proportionally greater: hence the heat given out in its distillation, and the warmth produced in the Atmosphere by the condensation of Aqueous Vapours —

More particularly characterised by the production of *Nitrous Acid* on its union with *Oxygen*, and of *Ammoniac* with *Hydrogen*. From the former of these properties obtains the name *Nitrogen*.

Of the means employed by nature to maintain a due proportion between this and *Oxygen Gas* in the composition of the *Atmosphere*. Besides the *Oxygen Vegetables* supply, it is reasonable to suppose that there are resources in nature that we are unacquainted with.

OF WATER.

The *physical* properties of *Water* differ in the *solid*, *liquid*, and *gaseous* or *vaporous* states of aggregation, which depend upon the influence of *Caloric*.

In its passage from the *liquid* to the *solid* state of aggregation, there takes place an increase of *Temperature*, an extrication of *Air*, or other extraneous matter previously contained, a peculiar arrangement of *Particles*, and a consequent augmentation of *Bulk*.

The *Expansion* of *Water* in the act of *Congelation*

7

The proportions of *Hydrogen* and *Oxygen* in the composition of *Water*, said to be 15 of the former to 85 of the latter—

tion exerts itself with irresistible force; hence the beneficial effects of frost on some occasions and its inconveniences on others.

Water in the liquid state to a certain degree compressible.

Possesses in this state a *solvent* power over most other bodies, seldom therefore free from impregnation.

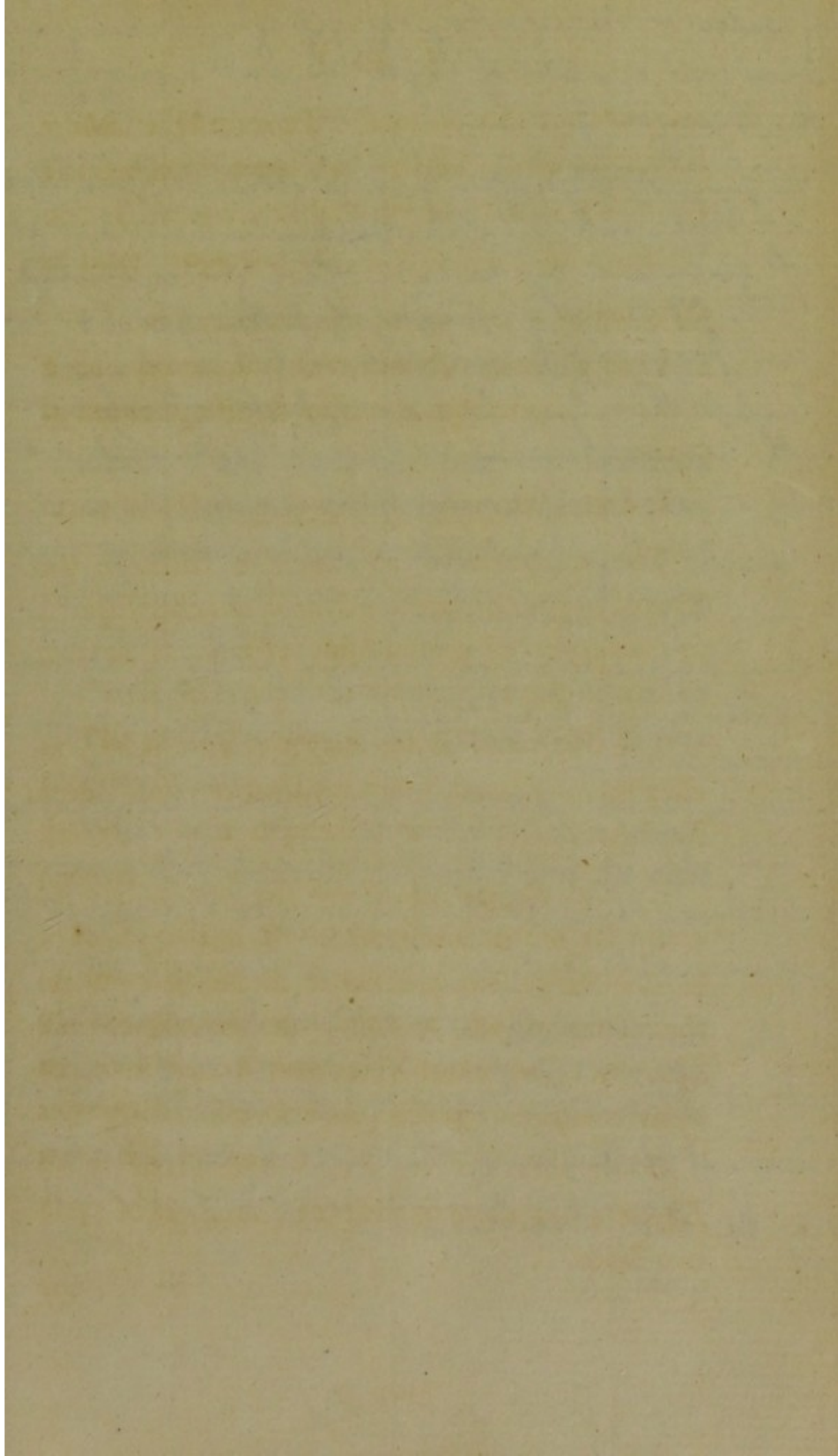
It enters into many bodies as a *constituent* part.

The temperature at which it passes to the state of vapour proportional, as in all other *Liquids*, to the degree of pressure made upon its surface, as seen in the application of *Papin's Digester*.

The *Vapour* of *Water* highly elastic; hence, as already mentioned, the construction of *Steam Engines*.

By the *Vapour* of *Water* the combustion of many bodies is accelerated. When applied to heated *Iron*, *Zinc*, and other metals, it converts them into *Oxyds*, yielding at the same time *Hydrogen Gas*, which produces *Water* in combustion with *Oxygen Gas*, as before stated.

Water therefore no longer considered as an *Element*, but compounded of the *Bases* of these two fluids. This may account for Rain by supposing these two fluids coming into contact in the atmosphere, under combustion.



Of Hydrogen Gas

Inflammable air may be obtained from the application of water or Vapour to Iron filings, it changes the Iron into a state of Oxidation, and disengages the the Hydrogen Gas —

The purest Hydrogen Gas is obtained from Iron and Zinc with diluted Sulphuric Acid, but it is not given out by Acids in their concentrated state, Dr B. is of opinion that this Gas has never been prepared purer than 12 to 1 —

Unless this Gas has an opportunity of mixing with Atmospheric or Pure Air, it will not go into a state of combustion —

When impregnated with Carbonic Acid gas, it forms Hydro, Carbon —

When passed through burning sulphur it forms Hepatic air or Hydro. Sulphur which is of a very noxious smell —

When in union with Phosphorous forms Hydro Phosphorous —

It may also be united with different Bituminous substances hence the distinction into heavy and light Inflammable air's —

In its nascent state it is found to be capable of combining both with Oxygen and Azote; with the one producing Water, as in the case of combustion; and with the other, Ammoniac. —

Of Hydrogen Gas, or Inflammable Air.

Found in a disengaged state in *Coal Mines*, on the surface of *Stagnant Waters*, and rising through the waters of certain *Springs*.

Obtained also artificially from the distillation of *animal*, *vegetable*, and *bituminous* matter; from the application of heat to *Essential Oils*, *Alcohol*, *Æthers*, &c. and from pure *Ammoniac* by means the *Electric Spark*.

Purest from the decomposition of *Water* by *Metals* as above stated, or during their solution in *diluted Acids*.

When pure many times lighter than *Atmospherical Air*; hence the construction of *Aerostatic Machines*.

Smell adventitious.

On inspiration proves noxious to *Animal Life*, apparently by the exclusion of the *respirable* part of the *Atmosphere*; hence its late application in the treatment of certain diseases, arising as it has been thought, from excess of *Oxygen* in the system.

Burns only when in contact with *Oxygen Gas*. The *Slowness* or *Rapidity* of the combustion depends on the proportions, and intimacy of the previous Mixture.

On all occasions *Water* is the consequence.

The extrication of *Oxygen Gas* from vegetables growing under the influence of light depends, according to the general opinion, on the decomposition of *Water*, the *Hydrogen* of which is absorbed.

Hydrogen and *Nitrogen Gasses* by their union compose *Ammoniac*.

OF ACIDS.

Distinguished by being *sour* to the taste, changing vegetable *blue* colours to *red*, and by their extensive power of combining with other substances.

All unite readily with *Water*.

In

Of Hydrogen Gas.

Of Salts.

are characterized by being sapid or of a saline taste and easily soluble in Water; On exposure to Air generally they receive or impart moisture; hence said to be hygroscopic or efflorescent. —

They are divided into simple or compound, the more simple Acids and Alkalies, — the compound, such as result from union of these with each other, Neutral Salts, — or of the Acids with the Earths and Metallic Oxides, Earthy and Metallic Salts —

Of Acids

Saline substances are distinguished by their giving a sapid taste and are more or less soluble in water —

Simple saline substances are Acids and Alkalies; those mixed are simple compound saline substances; those where one acid and two Alkalies or one Alkali and two Acids are mixed, they are then called triple compound saline substances —

Alkalies are unisour to the taste, and change Vegetable Blue to Green —

Vegetable Acids are far inferior in their disceptic properties to the Mineral Acids —
Compound of Acids are now named from the acid employed, and not from the compound used, as was formerly the case. —

Of Acids

Acids exist in different states, some being fluid, others are forms, and some solid, those in a fluid state are combined with water. Acids consist of a Radical & Basis, Oxygen being always that Basis, and the Radicals are either simple or compound. The weakest acids, that is when impregnated with Oxygen minus have plus added to the word, as Sulphurous Acid, and when Oxygen plus, have is added, as Sulphuric Acid. —

Of the Sulphuric Acid

The most economical way of preparing the Sulphuric Acid, is by deflagrating Sulphur with Nitre —

The more rapid the process of burning is, (which is increased by adding a larger proportion of Nitre) the stronger will be the Acid —

The names of this acid differs in proportion to the quantity of Oxygen absorbed, when it has absorbed the greatest quantity it is capable of, it is then called Sulphuric Acid, but when it has only recd a certain quantity it is called Sulphurous Acid, & so with respect to other Acids. —

In combination with *Alkalis* form for the most part what are called *Neutral Salts*; with *Earths* and *Metallic Oxyds*, *earthy* and *metallic Salts*.

Most of the acids *antiseptic*. Some powerfully *corrosive*.

Consist of *Inflammable Substances* united to the base of *Oxygen Gas*, the proportion of which determines the degree of *acidity*.

Usually divided into *mineral*, *vegetable*, and *animal*, according to the sources from whence they are most abundantly obtained.

The *mineral Acids* are the *Sulphuric*, *Nitric*, *Muriatic*, *Carbonic*, *Fluoric*, *Boracic*, *Succinic*, *Arsenic*, *Tungstenic*, and *Molybdenic*.

Of the Sulphuric or Vitriolic Acid.

Obtained from the burning of *Sulphur*, and distillation of *Sulphate of Iron*.

Concentrated afterwards by *boiling*.

When pure, *limpid*, *ponderous*, *unctuous*, *inodorous* and intensely *sour*.

Has

Has a powerful attraction for *Moisture*, and on mixture with *Water* occasions an increase of temperature.

Freezes most easily when concentrated.

Unites intimately with *Alkalis*, producing with the vegetable, *Sulphate of Potash* (*Kali Vitriolatum* P. L.), with the mineral, *Sulphate of Soda* (*Natron Vitriolatum* P. L.), and with the volatile, *Sulphate of Ammoniac*.

With the *Earths*, *Sulphate of Baryt*, of *Lime*, of *Magnesia* (*Magnesia Vitriolata* P. L.), &c.

With *Metals*, *Sulphate of Zinc* (*Zincum Vitriolatum* P. L.), *Sulphate of Copper* (*Cuprum Vitriolatum* P. L.), &c.

May be deprived of a portion of its *Oxygen* by treatment with *Inflammable Substances* converting it into *Sulphureous acid Gas*, or totally decomposed and reduced to the form of *Sulphur*.

The properties of *Sulphureous acid Gas* in many respects different from those of *Sulphuric Acid*. Its compounds therefore denominated *Sulphites*.

The *Sulphuric Acid* superior to most others in respect to its *Power of Attraction*, and stands about the 17th in the order of attraction.

The

Of Sulphuric Acid

Sulphurous acid is formed by the slow combustion of the
precipitates, but when the combustion is rapid Sulphuric
acid is formed. —

This acid has no effect on the colour of Indigo. —

Independently of its Water, supposed to consist of
Parts of Sulphur and 24 of Oxygen. —

Of Nitric Acid

This acid generally contains a quantity of the Sulphuric or Muriatic acid, the existence of the muriatic may be known by the addition of Nitrate of Silver, and when the sulphuric, by adding to it a quantity of Muriate of Baryt, if it contains either of these the liquor becomes turbid. —

This acid is in many respects analogous to the Sulphuric Acid. —

The Radical of Nitric Acid is Azote, and when they are combined in a small degree, Atmospheric Air is the result, when the proportion of Oxygen is increased, Nitrous Oxide, in a greater proportion, Nitrous Acid Gas, in a still greater, Nitrous Acid, and when impregnated to the utmost Nitric Acid. —

Nitrous Acid gas, is decomposed by any substance which has a greater attraction for Oxygen than Azote. —

In a large way Nitric Acid is formed with Green Vitriol and Nitrate of Potash, or by mixing clay with Nitrate of Potash. —

The only difference between Nitrous Acid and Nitric Acid, is the Nitrous Acid containing a quantity of Nitrous Gas. —

Nitric Acid with two parts of water is called Double Aq. fortis, and if an equal quantity of water is added to this it is called single Aq. fortis. —

Nitrous gas having an electric shock passed through it forms Nitrous Oxide and Oxygen. —

By adding Sulphur or Phosphorus to Nitric Acid it is decomposed, and the Sulphuric or Phosphoric Acid is formed, while the Nitrous gas passes off in fumes. —

Nitrate of Copper lapped up in tin foil will remain a little time, and throw out flame, combustion taking place. —

The order of its *Attraction* is *Baryt*, *Potash*, *Soda*, *Lime*, *Magnesia*, *Ammoniac*, *Alumine*, *Metallic Oxyds*, *Water*, *Spirit*.

Employed principally in *Dying*, *Bleaching*, *Tanning*, *Purification of Oils*, and in *Medicine*.

Of Nitric Acid.

Obtained from the decomposition of *Nitrate of Potash* by *Sulphuric Acid*, by de-aqueated *Sulphate of Iron*, or *Alumine*.

Purified by re-distilling from a fresh portion of *Nitre*, or by the addition of *Nitrate of Silver*.

In its common form, of a *yellowish* or *orange* colour. When pure, altogether *colourless*.

More *volatile* and less *ponderous* than *Sulphuric Acid*. Its *Acidity* equally intense.

Attracts *Moisture* also from the atmosphere, and unites readily with *Water*; but produces with it a less degree of *Heat*.

Destructive more immediately than the *Sulphuric Acid* of the life and texture of bodies to which it is applied.

By

By union with *Sulphuric Acid* acquires new properties, *Aqua Regina*.

By its union with the *Alkalis* produces *Nitrate of Potash* (*Nitrum P. L.*) *Nitrate of Soda*, *Nitrate of Ammoniac*.

With *Earths*, *Nitrate of Baryt*, *Nitrate of Lime*, &c.

With *Metals*, *Nitrate of Zinc*, *Nitrate of Iron*, &c.

In dissolving *Metals*, is partially decomposed and converted into *Nitrous Gas*, which on mixture with *Oxygen Gas*, reproduces *Nitric Acid*, and has many other remarkable properties.

Many of the *Inflammable Substances* produce a similar effect.

Some decompose it more completely; and by the separation of its *Oxygen* occasion actual *Inflammation*.

Decomposed also by exposure to *Light*, as well as by the application of *Heat*. The product *Oxygen Gas*, with a certain admixture of *Azotic Gas*. These therefore considered as the elements of *Nitric Acid*.

By different modes of combination they may be made to reproduce it.

The

[The page contains extremely faint, illegible handwriting throughout.]

Of Muriatic Acid

By taking common Salt ^{8 parts} and adding to it a quantity of the Sulphuric Acid ^{5 parts}, the Muriatic acid gas will be evolved, and when water is impregnated with this gas the acid in question is formed. —

This acid if applied to the skin produces heat and redness, and if the parts are very tender blisters will arise. —

Muriatic Gas melts Ice nearly as readily as a hot Iron. —

This Gas gives a brightish green tinge to flame, and is more readily absorbed in cold than in hot water. —

The Muriates are very soluble in water. —

The purity of Muriatic Acid is known by adding Muriate of Potash, for if it contains Sulphuric Acid the liquor becomes turbid, not otherwise. —

This Gas turns all the colours of flowers white, except yellow; it also turns Rags, Paper, writing Ink, white. Bees Wax may be bleached white, as may also Bones in the dry Muriatic acid gas. —

Water absorbs but a small proportion of this acid. —

* This may be prepared by mixing muriatic acid gas with the Ammoniacal gas, when the Salt becomes deposited upon the sides of the Vessel, an increase of temperature takes place, which is always the case when gaseous matter becomes solid. —

Antimony drop into Muriatic gas detonates, with a thick white cloud, Ether drop into it, and a match held over the top produces instant combustion. —

Other acids turn Vegetable blue colours Red, while this turns them white. —

To fumigate Rooms, or cloaths, put three parts of Common Salt, two of Sulphuric Acid, and one of the black Oxide of Manganese in a Retort, and apply the heat of a Spirit Lamp to them, if they are Cloaths they ought previously to have been washed in a weak solution of Alkali. —

The *order of attraction* of this acid the same as that of the *Sulphuric*.

Chief uses in *Dying, Etching, and Assaying*; and sometimes, though rarely, in *Medicine*. But now in very general use.

Of *Muriatic Acid*.

Obtained by decomposing *Muriate of Soda* (common or sea salt) by means similar to those employed in the preparation of *Nitric Acid*.

Form gaseous.

In this state is readily absorbed by water, increasing both its temperature and bulk, and communicating to it the general properties of an *Acid* (*Acidum Muriaticum*, P. L.).

In union with *Alkalis* forms *Muriate of Potash*; *Muriate of Soda* (*Sal Muriaticus*, P. L.) and *Muriate of Ammoniac* (*Sal Ammoniacus*, P. L.).

With *Earths*, *Muriate of Baryt*, of *Lime*, &c.

With *Metals*, *Muriate of Zinc*, of *Iron*, &c.

With some of the *Metals*, as *Zinc* and *Iron*, and some of the *Inflammable Substances*, as *Alcohol*, *Essential Oils*, *Phosphorus*, &c. it produces *Hydrogen Gas*.

On distillation from certain *metallic Oxyds*, it unites with their *Oxygen*, and acquires thereby a singular alteration in its properties. *Oxy-muriatic Acid, Aqua regia.*

Remarkable in this form for its effects on animal and vegetable colours; hence its present application in *Bleaching*.

The affinity of *Muriatic Acid* in most instances weaker than that of either the *Sulphuric* or *Nitric*; but the order of its attraction the same.

Basis as yet unknown.

Employed principally in *Medicine, Bleaching, Dying, and Assaying.*

Of Carbonic Acid.

Sources of this *Acid* various.

Usually collected ^{in a gaseous form} from bodies undergoing the *vinous Fermentation*; or from *Carbonated Earths* or *Alkalis*, by the application of *Heat*, or more commonly by the addition of an *Acid* of superior attraction.

Specifically *heavier* than atmospheric air, nearly as 2 to 1. hence so frequently found in *Mines, Caverns and Grottoes.* In

Of Muriatic Acid

most remarkable alteration takes place in this acid when brought into union with the brown, or black calx of manganese. Mr. Shield found upon pouring this acid on powdered oxyd of manganese, and submitting it to a sufficient degree of heat, that a new compound was produced, which was brought about by the acid absorbing a larger quantity of oxygen, therefore it ought to be called muriatic acid, and the present muriatic acid, muriatous acid, for the same reason as one is called Nitric, the other nitrous acid, for the only difference here is the oxy. muriatic acid containing a great proportion of oxygen. This acid may be derived from the other different oxyds, but not so especially. It is capable of dissolving gold and platinum which cannot be done by any other substance except Aq. Regia, which is this acid formed in a different manner. —

Of Carbonic Acid

Called also aeriform acid or fixed air, it being gaseous, is found in the air in every case without exception. After it has undergone respiration, it is found also in subterraneous situations, in different springs communicating them properties that are highly beneficial in diseases. —
On earthy or metallic bodies this acid unites with acids, mild, they being rendered so by the mixture. —
This acid we have two forms the Carbonic acid gas, and Carbonic acid, the latter being formed by making water absorb the Carbonic acid gas. —
Carbonic acid is Carbon in combination with oxygen, and heat that can be applied is capable of bringing Carbonic acid gas to a fluid form, or any pressure will turn so it. —
Gas Redens Liquors. —

Of Fluoric Acid.

Obtained by decomposing *Fluate* of *Lime* by means of the *Sulphuric Acid*.

Form *gaseous*.

Heavier than atmospherical air, as 1.5 to 1.
Caustic.—*Azotic*.

Unites readily with *Water*, and renders it intensely four.

In union with the *Alkalis*, forms compounds of a gelatinous consistence.

Possesses the remarkable property of dissolving and volatilizing *Silex*.

Dissolves *Zinc*, *Iron*, and *Copper*; the other metals not acted on, unless in the state of *Oxyds*.

Basis unknown.

Order of Attraction, *Lime*, *Baryt*, *Magnesia*, *Potash*, *Soda*, *Ammoniac*, *Alumine*, metallic *Oxyds*, *Water*, *Spirit*.

Use—*Etching on Glass*.

Of

Of Fluoric Acid.

The experiments of Mr Shield have shown it to be composed of calcareous Earth or lime in union with the acid in question, the most curious and important property of this acid, is that it is a menstruum for flinty earth of Pilex, while no other acid we are yet acquainted with, therefore when you prepare this acid it comes over in a gelatinous form, which is caused by its uniting with the Pilex contained in the glass vessel you are carrying on the experiment with. —

When dissolved in 50% of wine and set fire too, it gives out a beautiful green flame. —

The Radical of this acid is not known, nor is it ascertained whether it contains any oxygen or no. It extinguishes light flame, and is noxious to those animals that are made to breathe it. —

With this acid petrifications might be made, for upon moist bodies being brought into it, a deposit of Silicious Earth takes place upon their surface. —

This acid gas gives a roughness to glass, and is used in etching upon glass, you first cover the surface of the glass with wax, and then make your impressions down upon the glass, and then pour this acid into these hollows. —

With a slight degree of heat this acid is Phosphorescent. —

Boracic Acid

When this acid is used in soldering it goes into a state of glass becoming vitrified, it therefore acts in two ways, first by defending the metal, preventing it oxidating, but if any does become oxidated it unites with it, converting it also into a state of glass. —

Of Boracic Acid.

Called formerly Sedative Salt.

Found in solution in the water of certain *Lakes*; or obtained artificially, by decomposing *Borate of Soda* by *Sulphuric Acid*; or by sublimation with *Sulphate of Iron*.

Form *concrete, scaly; Semi-transparent*, and of a *pearly lustre, in its native saline*.

Sparingly soluble in *Water*; more so in *Alcohol*, to the flame of which it communicates a greenish tinge.

When united with *Water* easily sublimed.

Fusible without addition into a transparent *Glass*.

Forms, with *Potash*, *Borate of Potash*; with *Soda*, *Borate of Soda* (*Common Borax*); &c.

With *Lime*, *Borate of Lime*, &c.

Basis unknown.

Order of Attraction, *Lime, Baryt, Magnesia, Potash, Soda, Ammoniac, Alumine, metallic Oxyds, Water, Spirit*.

Supposed by the discoverer Homberg to possess peculiar *sedative* powers, and hence called by him *sedative salt*.

Of Succinic Acid.

Obtained from *Amber* by distillation without addition.

Freed from *Empyreumatic Oil*, and rendered colourless, by redistillation; by solution and filtration; by solution in muriatic acid; or, by detonation with *Nitre*.

Readily soluble in *cold Water*, still more so in *boiling Water* or in *Spirit*.

Form *concrete*, consisting of minute triangular prisms, truncated at their apices.

Unites with the *Alkalis*, *Earths*, and *metallic Oxyds*, forming with them compounds, the properties of which have as yet been little enquired into.

Basis not ascertained.

Order of attraction—*Baryt*, *Lime*, *Magnesia*, *Potash*, *Soda*, *Ammoniac*, *Alumine*, *metallic Oxyds*, *Water*, *Spirit*.

Use confined to medicine.

(3)

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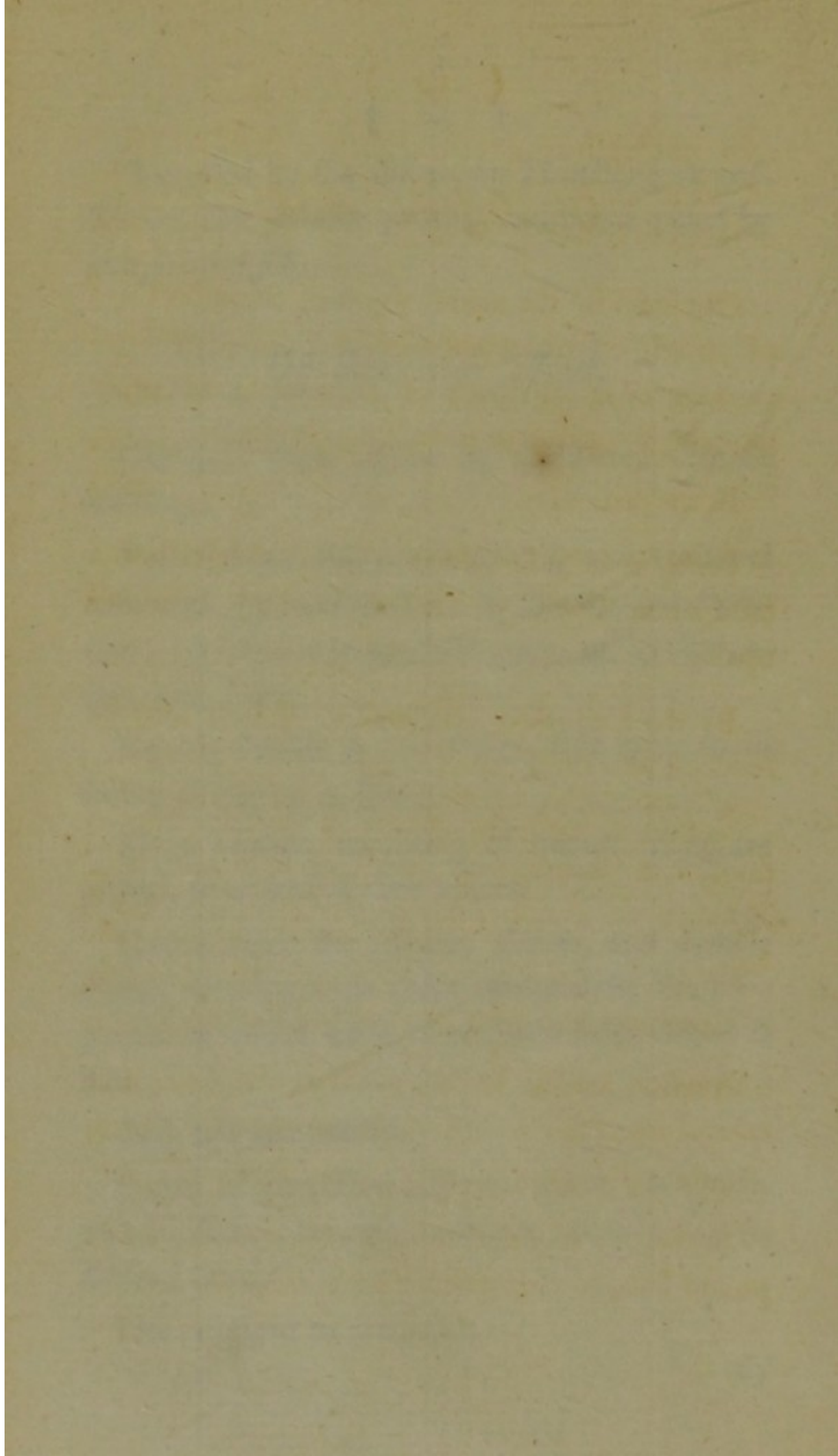
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Of Arsenic Acid.

Obtained by the acidification of common *Oxyd* of *Arsenic* by treatment with the *Nitric* or *Oxy-muriatic Acid*; *Nitrate* of *Ammoniac*; or other substances capable of furnishing *Oxygen*.

Form *concrete*.

Pretty readily soluble in *Water*. Melts into a transparent *Glass*, which on cooling becomes opake.

By the continued application of heat may be reduced into the form of *Oxyd*.

Combines with the *Alkalis* in certain proportions, and forms with them crystallisable salts. *Arseniate* of *Potash* (*Macquer's Arsenical Salt*), &c.

Combines also with most of the *Earths*.

Acts on several *Metals*, as *Zinc*, and *Iron*; and enters into union with most of the metallic *Oxyds*. *Arseniate* of *Copper* (*Scheele's green Pigment*); &c.

In the dry way decomposes many of the compound salts, as *Sulphate* of *Potash*, of *Soda*, &c.

By distillation with *Charcoal*, or digestion with *Turpentine*, *Expressed Oils*, or *Sugar*, may be completely deprived of its *Oxygen*, and reduced to a *Regulus*.

Unites readily with *Sulphur*.

Order of Attraction, *Lime*, *Baryt*, *Magnesia*, *Potash*, *Soda*, *Ammoniac*, *Alumine*, *metallic Oxyds*, *Water*, *Spirit*.

Medical properties nearly the same as those of the *white Oxyd*, or common arsenic.

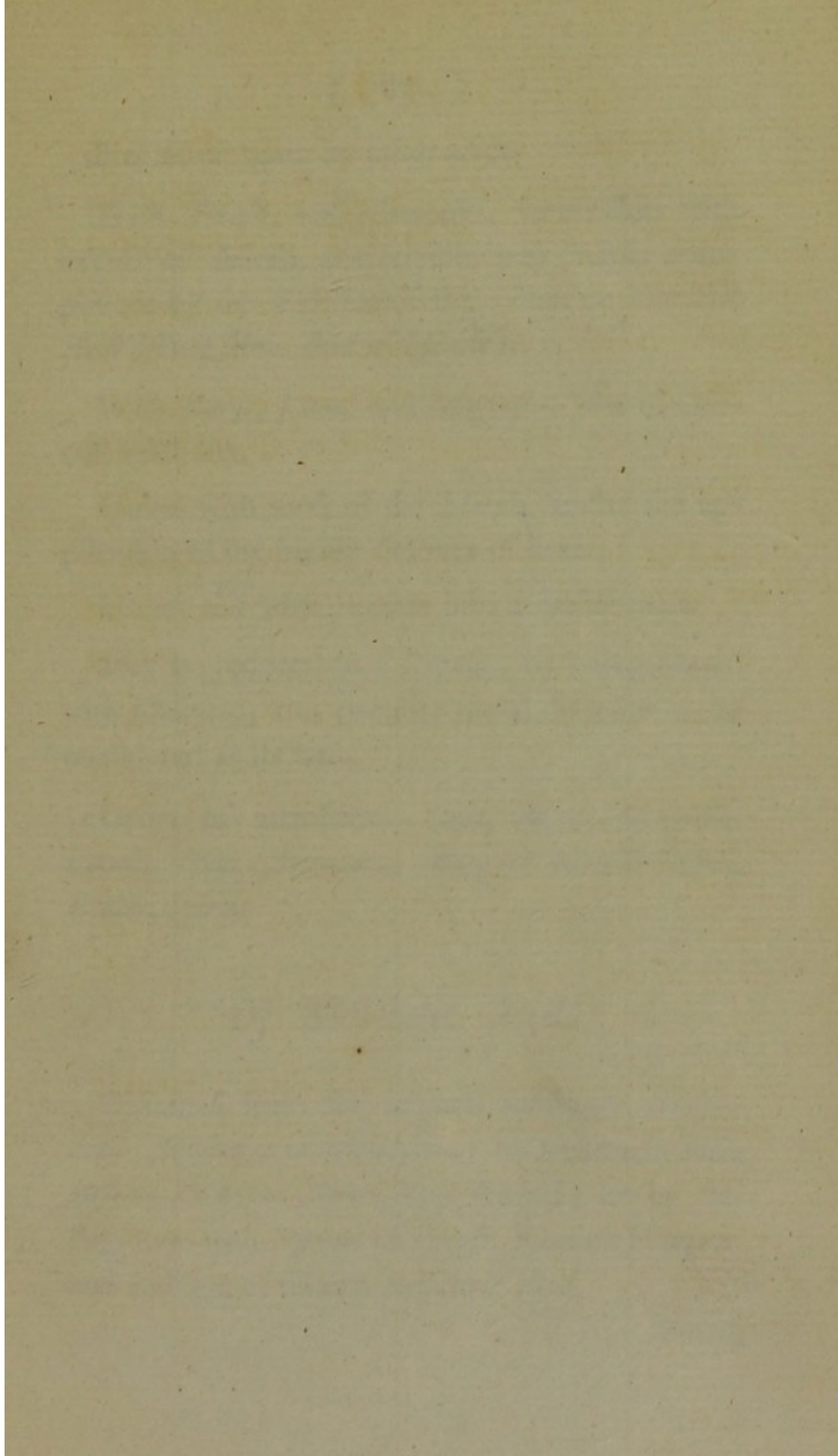
Of Tungstic Acid.

Obtained from the mineral substances *Tungsten* and *Wolfram*, by fusion with *Carbonate* of *Potash*, solution in *Water*, and addition of *Nitric Acid*; or by alternate digestion in *Nitric* or *Muriatic Acid*, and *Ammoniac*, and subsequent application of heat.

Form *pulverulent*.—Colour *yellow*. Specific gravity 6, 12.—*Insipid*.—*Insoluble*.

Infusible per se, but with *Phosphate* of *Soda*, and *Ammoniac*, forms a blue, and with *Borate* of *Soda*, a brownish-yellow glass.

Not



Form, *pulverulent*.—Colour *white*.—Taste *metallic*.—Specific gravity 3, 46.

Of little solubility in *Water*, more soluble in *Sulphuric Acid*, still more so in the *Muriatic*; the two last of which on cooling acquire a blue colour.

Sublimes into white flowers under the joint application of *Heat* and *Air*.

Unites with *Potash*, and forms a salt, crystallisable by evaporation—With *Ammoniac* one which parts with its alkali in a gentle heat.

With *Baryt*, *Lime*, and *Magnesia*, salts sparingly soluble in water.

Dissolves several *Metals*. By fusion with some of them, as *Iron*, *Copper*, and *Silver*, forms friable compounds. Also precipitates several of the metallic solutions, as *Nitrate of Silver*, *Quicksilver*, &c.

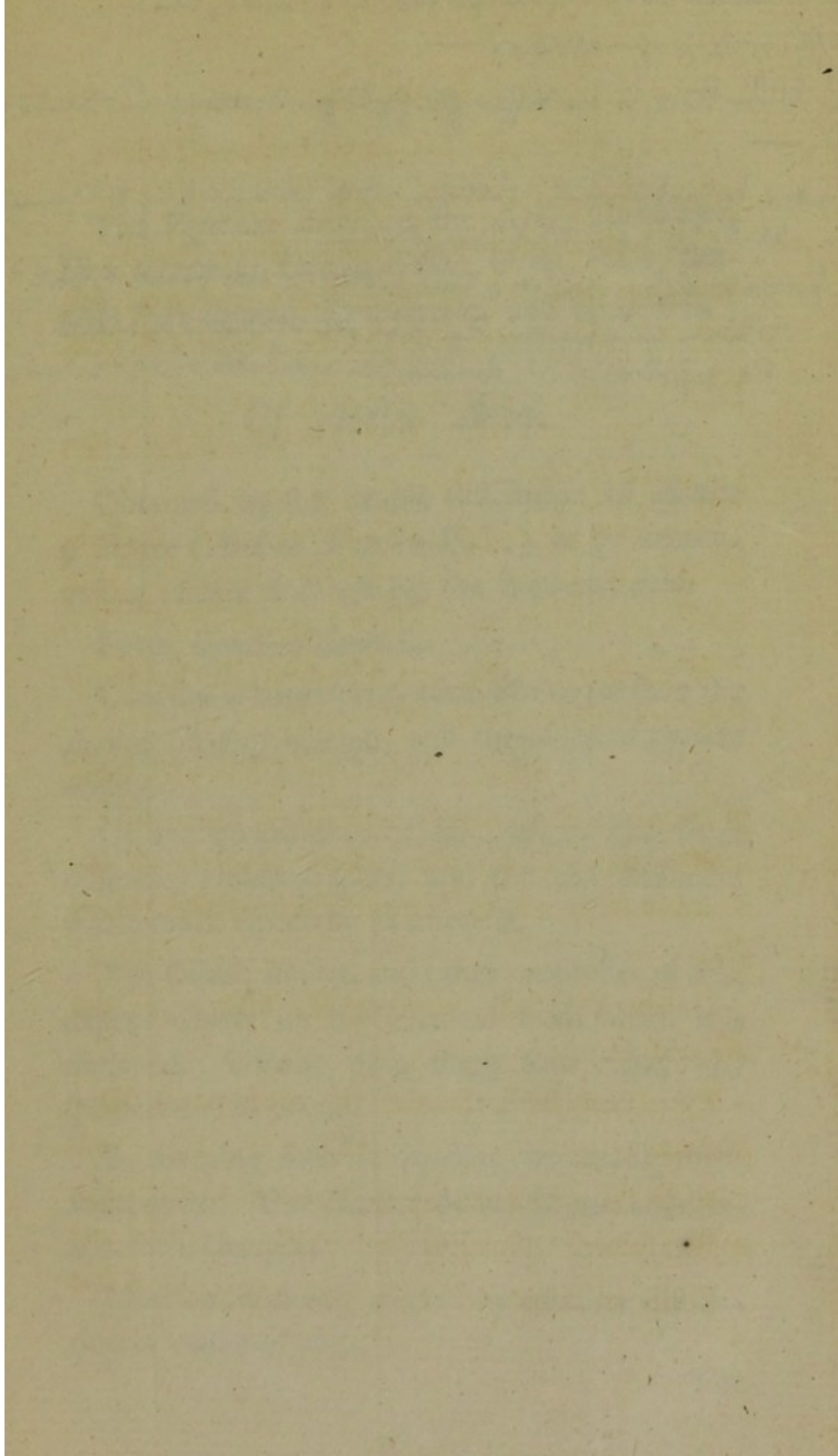
In the dry way, decomposes several of the *Neutral salts*.

By union with *Sulphur* it regenerates *Molybdena*.

May be metallized by mixture with *Oil*, and application of an intense degree of *Heat*.

Order of attraction not yet ascertained.

The



Acetic Acid

The Radical of this Acid is Carbone and Hydrogen, and this is the Radical of all the Vegetable Acids, being in greater or less quantities. —

Some think there is no difference between Acetous and Acetic acid. —

In order to distinguish whether it contains any Sulphuric acid add to it acetate of Baryt. —

Two parts of strong Acetous acid added to one part of Sp of Wine which had previously had oil of Cloves or other aromatic dissolved in it, forms the aromatic Vinegar. —

The *Vegetable Acids* are, the *Acetic*, *Tartareous*, *Pyro-tartareous*, *Oxalic*, *Gallic*, *Citric*, *Malic*, *Benzoic*, *Pyro-ligneous*, *Pyro-mucous*, and *Camphoric*.

Of *Acetic Acid*.

Obtained by the simple distillation of *Acetite of Copper* (*Acidum Acetosum* P. L.), or by decomposing *Acetite of Potash* by the *Sulphuric Acid*.

Form, *liquid*—*Colourless*.

Contains a larger proportion of *Oxygen* than the *Acetous Acid* or vinegar, and therefore of greater acidity.

Of the preparation of the *Acetous Acid* from different vinous liquors, and the circumstances which more especially promote it.

The *Colour*, *Acidity*, and other properties of this, depend chiefly on the material from which it is obtained. Usually of a sharp sour taste, and spirituous acid odour.

By keeping loses its *acidity*, becoming thick and putrid. The *Heat* of *boiling Water* counteracts these changes.

Most conveniently *purified* by cautious distillation in vessels of glass.

The

The higher degrees of heat decompose it.

May be *concentrated* by freezing.

Forms with *Potash*, *Acetite of Potash* (*Kali Acetatum* P. L.), with *Ammoniac*, *Acetite of Ammoniac* (*Aqua Ammoniacæ Acetatae* P. L.).

Dissolves most of the *Earths*.

Dissolves also most of the *metallic Oxyds*, producing with *Lead*, *Acetite of Lead* (*Cerussa acetata* P. L.); with *Copper*, *Acetite of Copper* (*Aerugo* P. L.), with *Quicksilver*, in the *acetic* form, *Acetate of Quicksilver* (*Hydrargyrus Acetatus* P. L.).

Gums, *Gum-resins*, vegetable *essential Salts* and *Extracts* soluble in *acetous Acid*; hence its extensive application in pharmacy.

Appears to be a compound of *Carbon* and *Hydrogen* in union with *Oxygen*.

Order of Attraction, *Baryt*, *Potash*, *Soda*, *Ammoniac*, *Lime*, *Magnesia*, *Alumine*, *metallic Oxyds*, *Water*, *Spirit*.

Employed in the arts, as in *Dying* and *Printing*, and also extensively for *dietetic* and *medical* purposes.

Of the History of the

Church of England, from the
Reformation to the present time,
in which is contained a full and
true account of the proceedings
of the Synods and Convocations
of that Church.

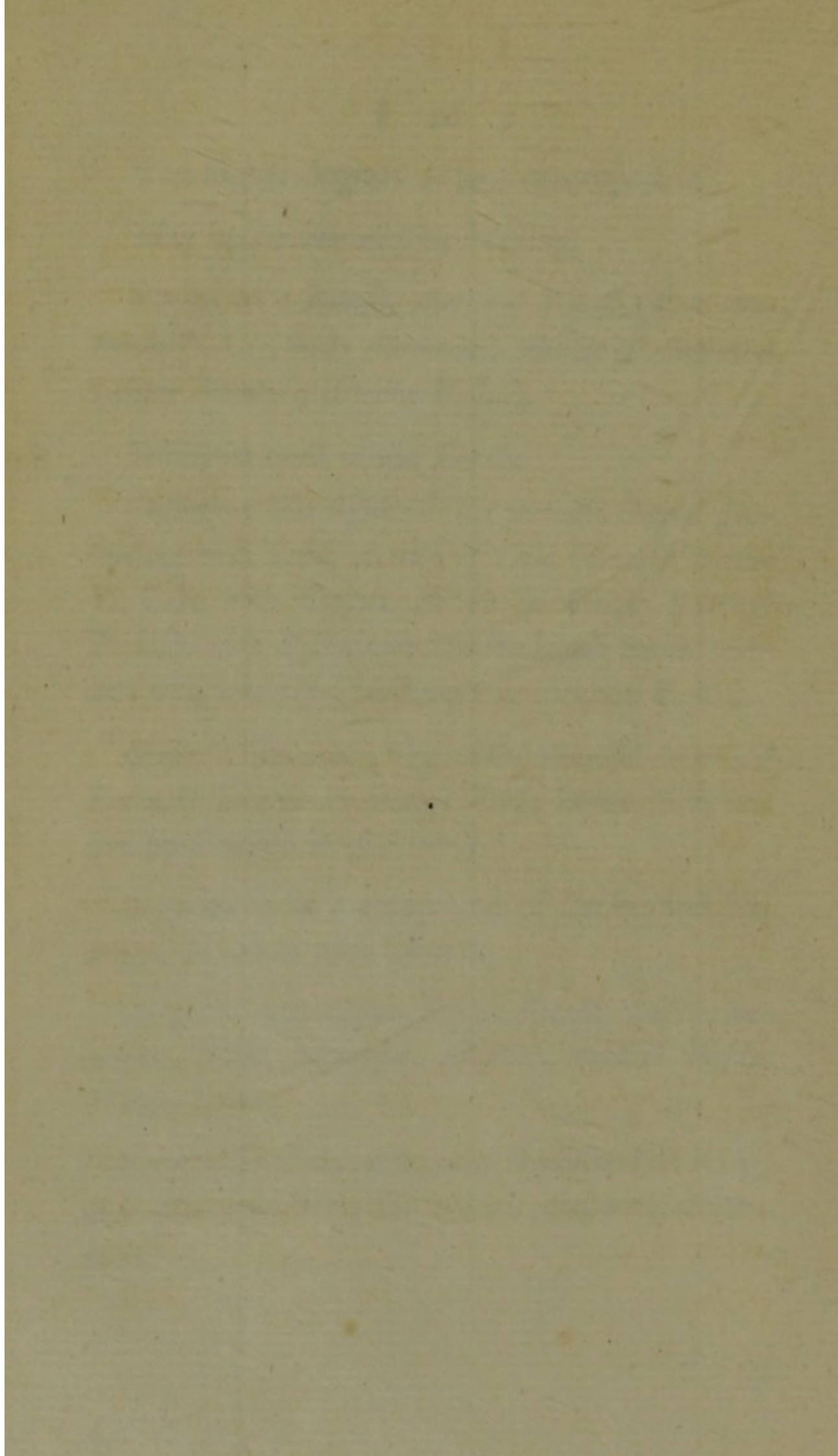
By John Tillotson, D.D.
Bishop of Exeter.

Printed by J. Streater, at the
Sign of the Sun in St. Dunstons
Church-yard.

1693.

Price 1s.

For Sale at the Sign of the Sun
in St. Dunstons Church-yard.



Of Tartareous Acid.

Obtained from *Acidulous Tartrite of Potash* by means of *Lime*, or *Carbonate of Lime*, and the subsequent addition of *Sulphuric Acid* (*Acidum Tartari crystallisatum* P. Suec.). May also be prepared by the *Sulphuric Acid* alone.

Crystallises in small transparent scales or needles. Not altered by exposure to *Air*. Readily soluble in *Water*, and of an agreeably acid taste.

Easily decomposed by *Heat*.

Yields *Oxalic Acid* by treatment with the *Nitric*; and *Acetous* by digestion with *Water* and *Spirit*.

In union with *Potash* forms, according to the proportions, *Tartrite of Potash* (*Kali Tartarificatum* P. L.), or *acidulous Tartrite of Potash* (*Cremor Tartari* P. L.), and with *Soda*, *Tartrite of Soda* (*Natron Tartarificatum*, P. L.)

Dissolves *Lime*, *Magnesia*, and *Alumine*.

Dissolves also several of the *metallic Oxyds*, and precipitates many of them from their solutions in other *Acids*.

Differs

Differs only from the foregoing in the proportion of its *Oxygen*.

Order of Attraction, *Lime, Baryt, Magnesia, Potash, Soda, Ammoniac, Alumine, metallic Oxyds, Water, Spirit.*

Use confined to *Medicine*.

Of Pyro-tartareous Acid.

Obtained from *acidulous Tartrite of Potash*, or the *Tartareous Acid* by distillation with a strong *Heat*.

Form, *liquid*.—Taste, *empyreumatic*.

Redistillation dangerous, from the sudden evolution of elastic matter.

Compounds of this *acid* not as yet examined.

Of Oxalic Acid.

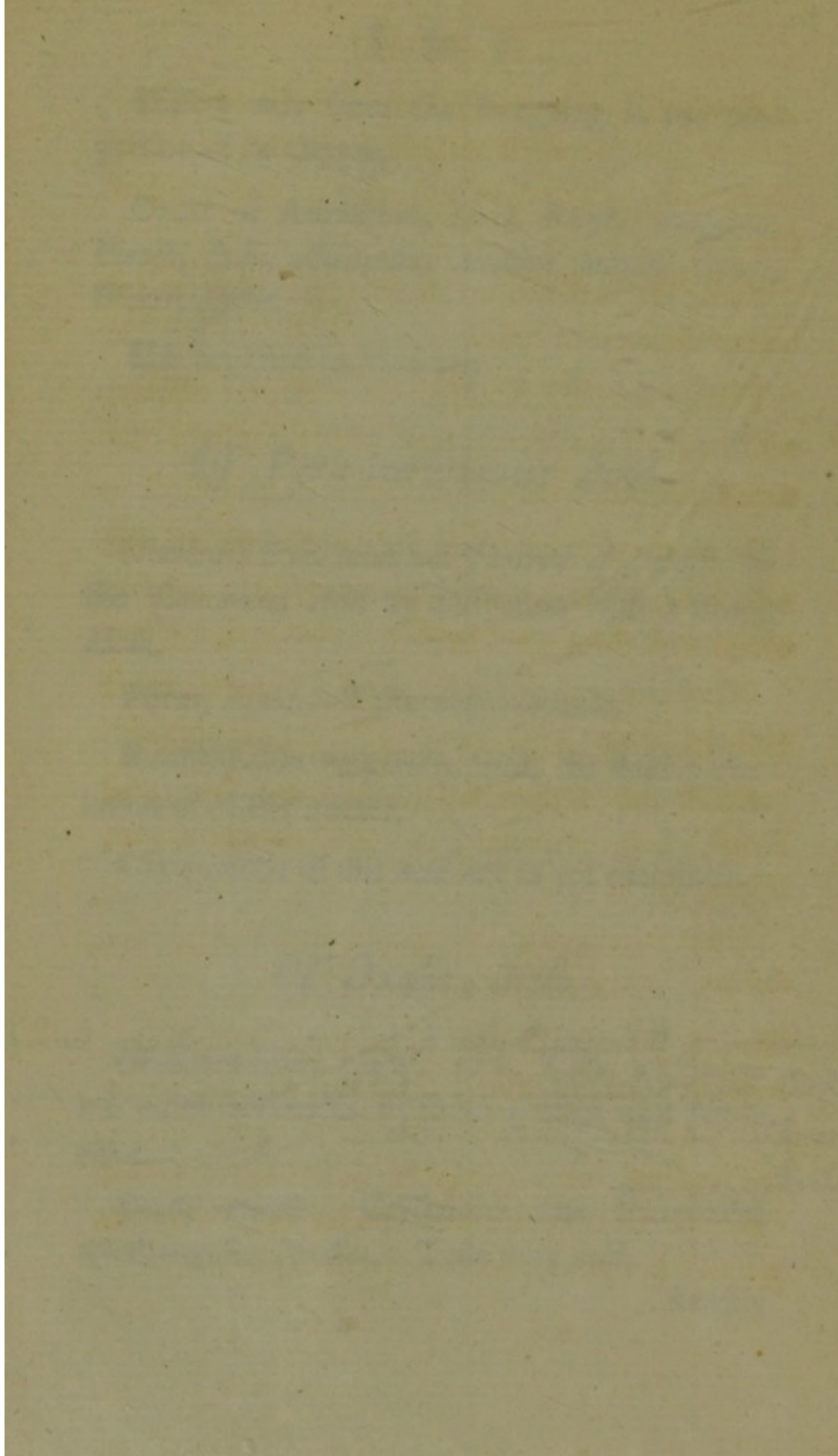
Obtained from *Sugar, Malt, Galls*, and various other substances, by treating them with *Nitric Acid*.

Form *concrete*. Crystallises into transparent quadrangular *Needles*. Taste very *acid*.

Readily

Of Oxalic Acid

In preparing this Acid the Nitric Acid is decomposed and the Acid which remains is only the pure acidifiable principle, we therefore can obtain it from a great variety of substances. —



Readily soluble in *Water*: soluble also, and without decomposition, in the *Sulphuric* and other *Acids*, *Spirit of Wine*, *Æther*, *essential*, and *expressed Oils*.

Easily decomposed under the application of the higher degrees of *Heat*.

Forms peculiar compounds with the *Alkalis*, with most of the *Earths*, and with several of the *metallic Oxyds*.

Is more especially remarkable for its affinity with *Lime*, with which it produces an insoluble compound. *has an excellent test of its presence*

Would appear to consist of the same elements with the former *Acids*, but in different proportions.

Order of Attraction, *Lime*, *Baryt*, *Magnesia*, *Potash*, *Soda*, *Ammoniac*, *Alumine*, *metallic Oxyds*, *Water*, *Spirit*.

Used to take out *Iron-moulds*, and as a test for discovering the presence of *Lime*.

Of Gallic Acid.

Obtained from *Infusion of Galls*, by continued exposure to *Air*, edulcoration of the *Precipitate* which takes place, and subsequent *Crystallisation*.

Forms

Forms small granular or needle-like *Crystals*, of a sour but not astringent *Taste*.

More soluble in *Spirit* than in *Water*.

Burns in the open fire, leaving behind a hard insoluble *Charcoal*.

In close vessels, yields an *acid Liquor* and a *whitish saline Sublimate*.

A similar salt procurable from Galls, by *simple Distillation*. This also called *Gallic Acid*.

Remarkable for the property of producing a black colour with *Iron* and its solutions; hence the formation of *Ink*.

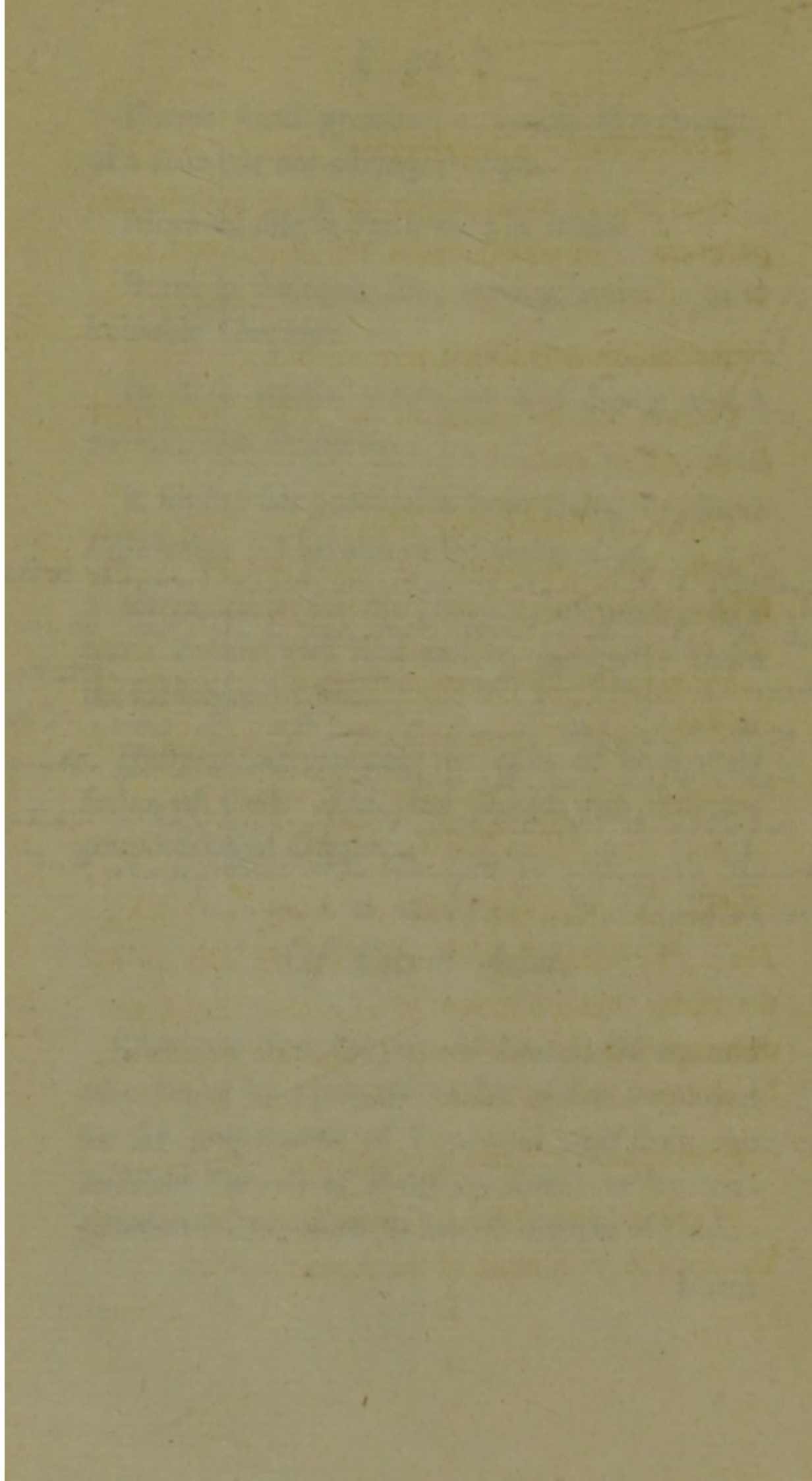
Hydro-carbon probably the basis of both these forms of *Gallic Acid*, but united with different proportions of *Oxygen*.

Of Citric Acid.

Obtained from the juice of *Lemons*, *Citrons*, and other fruits, by a process similar to that employed for the preparation of *Tartareous Acid* from the *acidulous Tartrate of Potash* by *Lime*; or by congelation on exposure to intense degrees of *Cold*.

Form

The goodness of Ink depends upon its being brought to the point of saturation with Iron, for if the Iron be in excess it becomes of a dirty brown colour. The reason of the auraticity of the Ink of the Ancients, was that the colour had for its basis Charcoal. The best Ink is made by adding to the ingredients white wine Vinegar instead of water, and a small quantity of Logwood with Verdigrise, but this is decomposed when exposed to Iron. —



Form *concrete*. *Crystallisable*.

Not subject to alteration by keeping. Forms particular compounds with the *Alkalis* and most of the *Earths*.

Action on *Metals* not remarkable.

Convertible by means of the *Nitric*, into *Oxalic* or *Acetic Acid*.

Order of Attraction, *Lime*, *Baryt*, *Magnesia*, *Potash*, *Soda*, *Ammoniac*, *Alumine*, *metallic Oxyds*, *Water*, *Spirit*.

Uses, in the more common form, in *Diet* and *Medicine*.

Of *Malic Acid*.

Obtained from the juice of *Apples*, and other *Fruits*, by saturating it with *Potash*, adding to the compound a solution of *Acetite of Lead*, and decomposing the *Malate of Lead*, thus produced, by *diluted Sulphuric Acid*.

Form *liquid*. Taste *agreeably acid*.

In union with *Alkalis*, forms *deliquescent Salts*. Unites also with most of the *Earths*.

D

Upon

Upon *Metals*, excepting *Iron* and *Zinc*, has no remarkable effect.

Is easily convertible into *Oxalic* or *Acetic Acid*, by treatment with the *Nitric*.

Considered as intermediate between *Tartareous* and *Oxalic Acid*.

Of Benzoic Acid.

Obtained in the dry way, by sublimation from *Gum Benzoin* (*Flores Benzoes* P. L.); or, in the moist way, by mixing and boiling it with *Lime*, filtering the liquor, and adding *Muriatic Acid*.

Form *minutely crystalline*. Taste *indistinctly acid*.

Soluble both in *Water* and *Spirit*, also in different *Acids*, and without being decomposed.

Melts in *close Vessels*; and burns in the *open Fire*. Unites into crystallisable compounds with the *Alkalis* and several of the *Earths*.

Neither the *Order of Attraction*, nor the *Composition* of this acid, as yet sufficiently ascertained.

Received of the Treasurer of the State of New York

the sum of One Hundred and Fifty Dollars

for the purchase of a certain quantity of

of the same kind and quality as the

above described, and for the same purpose

as the above described, and for the same purpose

as the above described, and for the same purpose

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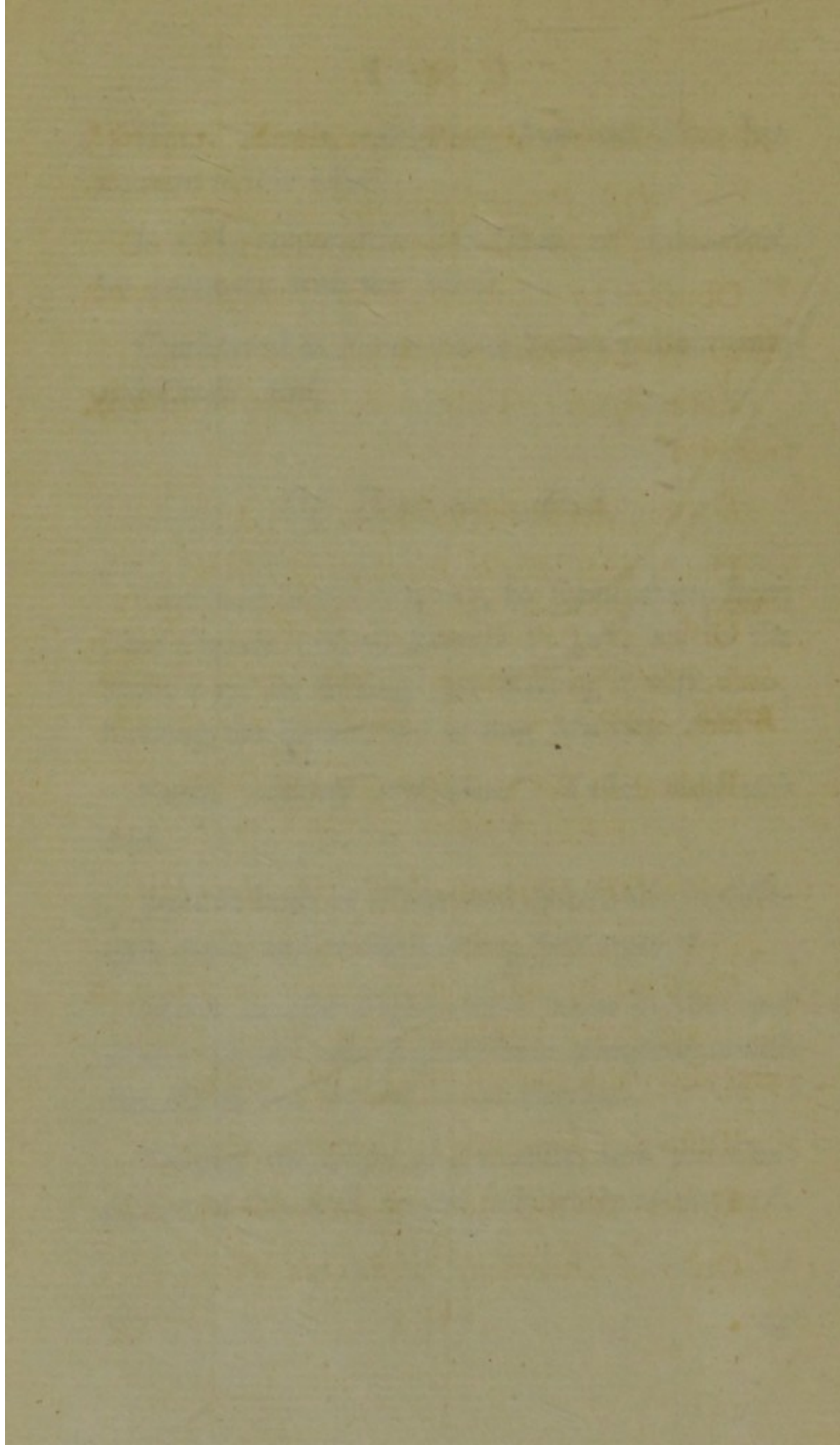
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as the above described, and for the same purpose

as the above described, and for the same purpose



Of Pyro-ligneous Acid.

Obtained by distillation, from *Birch, Beech*, and many other woods.

Form *liquid*. Taste *acid*. Specific gravity 49 to 48.

Decomposes in the open *Fire*.

Unites with *Alkalis, Earths*, and *Metals*.

Order of Attraction, *Lime, Baryt, Potash, Soda, Magnesia, Ammoniac, metallic Oxyds, Alumine, Water, Spirit*.

Radical of this acid *Hydrogen* and *Carbon*.

Of Pyro-mucous Acid.

Obtained by distilling *saccharine Substances* in a strong heat; redistilling the liquid product, and afterwards concentrating it by *freezing*.

Taste *very penetrating*. Colour *yellowish*.

Unites with the *Alkalis, Earths* and *Metals*.

Order of Attraction, *Potash, Soda, Baryt, Lime,*
D 2
Magnesia,

Magnesia, Ammoniac, Alumine, metallic Oxyds, Water, Spirit.

Consists chiefly of water and oil slightly oxygenated.

Convertible by the *Nitric*, into *Oxalic* or *Malic Acid*.

Of Camphoric Acid.

Obtained by the distillation of *Nitric acid* from *Camphor*.

Forms *silver-white parallelopiped Crystals*. Taste *bitterish, sour*.

Soluble in *Water*, insoluble in *Spirit*.

Unites with the *Alkalis, Earths, and Metals*.

Thought to have the same basis as *Oxalic Acid*.

The *animal Acids* are, the *Phosphoric, Lactic, Saccho-lactic, Formic, Prussic, Sebacic, Litbic, and Bombic*.

Of

* and when in a state of glass, if it be exposed to the
air or put into water for any length of time, it
again assumes its acid form. —

Of Phosphoric Acid.

Sources of this acid various. Modes of obtaining it various also. Usually procured from common *Phosphorus*, by deflagration; or by slow combustion, under long exposure to air; or by treatment with the *Nitric Acid*.

CrySTALLISES into quadrangular *Prisms*. Taste *acid*, but not *corrosive*. Specific gravity 2,687.

Has a strong attraction for *Moisture*, producing heat.

✱ Under the application of the higher degrees of *Heat*, fuses into a transparent *Glass*.

With the *Alkalis*, *Earths*, and *Metals*, forms particular compounds. With *Soda*, *Phosphate of Soda* (*Soda Phosphorata* P. Edin.). With *Silex*, in the dry way, a deliquescent glass. With *Iron*, *Phosphate of Iron* (*cold short Iron*).

May be partially or totally decomposed, by treatment with different *inflammable Substances*.

In distillation with *Charcoal*, reproduces *Phosphorus*; this therefore considered as its *Radical*.

Order of Attraction, *Lime, Baryt, Magnesia, Potash, Soda, Ammoniac, Alumine, metallic Oxyds, Water, Spirit.*

Of Lactic Acid.

Obtained from *sour Whey*, by evaporating it to a certain point, filtering, adding first *Lime-water*, and afterwards *Oxalic Acid*, separating the *Oxalate of Lime* by decantation, evaporating the decanted liquor to the consistence of honey, dissolving in *Alcohol*, adding *Water*, and drawing off the spirit by distillation.

Form *liquid*.

Easily decomposed by *Heat*. With the *salifiable Bases* forms compounds which do not crystallise.

Would seem analogous to *Acetous Acid*. Order of Attraction the same.

Of Saccho-lactic Acid.

Obtained from *Sugar of Milk* and other substances, by treatment with the *Nitric Acid* in a similar manner to that employed in the preparation of *Oxalic Acid*.

Form

THE [illegible] OF THE [illegible]

By [illegible]

It is [illegible] by [illegible]

Form [illegible] [illegible] [illegible]

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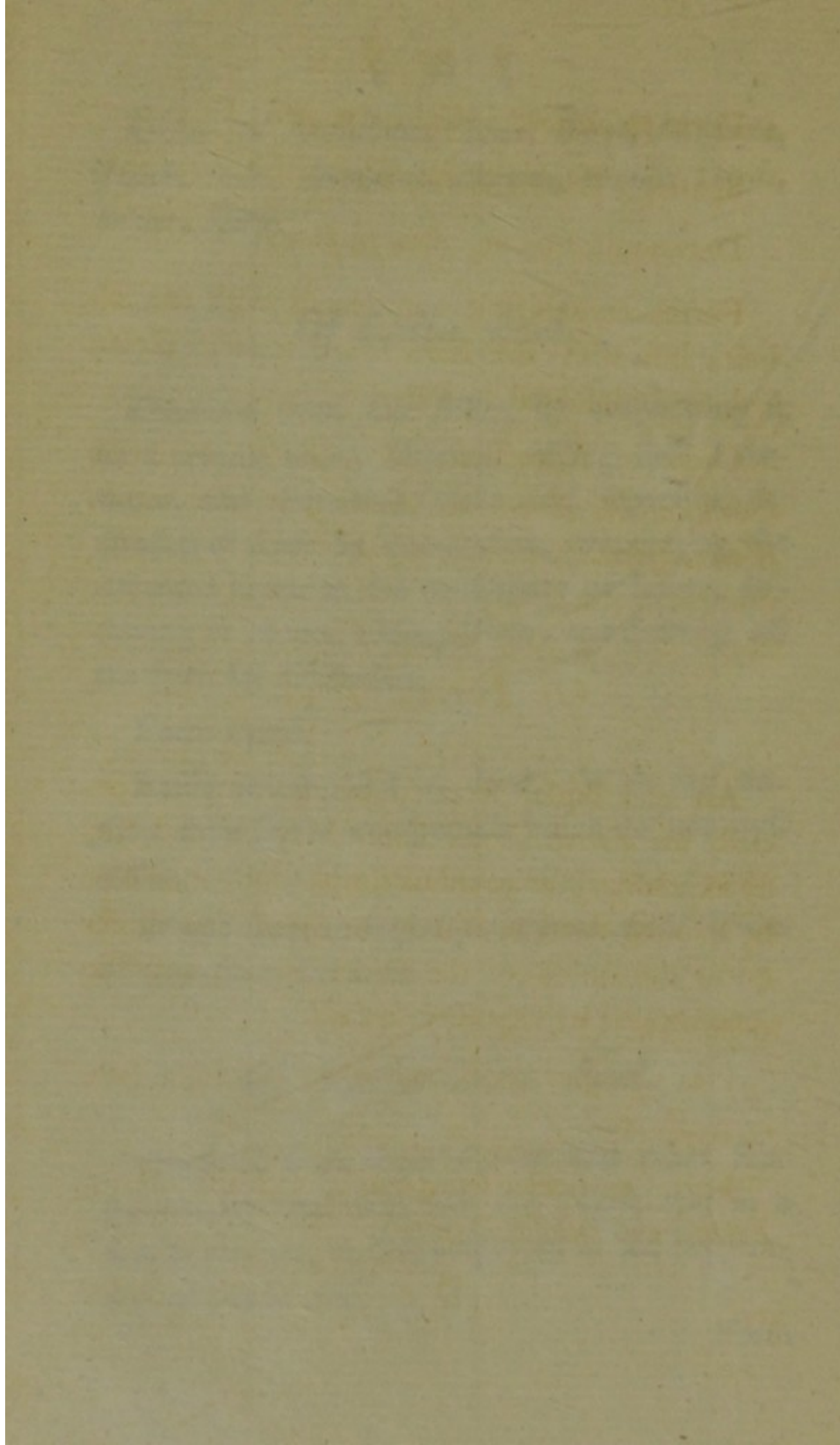
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Form *pulverulent*. Colour *white*.

Sparingly soluble in *Water*.

Decomposed by exposure to *Heat*.

Forms crystallisable compounds with the *Alkalis*; but with the *Earths* and *metallic Oxyds*, such as are insoluble in water.

Order of Attraction, *Lime, Baryt, Magnesia, Potash, Soda, Ammoniac, Alumine, metallic Oxyds, Water, Spirit*.

Of Formic Acid.

An acid liquor secreted by *Ants*, more especially the *Formicæ rufæ Lin.* May be collected by expression; or cautious simple distillation; or by infusing them in *Water*, or *Spirit*, and subsequent distillation of the liquor, which may be concentrated by exposure to *Cold*.

Has a *pungent Smell*, and when diluted, a taste agreeably *Acid*.

Forms particular compounds, with the *Alkalis, Earths*, and *metallic Oxyds*.

Order of attraction, *Baryt, Potash, Soda, Lime, Magnesia, Ammoniac, Alumine, metallic Oxyds, Water, Spirit.*

Of Prussic Acid.

Obtained from *Prussiate of Iron (Prussian Blue)* by boiling it in a solution of *Potash*, adding *Sulphuric Acid* to the liquor when filtered, and submitting it to distillation; or by distilling a mixture of *Prussiate of Potash*, and diluted *Sulphuric Acid*, and redistilling the product from *Carbonate of Lime*.

Form *gaseous*.

Unites readily with *Water*.

Combines with *Alkalis, Earths, and metallic Oxyds*. With *Oxyd of Iron* reproduces *Prussian Blue*.

Consists of the same elements as *Carbonate of Ammoniac*.

Order of Attraction, *Potash, Soda, Ammoniac, Lime, Baryt, Magnesia, metallic Oxyds, Water, Spirit*. From later Experiments it has been found that *Baryt* should be placed before *Potash*.

Of

Of Sulphuric Acid

This acid precipitates Lead antimony and a variety of other metals, white. Iron Blue, and Copper of a red brown colour. —

It precipitates all the metals and leaves their Earth, except Baryt. —

The Sulphate of Lime is a delicate test of the presence of Iron. —

Of the first part

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Part first

In the first part of the ...

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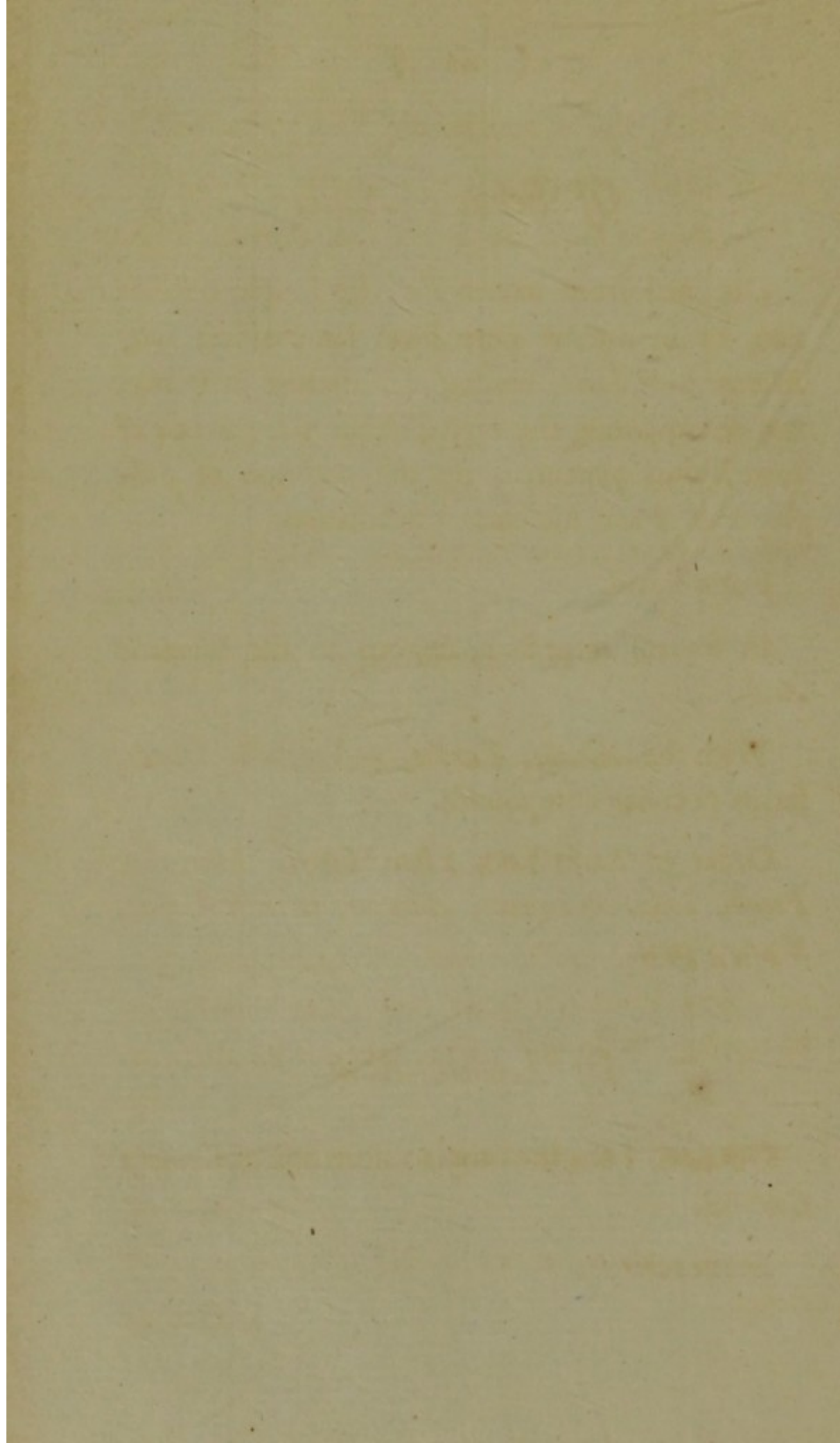
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Of the second part

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Part second

...the second part of the ...



Of Sebacic Acid.

Obtained from *animal Fat*, by simple distillation, or in a more pure form by melting *fatty Matter* with *Lime*, boiling the mixture in *Water*, and decomposing the crystallisable salt (*Sebate of Lime*) thus procured, by the addition of *Sulphuric Acid* and subsequent distillation.

Form *liquid*.

In several respects analogous to the *Muriatic Acid*.

With the *Alkalis*, *Earths*, and *metallic Oxyds*, forms peculiar compounds.

Order of Attraction, *Lime*, *Baryt*, *Magnesia*, *Potash*, *Soda*, *Ammoniac*, *Alumine*, *metallic Oxyds*, *Water*, *Spirit*.

Of Lithic Acid.

Obtained from the simple distillation of *Urinary Calculus*.

Form *concrete*.

Difficultly

Difficultly soluble in *Water*.

Forms with the *Alkalis*, *Earths*, and *metallic Oxyds*, compounds as yet but little known.

Of Bombic Acid.

Obtained by expression, or infusion in *Alcohol*, from the *Silk Worm*, when in the state of *Chrysalis*.

Form *liquid*. Taste *penetratingly acid*. Colour *yellow*.

Combinations not yet examined.

OF ALKALIS.

Distinguished, by being of a pungent, lixivial, or urinous taste, and changing most vegetable *blue* colours to *green*, and many of the *yellowes* to *brown*.

Have, like most of the acids, a strong attraction for *moisture*.

They manifest also an extensive disposition to
union

Of Alkalies

If you wish to render an Alkali Caustic, take any quantity of it and three or four times its quantity of Quick lime fresh prepared, then pouring upon these a sufficient quantity of hot water to give it a plastic form, then let it stand three or four hours, then pour upon it more water, then try it with the Sulphuric Acid and if no effervescence takes place you may be certain that it is pure. After this it should be decanted off through gravel; and sand laid upon it, then pour the liquor upon it, and it will pass through more pure than any other way - It is much more fusible in its Caustic state, than in its Carbonated -

Of Alkalies

Potash and Soda are to be considered as simple bodies, while Ammonia we know to be a compound. —

Some authors have added some of the Earths under the head of Alkalies. —

The precipitate from their solutions most of the Earths, and all the Metallic Oxids, several of which they are capable of redissolving. —

With unctuous substances they form soaps; with Silica and Alumina various kinds of Glas, and Porcelain; with Sulphur Alkaline Sulfates, or Sulphurets. —

Of the Vegetable Alkali ..

It is not improbable but that certain constituent parts come together in the burning of Vegetables, tho' the Alkali may be obtained in the moist way — when this Alkali is pure no effervescence takes place upon the addition of an acid. —

In obtaining this Alkali by adding Lime to Carbonate it is produced by double Elective Attraction, for the Alkali parts with its Carbonic Acid gas and takes in its stead Caloric; therefore the lime is rendered mild while the alkali becomes exceedingly caustic. —

It restores Litmus paper blue after being turned Red by an acid. —

When the substances are burnt slow they yield the most Potash, and when burnt in a close Vessel they hardly give you any Potash. —

The Salt of Tartar contains about 70 per Cent of pure Caustic Alkali (Vegetable) The Best Pearl Ashes about 55. Dantzic, 51 Ordinary 40. —

union with other bodies. With the acids, as before mentioned, they constitute *neutral Salts*.

With unctuous substances, they form *Soaps*.

They are usually divided into *fixed* and *volatile*.
The *fixed* subdivided into *vegetable* and *mineral*.

The *fixed* suspected, the *volatile* known, to be compounded.

Of Vegetable Alkali. (Potash.)

Appears to be a constituent part of most vegetable substances, enters also into the composition of several saline minerals. Obtained from *Carbonate of Potash*, by treatment with *Lime*.

Form *concrete*. Taste extremely *pungent*.
Caustic. Colour *white*.

Has a strong attraction for *moisture*.

On solution in water produces an increase of temperature (*Aqua Kali puri* P. L.).

Fusible in a moderate, and volatile in an intense, *Heat*.

Promotes the fusion of *Earthy Bodies* and of
metallic

metallic Oxyds; hence the preparation of different kinds of *Glass*. Unites readily with all the *Acids*. and with *Sulphur* producing *Sulphurets*

Its more important compounds are,

1st. *Sulphate of Potash* (*Kali vitriolatum* P. L.), prepared usually from the saline mass, which remains after the distillation of *Nitric Acid*.—Form, *crystalline*.—Taste, *saltish bitter*.—Difficultly soluble in water; also very difficult of fusion.—May be decomposed either in the moist way by *Baryt*, or in the dry way by calcination with *Charcoal*.—Application chiefly *medical*.

2d. *Nitrate of Potash* (*Kali Nitratum* P. L.) obtained in the East Indies and other countries by the elixation of certain soils, in which it is either already contained, or produced artificially by the addition of *Potash*.—Those soils more especially productive in which vegetable and animal matter have run into a state of putrefaction.—Freed from extraneous saline matter by repeated crystallisation.—Form of its crystals *prismatic*.—Taste, *cold, saline, penetrating*.—*Much more soluble in hot than cold water*.—In a moderate heat undergoes watery fusion (*Sal-prunel*).—An increase of the heat produces a decomposition

The *Pulvis Fulminans*, is made by mixing three parts of Nitre, to two of Potash, and one of Sulphur—Gunpowder is made by mixing 75 parts of Nitre to 15 of Charcoal and 10 of Sulphur—Count Rumford found that 12 Grains of Gunpowder lifted up a Cannon that weighed 8000 Pounds—

Of the Vegetable Alkali
Sulphat of Potash decomposed Water, forming Hydro-Sulphur-
Acid. —

Beautiful large Crystals may be formed of the neutral
salts, by adding Crystals to solutions which are just in the
act of crystallizing, in this way you may by continuing
the process procure the largest and finest Crystals, —

No⁶ This Salt crystallises most beautifully, being made up of
Double Pyramids, Base to Base, each base having six faces. —

No² Gunpowder is a simple mixture of certain
Proportions of Nitre, Sulphur, and Charcoal —

The goodness of Gunpowder depends upon the purity,
of all the Ingredients and upon their proper mixing,
for they cannot be mixed too much —

To make the powder granulated the mixture is
moistened with water and then passed through
Sieves of different sizes —

To make it polished it is put into Casks, and
then given a rotatory motion —

The proportion of the ingredients is not accurately
ascertained, as it depends upon the purity or
impurity of the Ingredients, the proportion not
being the same in two Countries —

The Ingredients of Gunpowder to be in the greatest
perfection must be kept perfectly dry —

Of the Vegetable Alkali

2nd Oxygen Gas is furnished most pure from the watery fusion of the Oxy - muriat of Potash - Oxy muriate of Potash if mixed with Sulphur and Charcoal you will have a very dangerous preparation -

Oxy - muriat of Potash triturated with Sulphur you will have a violent explosion, but more so, if mixed with Phosphorus in as dry a state as possible -

By mixing any of the following substances with Oxy muriat of Potash, combustion will take place by touching them with strong Sulphuric Acid, Sugar, Gum Arabic, Camphor and black Lead, Indigo, Lamp black and Sulphur and Camphor. -

By the the following mixture you will have combustion with the Oxy muriat of Potash, Pour a quantity of Water upon a little oxy muriat of Potash, then drop in a few pieces of Phosphorus, and with a funnel pour a little of the strong Sulphuric Acid at the bottom of the Vessel, when the Charcoal will become luminous in the Water. Next pour a quantity of Alcohol on Oxy muriat of Potash, and put in Phosphorus, and by pouring strong Sulphuric Acid as before combustion will take place. Next pour Oil upon Oxy muriat of Potash, and adding the Sulphuric Acid to the mixture combustion takes place, but the violentest combustion will be produced by putting Oxy muriat of Potash into into Oil of Turpentine: and then add to the mixture a strong Sulphuric acid. -

composition of its *Acid*; the *Alkali* remaining unchanged.—May be more readily decomposed by the addition of *Charcoal* or other inflammable matter; hence the preparation of *Gun-powder*.—When decomposed in the moist way, by treatment with the *Sulphuric*, furnishes *Nitric Acid*.—Used extensively in *Glass-making*; *Metallurgy*; preparation of *Gun-powder*; and for *dietetic* and *medical* purposes.

3d. *Acidulous Tartrate of Potash*, prepared from *crude Tartar* (the spontaneous deposit from new wine) by solution, and evaporation (*Cremor Tartari* P. L.), or by crystallisation under cooling (*Tartari Crystalli* P. L.).—Form *crystalline*.—Taste agreeably *acid*.—Of little solubility in *Water*.—Decomposed by the application of *Heat*; chief products, *Pyro-tartareous Acid*, and *Carbonate of Potash*, therefore called *Salt of Tartar*.—Of various application in the arts, as in *Tinning*, *Dying*, *Hat-making*; employed also extensively in *Medicine*.

4th. *Tartrate of Potash* (*Kali Tartarizatum* P. L.), prepared from the solution of the former, either by precipitating its excess of acid, by means of *Chalk*, or by saturating it with additional
Potash.

Potash.—Form, *crystalline*.—Taste *saltish-bitter*.—Attracts moisture from the atmosphere; also very soluble in *water*.—Decomposed by heat, nearly in the same way as the *Acidulous Tartrate of Potash*.—Employed only in medicine, as a *mild Cathartic*.

5th. *Acetite of Potash* (*Kali Acetatum P. L.*) prepared by saturating *Potash*, with *Distilled Vinegar*, evaporating to dryness, melting the remaining mass, dissolving it in water, filtering and evaporating a second time.—Form, *flaky*.—Colour, *white*.—Taste *pungent*.—*Deliquescent*.—Easily soluble both in *Water* and *Spirit*.—Its acid decomposed in distillation.—Yields *Acetic Acid*, on the addition of the *Sulphuric*.—Used in medicine as a *Diuretic*.

6th. *Carbonate of Potash* (*Kali Præparatum P. L.*) usually obtained from the ashes of vegetables by lixiviating them in water, decanting, and evaporating to dryness.—Form *powdery*.—Taste, *urinous*.—Colour, *pearly-white*.—*Deliquescent* in a moist atmosphere (*Aqua Kali P. L.*); may then be crystallised after cautious evaporation.—May be decomposed in the moist way by most of the other *Acids*, or by *Lime*, and in the dry way by the simple application of *Heat*.—

Uses

Of the Vegetable Alkali

Of the Vegetable Alkali

Of the Mineral Alkali

If you wish to obtain the Mineral Alkali basis, you must take the Nitre Vitriolatum and powder it, then mix it with powdered Charcoal, after which it must be exposed to heat and air —

This can only be distinguished from pure Potash by its different affinities and Compounds for it possesses all the sensible properties of the Vegetable Potash. —

This Alkali manufactured at Liverpool contains about 40 per cent of its weight of Alkali in Crystals, at India 28, Best Alicante Barilla 26½, Sicilian Barilla 2, Richest Kelp from Norway, the Orkney & Shye. Ork. Scottish Kelp 2½

Uses various, as in *Glass-making, Bleaching, Metallurgy, Medicine, &c.*

The order of attraction of this alkali in the moist way, *Sulphuric Acid, Nitric, Muriatic, Sebatic, Fluoric, Phosphoric, Oxalic, Tartareous, Arsenic, Succinic, Citric, Formic, Lactic, Benzoic, Acetic, Saccho-lactic, Boracic, Sulphureous, Nitrous, Carbonic, and Prussic, Water, Unctuous Oils, Sulphur, Metallic Oxyds*; in the dry way, *Phosphoric Acid, Boracic, Arsenic, Sulphuric, Nitric, Muriatic, Sebatic, Fluoric, Succinic, Formic, Lactic, Benzoic, and Acetic, Baryt, Lime, Magnesia, Alumine, Silex, Sulphur.*

In solution sometimes prescribed internally; in the concrete form frequently employed as a *Caustic.*

Of Mineral Alkali. (Soda.)

Found in great abundance in the mineral kingdom, particularly in combination with *Muriatic Acid*.—Obtained in a separate form, from *Carbonate of Soda*, by means of *Lime*, as in the case of *Potash*, from *Carbonate of Potash*.

Its

Its form, colour, taste, causticity, &c. nearly the same with those of the former alkali.

Acts also powerfully on the *Earths* and *metallic Oxyds*, and unites readily with *unctuous Substances*. *Forming harder soap than if mixed with vegetable oil.*

Its more important saline compounds are,

1st. *Sulphate of Soda* (*Natron Vitriolatum* P. L.), obtained by solution and crystallisation from the matter left behind in the preparation of *Muriatic Acid*, *Muriate of Ammoniac*, or *Muriate of Quick-silver*. Form of its crystals, *prismatic*.—Taste, *bitter*.—Effloresces on exposure to *Air*.—Readily soluble in *Water*.—When exposed to *Heat* undergoes watery fusion. May be decomposed in the same way as *Sulphate of Potash*.—Used only as a *Cathartic*.

2d. *Muriate of Soda* (*Common Salt*) obtained by evaporation from *Sea Water*, or the water of *saline Springs*, or the solution of *Rock Salt*, which is found in great abundance.—Form of its crystals *cubical*.—Taste, agreeably *saline*.—Equally soluble in hot as in cold *Water*. Soluble also in *Spirit*.—Decrepitates on sudden exposure to *Heat*. Melts in a red heat without decomposition. By

Soap when well made ^{of the Mineral Alkali} is entirely soluble in Spirits
of Wine, and all soaps are soluble in the acids. —
When the soap is decomposed by water, and becomes
greasy, it may be remedied by adding a small
quantity of either the Carbonate of Potash or Soda.

1st At Apothecaries Hall the Natrium Vitriolatum
is prepared with the Common Salt and the Sulphuric
Acid, but there is no necessity for preparing it
in such a costly way —

The bag salt is prepared by the evaporation
of Sea water it is the purest and most expen-
sive. Its colour depends upon its mixture with
heterogeneous matter —

The Rock Salt is not used until it is dissolved
and evaporated, altho' pure before —

The effects of this Salt depends upon the quantity
used, large quantities are found to be antiseptic,
but small and divided quantities are Septic —
If muriat of Soda is mixed with powdered Pythagore
it will be decomposed, and the product be oxy
muriat of Lead, and Carbonate of Soda, the
oxy muriat of Lead makes a valuable yellow,
called, Turner's Patent yellow. —

The Saltness of the Sea Water depends upon its containing
a quantity of this Salt, but this is in greater or
less proportion in different parts of the Sea, in the
Baltic the proportion is $\frac{1}{64}$. Between England and Norway
 $\frac{32}{100}$ and near Spain $\frac{10}{100}$ —

Of the Mineral Alkali

* 100 Parts of which consist of 52 Muriatic Acid, 42 Soda, and 6 Water. —

4th It is improperly called Tartrite of Soda, as it contains the Vegetable, as well as the Mineral alkali — and therefore to be called Tartrite of Soda and Potash. —

being intensely heated may be converted into vapour.—Promotes the fusion of many of the *earthy* and *metallic* bodies.—May be decomposed in the moist way by *Sulphuric* and *Nitric Acids*; and in the dry way, by the *Phosphoric*, *Boracic*, and *Arsenic*.—May also be decomposed by Oxyd of *Lead*; hence the preparation of *Patent Yellow*.—Of extensive application in *Agriculture*, *Glass-making*, *Glazing*, *Metallurgy*, *Soap-making*, *Diet*, *Medicine*, &c.

3d. *Phosphate of Soda* (*Soda Phosphorata* P. Edin.) Obtained by uniting *Phosphoric Acid* and *Soda* to the point of saturation, evaporating, and cooling. Form *crystalline*.—Taste not unpleasantly *saline*.—*Efflorescent*.—Dissolves readily in *Water*.—Forms a triple salt with *Ammoniac*, (*Sal Microcosmicus*).—Lately introduced as a *cathartic*. *and Sparging*.

4th. *Tartrate of Soda* (*Natron Tartarifatum* P. L.) Obtained, by evaporation and crystallisation, from the union of *Soda* with *Tartareous Acid*, by adding to a solution of the former *Acidulous Tartrate of Potash*.—Form of its crystals, *prismatic*.—Taste *bitterish saline*.—In most of its properties, and in its application, analogous to the *Tartrate of Potash*.

5th. *Borate of Soda*, (*Natron Boracicum* P. L.) Obtained in an impure form from the spontaneous evaporation of the water of certain lakes in the kingdom of *Thibet*; said also to be found in *South America*.—Purified by subsequent solution, boiling, and crystallisation.—Form of its crystals, *prismatic*.—Taste *styptic*.—Readily soluble in *hot Water*.—Changes vegetable blue colours to green.—When heated, parts with its water of crystallisation, and melts into a transparent *Glass*, which effloresces on exposure, and may be again dissolved in water.—Serves as a flux for all the *Earths* and most of the *Metallic Oxyds*.—May be decomposed in the moist way, by the *Sulphuric*, and several other acids; in the dry way, by the *Phosphoric* only.—Employed chiefly in *Metallurgy*, and *Glass-making*, and *medicine*

6th. *Carbonate of Soda*, (*Natron Præparatum* P. L.) Found native in the island of *Teneriffe*, *Egypt*, and elsewhere. Obtained also from the ashes of certain marine plants, by elixation, evaporation, and crystallisation.—Form of its crystals, *octohedral*.—Effloresces on exposure to *Air*.—Its other properties and uses nearly similar to those of *Carbonate of Potash*. Employed in *medicine*

Of the Mineral Alkali

Of the Volatile Alkali

If you take powder of Lin, and mixing with it Nitric Acid, after which adding lime to the mixture, the Volatile Alkali will be given out — This shows it to be a compounded substance, and made up of certain Elements. —

It is frequently called Animal Alkali, being obtained from Muriate of Ammoniac. —

This gas is incapable of supporting Animal life, but when mixed with Atmospheric air, it appears to increase combustion, but when pure it immediately extinguishes flame. But it must be remembered before this takes place the flame is increased, being of a light yellow colour. —

Order of Attraction, also, of this Alkali, the same as that of *Potash*. *But inferior in Degree.*

Of Volatile Alkali (Ammoniac).

Obtained from the decomposition of *Muriate of Ammoniac*, by *Potash*, *Soda*, or *Lime*. *more especially.*

Form *gaseous*.—Smell extremely *pungent*.—*Caustic*.—*Azotic*.—Lighter than *Atmospherical Air*.

Is absorbed both by *Water* and *Spirit*; by the former with great rapidity, producing an increase of temperature and bulk (*Aqua Ammoniae Puræ* P. L.). *Ice* dissolved in this fluid, on the contrary, produces cold.

Is in a slight degree *inflammable*.

May be decomposed in various ways; as by exposure to *Heat*, by the *Electric Spark*, in the reduction of *Metallic Oxyds*, by the distillation of *Nitrate of Ammoniac*, &c. yielding in some cases *Hydrogen*, in others *Azotic Gas*, which gasses by particular modes of combination have been found to reproduce it, and are therefore considered as its elements.

The principal saline compounds of this *Alkali* are,

1st. *Sulphate of Ammoniac*. Obtained by the union of *Sulphuric Acid* with *Ammoniac*, on the addition of diluted *Sulphuric Acid* to liquid *Carbonate of Ammoniac*.—Form, *crystalline*.—Taste, *bitter, pungent*.—Easily soluble in *Water*.—Fusible. *Volatile*.—Employed principally in the manufacture of *Muriate of Ammoniac*.

2d. *Nitrate of Ammoniac*. Obtained by slow evaporation, from the combination of *Nitric Acid*, and *Ammoniac*.—Form, *crystalline*.—Taste *cool, bitter, urinous*.—*Deliquescent*.—Easily fusible. Under cautious distillation, yields *Nitrous Gas*, *Oxygen Gas*, and *Water*; but detonates when suddenly heated.

3d. *Muriate of Ammoniac*, (*Sal Ammoniacus* P. L.) Found native in the neighbourhood of *Volcanos*; prepared also, in large quantities, in the dry way, by compounded chemical affinity, from a mixture of *Sulphate of Ammoniac* and *Muriate of Soda*.—Form *concrete*.—Taste *penetrating, acrid, urinous*.—Readily soluble in *Water*, producing cold; soluble also in *Spirit*. Crystallises under evaporation into small quadrangular
Prisms.

Of the Volatile Alkali

2^d By cautious distillation the Gaseous Acid of Azote is produced, and by an increase of Oxygen, Nitrous Gas, by a further increase Nitrous acid, and by the greatest possible quantity of Oxygen, the Nitric acid is produced. —

Of the Volatile Alkali

5th Carbonate of Ammoniac differs from Sal:
Vol: C: C: in no other respect than in being more
pure, the salt of Hartshorn being contaminated
generally with empyreumatic oil —

Prisms.—Of extensive application in *Dying, Tinning, Soldering, &c.* used also frequently in *Medicine.* *internally* *Diuretic, Externally* *Stimulant.*

4th. *Acetite of Ammoniac* (*Aqua Ammoniae Acetatae* P. L.) Prepared by saturating *Acetous Acid* with *Ammoniac.*—Form, *liquid.*—Taste *urinous.*—Employed as a *diaphoretic*; sometimes also used externally as a *discutient.*

5th. *Carbonate of Ammoniac* (*Ammonia preparata* P. L.) Obtained by distillation from most animal, and some vegetable and mineral substances; or from the decomposition of *Muriate of Ammoniac*, by *Carbonate of Potash* or of *Lime.* Form *concrete.*—Smell, *pungent.*—Taste, *urinous.*—Very soluble in *Water* (*Aqua Ammoniae* P. L.) Soluble also in *Spirit* (*Spiritus Ammoniae* P. L.) With unctuous substances forms an imperfect *Soap* (*Linimentum Ammoniae* P. L.) Like all the foregoing compounds may be decomposed by *Potash, Soda, Baryt, or Lime.*

Agrees nearly with the other *Alkalis*, in the order of its Attraction, both in the humid and dry way. *But inferior in Degree to both the fixed Alkalis.*

OF EARTHS.

^ Soluble or ever free from foreign admixture; when purified Artificially they are

^ Distinguished by their Brittleness, Fixity, sparing solubility in Water, Insipidity, want of Odour, incapacity of communicating a tinge to Glass, and their specific gravity not exceeding that of Water more than in the proportion of 5 to 1.

These characters possessed more perfectly by some of the earths than by others; hence the distinction into *Saline* and *Insipid*.

All the earths soluble in one or other of the *Acids*, and some in all.

Cannot be precipitated from their solutions by *Prussiate of Potash* or of *Lime*, as is the case with all metals, *Platina* excepted.

The earths at present known are *Baryt*, *Strontian*, *Lime*, *Magnesia*, *Alumine*, *Silex*, *Adamantine Earth*, *Fargon Earth*, and *Sidnean Earth*. *in very small quan*

Of Baryt.

Found in combination, 1st. with Carbonic Acid, (*Carbonate of Baryt*); 2d. with Sulphuric Acid, (*Sulphate of Baryt*, *Baroselenite*); or 3d. with Sulphuric

Of Earths

If you take any Earth, you may tell whether it contains any metallic Oxyd by fusing it with Borax, as in that process, providing there be any contained in it, you will know by the particular tinge given to the Borax —

Flux is the least capable of being acted upon by any of the acids, and indeed it is only acted upon by the Acid of fluor which dissolves it —

The Earths separately are incapable of being acted upon by the most intense degree of heat, yet when two are in union, then they become fusible —

We find the most considerable part of the Globe composed of the Calcareous, aluminous, and Silicious Earths, and to these might be added magnesian, and it is this Earth that gives that unciosity to the different Mineral substances and these three Earths are of the greatest importance to the arts, for Silicious Earth is the Basis of Pottery, Glass, the Calcareous Earth of the different Cements, and the aluminous of the different kinds of Pottery, from the solubility of Phosphoric, Lime, and magnesian, Pottery has elapsed them with the Alkalies, but if all their properties are considered they will be found to be more properly Earths.

Of Baryt

Carbonate of Baryt is found native in Lancashire —

This has been placed among the Alkalies, and is ^{not} very soluble in water, it is the heaviest of all the Earths. —

It is found in combination with Carbonic and Phosphoric Acid, both these are found native in this Country. —

[Faint, illegible handwriting on aged paper]

Sulphuric Acid, Silix, Sulphate of Alumine, Sulphate of Lime, and Petroleum, (*Liver Stone*.)

Obtained in a separate state, by the application of a strong heat, from *Carbonate of Baryt* prepared artificially.

Form *pulverulent*. Colour *white*. Specific gravity 4.000.

Soluble in about 900 times its weight of water, communicating to it properties analogous to those of *Lime-water*.

Infusible.

Unites with the *Sulphuric Acid* into a compound requiring for its solution 40,000 times its weight of *Water*. With the *Nitric* and *Muriatic Acid* forms crystallisable salts.

Melts with effervescence when mixed with *Borax* or *Microcosmic Salt*.

Unites with *Sulphur* into a species of *Hepar*, (*Sulphuret of Baryt*).

Order of Attraction in the moist way, *Sulphuric Acid*, *Oxalic*, *Succinic*, *Fluoric*, *Phosphoric*, *Saccho-lactic*, *Nitric*, *Muriatic*, *Sebacic*, *Citric*, *Tartareous*, *Arsenic*, *Formic*, *Lactic*, *Benzoic*, *Acetic*, *Bo-*

racic, Sulphureous, Nitrous, Carbonic, and Prussic, Water, Unctuous Oils, Sulphur; in the dry way Phosphoric, Boracic, Arsenic, Sulphuric, Succinic, Fluoric, Nitric, Muriatic, Sebacic, Formic, Lactic, Benzoic, and Acetic Acids, Potash, Sulphur, Oxyd of Lead.

The soluble forms of this earth remarkable, for their violent effects, when exhibited internally.

Used principally as a test for ascertaining the presence of *Sulphuric Acid*.

Of Strontian.

Found in combination with Carbonic Acid, *Strontheanite*; the exposure of which to heat furnishes the pure earth.

Most of the properties of this intermediate between those of *Baryt* and *Lime*.

More soluble however than either, and remarkable for the property of crystallising into *transparent rhomboidal prisms. which are very beautiful*

Attraction, the same as that of *Baryt*, as to order, but inferior to it in degree.

Of

Of Barytes

Of Strontian

Strontian is found in Combination with Carbonic Acid. in Strontian in Scotland —

This Earth is also placed by some among the Alkalies. —

The solution of this Earth in Sp of Wine burns with a Red flame, which is characterizing of Strontian. —

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Of Lime

There is no difference between Marble and lime Stone, excepting that of Texture. They are a compound of Calcareous Earth and Carbonic Acid, and the variety of colour in Marble depends entirely upon the degree of Oxidation of the metal with which it is combined —

Of Lime.

Found 1st. uncombined, *Native Quicklime*; 2d. in union with Carbonic Acid and Water, *Calcareous Spar*, *Marble*, *Lime-Stone*, *Chalk*, &c. 3d. with Carbonic Acid and Petroleum, *Swine-Stone*; 4th. with Carbonic Acid and Oxyd of Manganese, *Sidero-Calcite*; 5th. with Carbonic Acid and Carbonate of Baryt, *Baryto-calcite*; 6th. with Carbonic Acid, Carbonate of Magnesia, Iron, and Manganese, *Muri-Calcite*; 7th. with Carbonic Acid, Magnesia, Alumine, and Iron, *Schiefer Spar*; 8th. with excess of Carbonic Acid, Alumine, Magnesia, and Iron, *Dolomite*; 9th. with Fluoric Acid and Water, *Fluor*; 10th. with Phosphoric Acid, *Apatite*; and 11th. with Sulphuric Acid and Water, *Gypsum*, *Selenite*, *Plaster of Paris*.

Prepared for various purposes from *Carbonate of Lime*, by the continued application of a strong heat.

Form *concrete* or *powdery*. Taste *hot*, *pungent*, *caustic*. Specific gravity 2.3.

Soluble in about 700 times its weight of water

(*Aqua*

(*Aqua Calcis* P. L.) Changes vegetable blue colours to green.

On being suddenly moistened, emits both *Heat* and *Light*, losing at the same time its attraction of cohesion. The same takes place spontaneously on exposure to *Air*. On further exposure attracts Carbonic Acid from the Atmosphere; hence the increase of hardness observable in *calcareous Cements*.

Though infusible *per se*, promotes very powerfully the fusion of all the other earthy Bodies.

Melts with *Borax* and *Microcosmic Salt*, without effervescence. Melts also with *Oxyd of Lead*.

Forms, with the *Sulphuric Acid*, a compound of little solubility in water, *Gypsum*; with the *Nitric* and *Muriatic*, salts strongly deliquescent.

With *Sulphur*, a calcareous *Hepar*; with unctuous substances, peculiar *Soaps*.

Supposed in many instances to be of animal origin. *evidently so in many places*

Order of attraction in the moist way, *Oxalic Acid*, *Sulphuric*, *Tartareous*, *Succinic*, *Phosphoric*,
Saccho-

of June

The many Islands in the Pacific Ocean are
without doubt of animal origin —

The greater part of the Earth is made up of
Calcareous Earth, but to say the whole of it
was of Animal origin would be going too
far —

Of Lime

Of Magnesia

Magnesia gives a smoothness and unctuousity to Earths it is in combination with, it is not peculiar to this, for Clay has a greasy feel but more harsh and may be known from it by breathing upon it, for it gives out a particular smell, it could not be known from soap by the feel —

If you heat Fullers Earth and pour boiling water upon it, it will fall down like lime, but gives out neither heat nor light —

You may distinguish a mixture of Magnesia from Lime by pouring upon it the Diluted Sulphuric Acid, the Magnesia will be held in solution and the Lime will fall to the bottom. This is also known from Lime by not being of so caustic a nature when pure. —

Saccho-lactic, Nitric, Muriatic, Sebacic, Fluoric, Arsenic, Formic, Lactic, Citric, Benzoic, Acetic, Boracic, Sulphureous, Nitrous, Carbonic, and Prussic, Water, Unctuous Oils, Sulphur; in the dry way, *Phosphoric, Boracic, Arsenic, Sulphuric, Succinic, Nitric, Muriatic, Sebacic, Fluoric, Formic, Lactic, Benzoic, and Acetic Acids, Potash, Sulphur, Oxyd of Lead.*

Used extensively as the basis of *Calcareous Cements, Plaster and Stucco*; in *Dying, Bleaching, Tanning, Sugar-baking*, and various other arts, besides its application in *Medicine*.

Of Magnesia.

Found 1st. in union with Lime and some Iron, *Calci-murite*; 2d. with Silex, Alumine, Lime, Oxyd of Iron, and Water, *Argillo-murite*; 3d. with Carbonic Acid, Silex and Iron, *Silici-murite*; 4th. with Silex and Alumine, *Talc*; 5th. with Silex, Alumine, Iron, and Carbonate of Lime, *Lapis Ollaris*; 6th. with Silex, Alumine, Iron, Air and Water, *Steatites*; 7th. with Silex, Iron, Carbonate of Lime, Alumine, Muriate of Magnesia, and Water, *Serpentine*; 8th. with Silex, Alumine,

mine, Lime, Iron, Air, and Water, *Chlorite*; 9th. with Carbonic Acid, Silex, Carbonate of Lime, Alumine, and Oxyd of Iron, in different proportions, *Asbestos*, *Amianthus*, *Suber montanum*, *Actynolite* and *Fade*; 10th. with Silex, Lime, and Oxyd of Iron, *Baikalite*; 11th. with the Boracic Acid, Lime, Silex, Alumine, and Iron *Boracite*; and 12th with Sulphuric Acid, *Sulphate of Magnesia*.

✕ Prepared from a solution of this last, by the addition of *Carbonate of Potash*, and subsequent exposure of the washed earthy precipitate to a strong and continued heat.

Form *pulverulent*. Colour *pure white*. Taste *insipid*. Specific gravity about 2.3.

Requires for its solution 7900 times its weight of water.

Infusible without addition, even in the most intense degrees of Heat; but melts into a glass with *Lime*, *Microcosmic salt*, or *Borax*.

Unites with all the Acids. With the *Sulphuric Acid* regenerates *Sulphate of Magnesia* (*Magnesia Vitriolata* P. L.) With *Carbonic Acid*, Carbonate of Magnesia (*Magnesia Alba* P. L.)

Is a principal ingredient in the preparation of the finer kinds of *Porcelain*.

May

Of Magnesia

2 Sulphate of Magnesia is to be dissolved in 7 times its weight of water, and to this solution add the Carbonate of Potash, you then boil it, and wash it untill the Acid is given off, and when dried it will be pure Magnesia. —

Of magnesia

Of Alumine

Alumine is a substance which gives a degree of Plasticity when mixed with water, that which is called common Clay contains a very large proportion of Pilex —

May be combined, in small proportions, with *Sulphur*.

Order of Attraction in the moist way, *Oxalic Acid, Phosphoric, Sulphuric, Fluoric, Sebacic, Arsenic, Saccho-lactic, Succinic, Nitric, Muriatic, Tartareous, Citric, Formic, Lactic, Benzoic, Acetic, Boracic, Sulphureous, Nitrous, Carbonic, and Prussic, Sulphur*; in the dry way, *Phosphoric, Boracic, Arsenic, Sulphuric, Fluoric, Sebacic, Succinic, Nitric, Muriatic, Formic, Lactic, Benzoic, and Acetic Acids, Potash, Sulphur, Oxyd of Lead*.

In common use in disorders of the *Primæ Viæ* as an *ancacid* and *laxative*.

Of Alumine.

Found united to, 1st. Carbonic Acid and Lime, *Lac Lunæ*; 2d. to Silix, *Clay*; 3d. to Silix, Carbonate of Lime, Carbonate of Magnesia, Oxyd of Iron, Air and Water, in different proportions, *Lithomarga, Fuller's Earth* and *Bole*; 4th. to Silix and Iron, *Tripoli*; 5th. to Silix, Oxyd of Iron, Manganese, Water and Air, *Lipidolite*; 6th. to Silix, Magnesia, Iron and Lime, in different proportions, *Sapari, Hornblende, and Basalt*;

Basalt; 7th. to *Silex*, *Magnesia*, and *Oxyd* of *Iron*, *Mica*; without *Magnesia*, *Micarelle*; 8th. to *Silex*, *Iron*, and *Carbonate* of *Lime*, *Calp*; 9th. to *Silex*, *Magnesia*, *Iron*, and *Petroleum*, *Argillaceous Schistus*; and 10th. to *Sulphuric Acid*, *Sulphate of Alumine*.

Obtained in its purest form from a solution of *Sulphate of Alumine* (common alum), by the addition of *Potash*, *Soda*, or *Ammoniac*.

Form powdery. Colour, when dry, pure white. Feel unctuous. Taste insipid. Specific gravity 2.

Insoluble in *Water*. When moistened becomes plastic. Hardens and contracts, when exposed to the higher degrees of *Heat*; but very difficult of fusion, therefore the basis of the different kinds of *Pottery*.

Fusible, with effervescence, both with *Microcosmic Salt* and *Borax*.

Combines with most *Acids*, but with great difficulty, except under precipitation. The most important of these compounds, the *Sulphate of Alumine*; prepared from the decomposition of *Argillaceous Schistus*. Form of its crystals octahedral.

Of Alumine

To obtain the purest alumine, add an alkali to a solution of common alum, then dissolve the precipitate which forms in Muriatic Acid, and then precipitate it again with ~~Carbonate~~ Ammoniac, which precipitate will be pure after frequent washing &c. —

The goodness of Porcelain depends upon its durability. All calcareous or saline matter should be avoided in the making of Bricks, for when mixed with these they soon perish. The Windsor Bricks contain a little mica in them. —

Most of the precious Stones contain more oil in them than Pilex, for the Experiments which were formerly made of them are found to be erroneous. —

Of Alumine

Of Pilex

There are some Springs which contain a large quantity of Silicious Earth, and in case any perishable substance is put into it, in process of time it will take to it the Silicious Earth, whereby it becomes as it is said petrified—
The Granite found in the primitive Mountains principally consists of Quartz, Mica and Feldspar —

bedral. Taste astringent. Soluble in about 14 times its weight of Water. Undergoes watery fusion, and parts with its water of crystallisation, on exposure to Heat (Alumen Ustum P. L.) When calcined with certain inflammable substances, as yolk of egg, or sugar, produces a compound, which takes fire spontaneously on exposure to Air (Pyrophorus of Homberg).

Order of Attraction of *Alumine* in the moist way, *Sulphuric Acid, Nitric, Muriatic, Oxalic, Arsenic, Fluoric, Sebacic, Tartareous, Succinic, Saccho-lactic, Citric, Phosphoric, Formic, Lactic, Benzoic, Acetic, Boracic, Sulphureous, Nitrous, Carbonic, and Prussic*; in the dry way, *Phosphoric, Boracic, Arsenic, Sulphuric, Nitric, Muriatic, Fluoric, Sebacic, Succinic, Formic, Lactic, Benzoic, and Acetic Acids, Potash, Sulphur, Oxyd of Lead.*

Uses, comprehending those of Sulphate of Alumine, *Dying, Tanning, Printing, Silvering, Painting, Pottery, Medicine, &c.*

Of Silex.

Found in union, 1st. with Alumine, Lime, and Iron, as in most of the *precious Stones, Hyalite* and *Prehnite*; 2d. with Alumine only,

Schorlite, and *Calcedony*; 3d. with Alumine and Iron, *Olivin*, *Elastic Quartz*, *Obsidian*, *Opal*, *Pitch-stone*, *Hornslate*, *Jasper*, and *Argentine Felspar*; 4th. with Alumine, Lime, Magnesia and Iron, *Schorl*, *Thumerstein* and *Silicious Spar*; 5th. with Alumine, Iron and Manganese, *Rubellite*; 6th. with Alumine and Lime, *Quartz*, *Flint*, *Hornstone*, and *Ædelite*, and with water *Zeolite*; 7th. with Oxyd of Nickel, Lime, Alumine, and Oxyd of Iron, *Chrysoprase*; 8th. with Lime, Magnesia, Iron and Coal, *Silicious Schistus*; 9th. with Alumine, Lime, Sulphate of Baryt, Magnesia, and Iron, *Adularia*, without Iron, *Felspar*; 10th. with Alumine, Sulphate of Lime, and Oxyds of Copper and Iron, *Labrador-Felspar*; 11th. with Alumine, Baryt and Water, *Staurolite*; and 12th. with Lime, Sulphate of Lime and Iron, *Lapis Lazuli*.

May be separated from most of these by digestion in *Nitric Acid*.

Colour *white*. *Insipid*. *Insoluble*. Specific gravity 2.66. *Infusible*.

Soluble in the *Fluoric*, but in no other acid.

Soluble also in the solution of either of the *fixed Alkalis*.

May

Of Flies

The colour of the Filicious Earths depends upon its being mixed with the different metals. —

The different Sands and Shints are most composed of Flies. —

There are doubts whether Flies will chemically combine with water, as some have supposed it to do in certain springs. —

The best Achromatic glasses are made by a double convex of Crown glass, and behind this a double concave glass of Flint glass. —

Of Pilex

Pilex is the basis of Glass, it is composed of Pilex, Fixed Alkali, Oxyd of Lead, and Oxyd of Manganese. in the making of common glass they are used in any quantity and impure, but in the making of glass which you wish to have of the greatest transparency the ingredients must be had in the purest form, The colour is given by the addition of some of the Oxyds, and it is of consequence in the examination of metals, for you may know by the colour given to glass what metal the Oxyd contains

Of Adamantine Earth

Its properties not yet known and some think it is not a particular Earth —

May be fused with *Lime*, *Microcosmic Salt*, or *Borax*; but much more readily with *Potash* or *Soda*: hence the preparation of the different kinds of glass.

When melted with a large proportion of *Alkali*, forms a deliquescent compound, *Liquor Silicium*, the decomposition of which by an *Acid*, furnishes a gelatinous precipitate thought to be soluble in about 1000 parts of *Water*.

Order of Attraction in the moist way, *Fluoric Acid*, *Potash*; in the dry way, *Potash*, *Boracic Acid*, *Phosphoric Acid*, *Oxyd of Lead*.

Used principally in *Polishing*, *Painting*, *Glass-making*.

Of Adamantine Earth.

Found combined with *Silex*, *Iron* and *Nickel*, in *Adamantine Spar*, of which it constitutes above $\frac{2}{3}$ of the whole.

Insoluble in *Acids*.

Infusible with *Alkalis*.

The other properties of this Earth not as yet fully ascertained.

Of Fargon Earth.

Combined with Silex, Iron, and Nickel, in the Stone called *Fargon* or *Circon*.

Colour, *white*. Specific gravity estimated at 4.000.

With *Sulphuric Acid* forms an astringent salt with stelliform crystals; with the *Acetous Acid*, a salt incapable of crystallisation.

Insoluble even in a boiling solution of *Potash*.

Melts with *Borax* without effervescence; but infusible with either the *Fixed Alkalis*, or *Microcosmic Salt*.

Order of Attraction as yet unknown.

Of Sidneyan Earth.

Found in a mineral, from *Sidney Cove*, consisting of white sand, colourless Mica, a few black particles, and white Alumine, with which this Earth appears to be mixed, and from which it may be extracted by the *Muriatic Acid*.

Colour,

Of Tongon Earth

Of Poneyan Earth

Of Metals

The Splendour of Metals differs from that in any other bodies, and their Splendour seems to depend upon their opacity, and this opacity is such that the plate which is the $\frac{250,000^{\text{th}}$ part of an inch in thickness is opaque, and will not transmit a Ray of Light. —

The quickness with which they transmit the Electric fluid is such that it will pass through a wire two or three miles in length so quick that the Senses cannot take cognizance of it. —

The easier Metals decompose water the more sensible their taste is on applying them to the Tongue. —

It is of consequence to know when Sulphur is in union with a Metal, whether it is united to the Metal, in its metallic state, as in its oxydated state for the difference is one contains more Oxygen than the other, this is seen in Zurich silver, when in union with it as a metal you have a black powder at the min: but when with the oxyd a beautiful substance

Colour, *white*. Fusible at 150 of *Wedgwood's Thermometer*.

Not soluble either by the *Sulphuric* or *Nitric Acid*.

Precipitable from its solution in the *Muriatic Acid*, by *Alkalis*, or by the affusion of *Water*. Its combination with this Acid may also be decomposed, by the addition of the *Sulphuric*.

Order of Attraction not further ascertained.

OF METALS.

Distinguished by their *Weight*, *Opacity*, and *Splendour*. Also remarkable for their power of conducting the *Electrical Fluid*. *Each different colour has its own give to glass*

Presented to us by nature under different forms, as, 1st. *Native*, i. e. when in possession of the properties just mentioned; 2d. *Oxydated*, or in union with *Oxygen*; 3d. *Saline*, or united with one or other of the *Acids*; 4th. *Mineralized*, or combined with *Sulphur*; *and Arsenic* and 5th. *Alloyed*, or in union with each other.

Different processes therefore necessary for obtaining these bodies in a separate state; hence the *Pounding, Washing, Roasting, Amalgamation, and Reduction* of Metallic ores.

May be considered insoluble in *Water* at a common temperature, though capable of decomposing it, under certain circumstances.

Differently affected by exposure to *Air*.

Fusible and *Volatile* at very different temperatures. All *crystallise* in cooling. The oxyds of many *vitriifiable*.

Some *Malleable* and *Ductile*, others *Fragile*; hence the distinction into *Metals* and *Semi-Metals*.

Some capable, others incapable of *Oxydation* under the joint action of *Heat* and *Air*; hence again the division into *perfect* and *imperfect*.

All metals combinable with one or other of the *Acids*, with which they produce for the most part crystallisable saline compounds. May be in some instances converted, by the decomposition of the acid, into the state of *Oxyd*, in others completely *acidified*.

The

Of Metals

Roasting is only applicable where the mettalic Ore is in combination either with Sulphur or Arsenic or with both, it is then said to be mineralized, and Roasting is made use of to dissipate these Volatile substances, by which means the mettalic Ore is left in a state of Oxyd. you may always know which it contains, by the peculiar smell —

Amalgamation is understood when Quicksilver is brought into Chemical Union with any of the Metals —

Tin is the most fusible of any of the Metals, Platina the least so. The Oxyds of Lead and Bismuth greatly facilitate the Vitification of the other mettalic bodies —

The process of reduction is required when in a state of oxyd, in this you have nothing to do but to mix the oxyd with a quantity of black flux, and expose it to the necessary degree of heat, but the 3 following Metals are reduced, the reason why Platina Gold and Silver are called perfect Metals, is in consequence of the Oxyds of these being brought back to their mettalic form without the addition of any substances except those of heat and light — This is right. —

There are some Metals which when mixed become more fusible than any of the Metals when in a separate state, hence the composition of different substances for Soldering. —

Before any Metal can act upon an Acid it must be in a state of Oxyd, and they must either be in a state of oxyd at the time, or the Acid must be such as to oxydate them before they can be dissolved, and the difference is that if you take the Metal in a state of metal there will be an evolution of Gas, but when in a state of oxyd no evolution takes place. —

Of Metals

The gas that is evolved when a metal is put into an acid differs according to the substances you employ, it being sometimes nitrous gas, at others Hydrogen gas, and sometimes Ammoniacal gas, but rarely the latter, when it is the latter it arises from the Hydrogen of the water coming into union with the Azote of the nitric acid. —

We can regulate the degree of oxydation the same as we can that of any solution, so as to bring it to the point of saturation, hence the perfect and imperfect oxyds, for example you may take Quicksilver, and say you have 100 parts of Quick-silver, and 20 of Oxygen, or 50, 100, 500th of Oxygen, this is of great consequence to remember for the metals differ much in their strength according to the degree and quantity of Oxygen they have received, and sometimes you render an oxyd harmless by adding a further addition of Oxygen; in others you render them more active. —

The corrosion of a metal by an acid, is when the acid acts too powerfully on a metal, and bringing it into a state of an insoluble oxyd, and the way to dissolve it is by taking from it part of its Oxygen. —

The solution of a metal may be decomposed, and the metal brought down in its metallic state, by the addition of Charcoal, Phosphorus, and any of the essential oils. —

The attraction of Iron for charcoal is such, that when mixed with it you will have a metal differing in many respects from Iron, this is Steel, and by the application of heat and air you may dissolve the Charcoal, (it forming Carbonic acid gas) and have the Iron in our natural state.

In the mixture of Bismuth, Lead and Tin, you will have a compound which is softer than any known metal, & easier fusible. —

The *Metallic Oxyds*, generally speaking, more readily soluble in *Acids*, than the *Metals* from which they are formed.

The same more remarkably the case with regard to *Alkalis*, which act on few of the metals unless they are previously *oxydated*.

The *Earths* do not appear to act on metallic substances, but unite, by fusion, with their *Oxyds*.

Metals, when united with each other, often undergo remarkable changes of *Volatility*, *Fusibility*, and *Specific Gravity*. *All will unite in any proportion except Iron with Lead, or Iron with Silver.*

By fusion, most of them may be united to *Sulphur*. *all except Platina, and they are generally found in combination with Sulphur.*

All except *Zinc*, soluble in *Alkaline Sulphurets*.

The Attraction of the Metals for *Acids* in most instances inferior to that of the *Alkalis*, and *Earths*.

The perfect Metals are, *Platina*, *Gold*, and *Silver*.

Of Platina.

Brought from *South America*, in small grains of a dull silver-colour, mixed with ferruginous Sand, particles of Native Gold, and Quicksilver.

Both malleable and ductile when pure, though harder than either gold or silver.

Specific gravity upwards of 22.

Extremely difficult of fusion, but when urged by an intense heat, becomes capable of being welded.

Diffolves slowly in the *Oxy-muriatic Acid*, communicating to it first a yellow, and afterwards a deep reddish-brown colour. Insoluble in the other acids, even with the assistance of heat.

Differs from all other metals in being precipitable from its solution by *Muriate of Ammoniac*; the precipitate, upon fusion, yielding a malleable Regulus.

Said also to be soluble in *Sulphuret of Potash*.

Is scarcely affected in the dry way, either by *Compound Salts*, or by *Sulphur*.

Unites

Of Platina

Platina in many respects resembles Gold, first in its being somewhat heavier, also like it in not being soluble in its metallic form by any of the acids except, Aq. Regia, or aq. muriatic acid, and when dissolved in this acid they are nearly of a Colour, altho they so much differ in their metallic form. —

The only way by which you can distinguish Platina from Gold, (accurately), is by the solution of Platina in Aq. Regia, being decomposed by Muriat of Ammonia while Gold is not, and in the solution of Gold being decomposed by Sulphate of Iron, while Platina is not. —
Dr. Babington thinks this metal will be used in time in the Business of Watergilding in the form of Amalgam as Gold is now used, which process will be seen under the head of Gold. —

Of Gold

Gold crystallises in its metallic form in beautiful octahedral crystals. —

The best method of collecting gold when mixed with sand is by adding *Terichscler* to the mixture, when an amalgam of gold will be formed. —

Gold in whatever form it is found always contains a quantity of other matter, and when pure it consists of 24 parts, called Carats, and the native gold contains about 22 Carats. —

Gold is decomposed from its solution in *Aq. Regia* by the Phosphate of Iron, while Platina is not, and this is the distinction. —

Unites by fusion in different proportions with many other metals, but most easily and intimately with *Zinc*. With *Copper* produces a compound of a golden colour, hard, malleable, close grained, susceptible of a fine polish, and durable.

Order of Attraction in the moist way, *Æther*, *Muriatic*, *Oxy-muriatic*, *Nitric*, *Sulphuric*, *Arsenic*, *Fluoric*, *Tartareous*, *Phosphoric*, *Sebacic*, *Oxalic*, *Citric*, *Formic*, *Lactic*, *Acetic* and *Succinic Acids*; in the dry way, *Arsenic*, *Gold*, *Copper*, *Tin*, *Bismuth*, *Zinc*, *Antimony*, *Nickel*, *Cobalt*, *Manganese*, *Iron*, *Lead*, *Silver*, *Quicksilver*, and *Sulphuret of Potash*.

Use as yet, principally, confined to Chemical and Philosophical purposes.

Of Gold.

Found either alloyed with *Silver*, *Copper*, or *Iron*, *Native Gold*; or combined with *Sulphur*, *Antimony*, *Arsenic*, *Lead*, *Iron* and *Silver*, *Grey Gold Ore*; or with *Bismuth* and *Sulphur*, *White Gold Ore*, *Aurum Graphicum*.

When pure, of a bright yellow colour, soft,

very tough, ductile and malleable to an extraordinary degree; not sonorous.

Next to *Platina* the heaviest body in nature, its *Specific Gravity* being 19.30.

Melts, after ignition, at 32 of *Wedgw.* = 5237 of *Farenh.* and may be volatilized by a more intense degree of heat. Crystallises in cooling, into quadrangular pyramids. Converted by electrical explosions, into a purple *Oxyd*.

Soluble only in *Oxy-muriatic Acid*, the compound Acid, *Aqua Regia*, and in the solutions of *Alkaline Sulphurets*.

The *Oxy-muriatic* solution of a yellow colour, stains the skin purple.

Separable from this solution in a metallic form, by *Æthers*, *Essential Oils*, and *Phosphorus*, by *Zinc* and many other metals; may be also precipitated by all the *Alkalis* and *Earths*. The precipitate by *Tin*, of a purple colour (*Purple Powder of Cassius*), and communicates a red colour to glass; that by *Ammoniac*, has the property of exploding with great violence when exposed to a moderate heat, *Aurum fulminans*.

Combines with all the *Metals* in various proportions.

Of Gold

Gold is so exceeding malleable as to be beat into
the 280,000th part of an Inch in thickness, and
the Gold beaters take 15 Pennyweights of Gold and
the smallest proportion of Copper, and they will
furnish you with 2000 Leaves of 3 Inches and $\frac{3}{8}$ th
Square —

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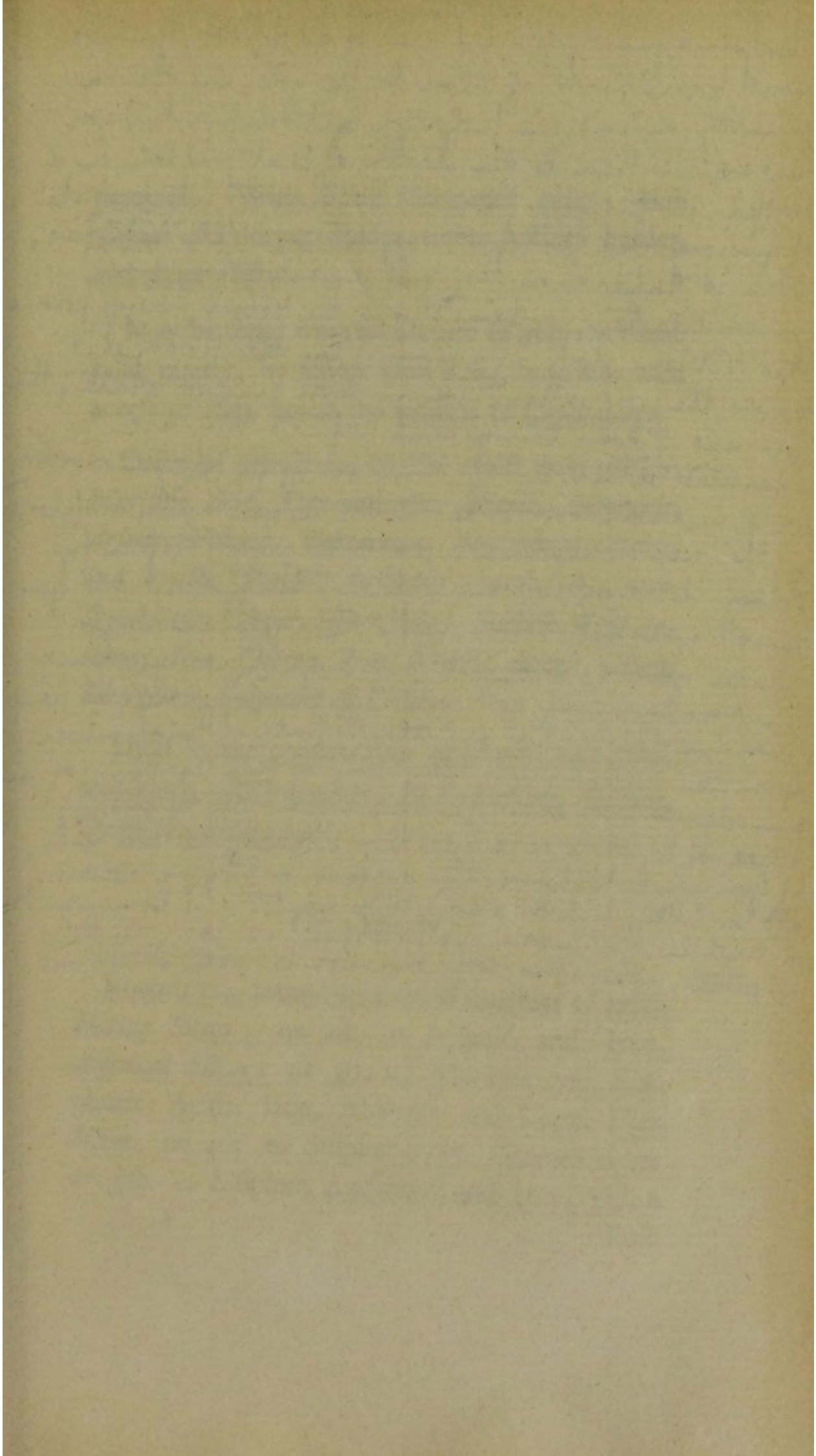
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1897

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1900



Of Gold

* The Purifying of Gold and Silver is as follows, you add about 4 or 5 parts of Silver to the gold, and then a quantity of lead (in proportion to its impurity) you then expose these to the action of heat and air, in a muffle, in this way they will be brought into a state of fusion, the Lead first separates, and then vitrifies, when it takes from the gold and Silver any impurities they contained, and the vessel being porous this vitrious mass is absorbed by the pores, and leaves the gold and Silver in their purest state, the Gold and Silver being thus refined they are separated either by the addition of the Apyrruatic Acid, or Nitric Acid, the latter is generally employed in its diluted state. If you only want to purify Silver it may be done without the Gold, but you must use the Silver with the gold. —

Water gilding consists principally in making an amalgam of gold with Quicksilver, the gold being pure. You first rub a little Nitrate of Quicksilver upon the metal, and then lay a thin surface of the amalgam upon this, you then apply the necessary degree of heat to separate the Silver from the gold, if you wish to have the surface a higher colour, add a little Nitric Acid to a solution of Common Salt and while the metal is hot plunge it into this mixture, after it is cool. lustrate it with Steel. —

Of Silver

portions. With *Silver* becomes paler; with *Copper* of a deeper colour, more fusible, harder, and more elastic.

May be freed from admixture of imperfect metallic matter, by fusion with *Lead*, together with access of *Air*; hence the process of *Cupellation*.

Order of attraction, in the moist way, *Æther*, *Muriatic Acid*, *Oxy-muriatic*, *Nitric*, *Sulphuric*, *Arsenic*, *Fluoric*, *Tartareous*, *Phosphoric*, *Sebacic*, and *Prussic*, *Potash*, *Ammoniac*; in the dry way, *Quicksilver*, *Copper*, *Silver*, *Lead*, *Bismuth*, *Tin*, *Antimony*, *Iron*, *Platina*, *Zinc*, *Nickel*, *Arsenic*, *Cobalt*, *Manganese*, *Sulphuret of Potash*.

Used in the construction of *Utensils* and different kinds of *Ornaments*; in *Enamelling*, *Gilding*, *Dying*, *Soldering*, &c.

Of Silver.

Found, 1st. united to a small quantity of gold, *Native Silver*; or 2d. to Arsenic and Iron, *Arsenical Silver*; or 3d. to Muriatic and Sulphuric Acids, Iron, Alumine and Lime, *Horn Silver*; or 4th. to Sulphur only, *Vitreous Silver*; or 5th. to Sulphur, Antimony and Iron, with a little

little Copper and Arsenic, *Brittle Vitreous Silver*; or 6th. to Arsenic and Sulphur; or to Antimony, Sulphur, and Sulphuric Acid, *Red Silver Ore*; or 7th. to Lead, Sulphur, Antimony, Iron, Alumine, and Silex, *White Silver Ore*.

Colour *white, splendid*. Less malleable and ductile than *Gold*, but harder and more opaque,

Specific gravity 10.47.

Tarnishes on exposure to air.

Fusible at 28 of *Wedgw.* = 4717 of *Fahrenheit*. and by increase of heat may be volatilized, and partially *oxydated*, in which state it communicates a yellow colour to *Glass*.

Most readily soluble in *Nitric Acid*, forming with it a corrosive crystallisable salt, susceptible of Watery Fusion (*Argentum Nitratum P. L.*) Soluble also in *Nitro-Sulphuric Acid*, *Aqua Regina* of *Keir*.

From the *Nitric Acid*, may be precipitated in the form of *Oxyd*, by *Alkalies* and *Earths*, or, un-*oxydated*, by many of the *Metals*, and also by *Phosphorus*. If thrown down by *Lime Water*, the *Oxyd* when dried, and afterwards washed with *Ammoniac*, explodes most violently on the slightest agitation, *Argentum fulminans*. You are never to use this but in the most minute quantities, and be particularly careful in making the preparation for the most trifling motion will explode it, even the motion of the air will explode it. —

The solution with the Nitric Acid is found of great use in the marking of Cloath, which in bleaching, becomes extremely black, for the more it is exposed to the Suns Rays the blacker it becomes—

It also changes the colour of the Skin and Nails black, which never becomes of its original colour again.—

Of Silver

Of Quicksilver

The most pure Quicksilver is obtained by decomposing either native or artificial Cinnabar by Iron filings. These are to be put into an Iron retort, when you are to proceed to distillation —

In order to separate Sulphur from Quicksilver, you have nothing to do but to add a metal to it which has stronger attraction for the Sulphur than the Quicksilver has, Iron therefore generally used. —

Combines extensively with the other *Metals*.
With *Copper* becomes harder and more sonorous.

Combines readily with *Sulphur*, and is blackened by *Hepatic Gas*.

Order of Attraction, in the moist way, *Muriatic Acid*, *Sebacic*, *Oxalic*, *Sulphuric*, *Saccho-lactic*, *Phosphoric*, *Nitric*, *Arsenic*, *Fluoric*, *Tartareous*, *Citric*, *Formic*, *Lactic*, *Acetous*, *Succinic*, *Prussic*, and *Carbonic*, *Ammoniac*; in the dry way, *Lead*, *Copper*, *Quicksilver*, *Bismuth*, *Tin*, *Gold*, *Antimony*, *Iron*, *Manganese*, *Zinc*, *Arsenic*, *Nickel*, *Platina*, *Sulphuret of Potash*, *Sulphur*.

Used in the construction of various *Utensils*; composition of *Bell-metal*; in *Silvering*, *Enamelling*, *Soldering*, *Dying*, *Medicine*, &c.

The imperfect metals are *Quicksilver*, *Lead*, *Copper*, *Iron*, and *Tin*.

Of Quicksilver.

Found 1st, *Native*; 2d. alloyed with silver, *Native Amalgam*; 3d. with Oxygen, *Native Oxyd*; 4th, with *Muriatic* and *Sulphuric Acids*, *Horn-mercury*;

mercury; 5th. with Sulphur, *Cinnabar*; and 6th. with Sulphuret of Potash or Soda, *Hepatic Ore*.

Form *liquid*. Colour, *silvery-white*.

Specific Gravity 13.56.

Not perceptibly altered by exposure. By agitation, with access of air, is converted into a black *Oxyd*: a change analogous to this seems to take place on trituration with tenacious substances; hence *Pilulæ Hydrargyri*, *Unguentum Hydrargyri*, &c. P. L.

Volatile at 600° and congeals at 39 below 0 of *Farenh*. When heated with access of air, is converted into a red *Oxyd* (*Hydrargyrus Calcinatus* P. L.)

Combines with, and partly decomposes, concentrated *Sulphuric Acid*, by the assistance of heat, producing a saline mass, which by the affusion of water becomes of a yellow colour (*Hydrargyrus Vitriolatus* P. L.)

Very readily soluble in the *Nitric Acid*, with the production of *Nitrous Gas*; the solution evaporated produces also a saline mass, which upon further decomposition of the acid by exposure to heat,

Of Quicksilver

When dissolved in the Nitric Acid and a quantity
of Ppr. Vin. Rect: add, and then dried, and if applyed
to a certain degree of heat, a great explosion will
take place. this was discovered by Mr Howard.

Of Quicksilver

You may obtain the mild muriat of Mercury in the
dry way also, by mixing the Sulphate of Mercury
to Muriate of Soda and adding Quicksilver and then
apply the necessary quantity of heat, and you will
have Calomel as pure as by the other process —

heat, is reduced to the state of Oxyd (*Hydrargy-
rus nitratus ruber* P. L.)

Not acted upon by the *Muriatic Acid* unless through the medium of *Oxygen*, by the assistance of which it unites with it more powerfully than with either of the former acids; hence the preparation of Muriate of Mercury, by sublimation, from a mixture of Sulphate of Mercury, and Muriate of Soda (*Hydrargyrus Muriatus* P. L.); of mild Muriate of Mercury in the dry way, by the addition of Quicksilver to the former, and repeating the sublimation (*Calomelas* P. L.); and in the moist way, by the decomposition of Nitrate of Quicksilver by Muriate of Soda (*Hydrargyrus Muriatus mitis* P. L.)

When oxydated, is dissolved by the *Acetic Acid*, or may be united with it by adding *Acetite of Potash* to a solution of *Nitrate of Quicksilver* (*Hydrargyrus Acetatus* P. L.)

May be precipitated from its solutions by *Alkalies*, by *Lime* and other Earths, and by several other metals; the colour of the precipitates differing according to the degree of oxydation. The precipitate from the solution of *Nitrate of Quicksilver* by *Ammoniac*, is of a grey colour (*Hydrargyrus*

drargyrus Precipitatus Cinereus P. Edin.); from the solution of *Muriate of Quicksilver* of a pure white (*Hydrargyrus Præcipitatus albus* P. L.) The precipitates by Alkalis, when mixed with Sulphur, possess the power of exploding if exposed to a gradual heat.

Combines readily with most of the metals, forming what are called *Amalgams*.

Unites with Sulphur, by trituration, into a black powder (*Hydrargyrus cum Sulphure* P. L.) by fusion and sublimation, into a red striated mass (*Hydrargyrus Sulphuratus ruber* P. L.) which may also be prepared by the distillation of a mixture of *Muriate of Quicksilver* and *Sulphuret of Antimony* (*Cinnabar Antimonii*).

Decomposes the *Alkaline Sulphurets*, producing an *Æthiops* with *Sulphurets of Potash* and of *Soda*, and a factitious *Cinnabar*, with *Sulphuret of Ammoniac*.

Order of Attraction, in the moist way, *Sebacic Acid*, *Muriatic*, *Oxalic*, *Succinic*, *Arsenic*, *Phosphoric*, *Sulphuric*, *Saccho-lactic*, *Tartareous*, *Citric*, *Nitric*, *Fluoric*, *Acetous*, *Boracic*, *Prussic*, *Carbonic*; in the dry way, *Gold*, *Silver*, *Platina*, *Lead*, *Tin*, *Zinc*, *Bismuth*, *Copper*, *Antimony*, *Arsenic*, *Iron*, *Alkaline Sulphurets*, *Sulphur*.

Used

[Faint, illegible text covering the page]

Of Lead

There is an ore of Lead in union with Phosphoric Acid which is a very remarkable ore and generally of a green colour—

All the ores of this Metal very scarce except the 1st Variety, the Potters Lead ore of Galena found in mineralization with Sulphur, which is found in such abundance as to make it an article of cheapness, which depends in some measure on the durability, and also upon the facility you come at it, as you have nothing to do but to roast it for the space of half an hour or so—

You will be able to detect the presence of Lead in any kind of Liqueur, by adding to it a few Drops of the Sulphuret of Ammoniac, but if it contains Bismuth that will also be precipitated, but you may know which metal it contained by taking the liqueur and evaporating it, if Lead you will find it soft, if Bismuth fragile—

In S. Weston's fusible Metal is made by mixing Lead Tin and Bismuth together.—

Used principally in the working of *Gold Ores*, construction of *philosophical Instruments*, and of *Mirrors*; in *Gilding*, *Painting*, *Anatomy*, and *Medicine*.

Of Lead.

Found 1st. *Native*, though very rarely; 2d. in union with Oxygen, Iron, and Alumine, *Red Lead Ore*; 3d. with Carbonic Acid, a little Lime and Alumine, *Spathose Lead Ore*; 4th. with Molybdic Acid, Iron and Silex, *Carinthian Molybdate of Lead*; 6th. with Sulphuric Acid, *Sulphate of Lead*; 7th. with Sulphur and a little Silver, *Galena*; and 8th. with Antimony and a little Silver, *Antimonial Lead Ore*.

Colour, *bluish-white*; *soft*, *flexible*, not *tenacious*.

Specific gravity 11.35.

Becomes dull on exposure to *Air*.

Melts at about 540° of *Farenh.*—In a strong heat boils, and if air be admitted, unites readily with different portions of *Oxygen*; hence the preparations of *Litharge* and *Minium*; by a
still

still greater degree of heat may be converted into *Glass*.

Unless assisted by heat, is not readily acted on either by the *Sulphuric* or *Muriatic Acid*. Dissolves in diluted *Nitrous Acid*, and forms with it a crystallisable salt. On exposure to the vapour of *Acetous Acid*, is converted into a white *Oxyd* (*Cerussa* P. L.), the solution of which, in a fresh portion of this acid, produces a crystallisable compound remarkable for its sweetness and astringency (*Cerussa Acetata* P. L. *Aqua Lithargyri Acetati* P. L.)

Exhibits a brownish colour when precipitated from its solutions by *Alkaline Sulphurets*.

By fusion with the *Fixed Alkalis*, becomes partially soluble in *Water*; and may be oxydated by deflagration with *Nitre*.

Unites easily by fusion with most of the metals, more especially with *Gold*, *Silver*, *Tin*, and *Bismuth*.

Produces with *Sulphur*, a grey coloured brittle compound, less fusible than itself; with *Phosphorus*, a compound which is malleable, but more disposed to tarnish.

The

^{Of Lead}
If you write upon paper with a solution of lead and
only expose it to the vapour of the Sulphuret of
Ammonia, it will become instantly brown. —

Of Lead

In the making of Phot, a small quantity of Arsenic is added for the purpose of having the Phot in a more granulated form, and the only difference between patent and common Phot is in the former being more Spherical which is done by the Sieves it passes through, being at a greater distance from the water, so that the Phot passes through a large Column of Air, thereby giving it an opportunity of cooling more gradually. —

Of Copper

The *Oxyds* of this metal soluble in *Oils*, hence the preparation of certain *Plaisters*, *Varnishes*, and *Paints*; capable also of decomposing several of the compounded salts, *Patent Yellow*.

Order of Attraction, in the moist way, *Sulphuric Acid*, *Sebacic*, *Saccho-lactic*, *Oxalic*, *Arsenic*, *Tartareous*, *Phosphoric*, *Muriatic*, *Nitric*, *Fluoric*, *Citric*, *Formic*, *Lactic*, *Acetous*, *Boracic*, *Prussic* and *Carbonic*, *Potash*; in the dry way, *Gold*, *Silver*, *Copper*, *Quicksilver*, *Bismuth*, *Tin*, *Antimony*, *Platina*, *Arsenic*, *Zinc*, *Nickel*, *Iron*, *Alkaline Sulphurets*, *Sulphur*.

Employed in medicine, and very extensively in the arts, particularly in the construction of *Buildings* and different *Utenfils*, in the making of *Shot*, in *Statuary*, *Glass-making*, *Glazing*, *Painting*, *Varnishing*, *Refinement of Gold and Silver*, *Composition of Pewter* and *Soft-solder*, &c. &c.

Of Copper.

Found 1st. *Native*; 2d. united to *Oxygen*, *Tile ore*; 3d. to oxygen and oxyd of *Iron*, *Pitch-Copper ore*; 4th. to *Carbonic Acid*, *red*, *green* and *azure Copper ores*; 5th. to *Arsenic Acid*,

G

Arseniate

Arsenate of Copper; 6th. to Sulphuric Acid, *Sulphate of Copper*; 7th. to Muriatic Acid, *Muriate of Copper*; 8th. to Sulphur, *Vitreous Copper ore*; 9th. to Sulphur and Iron, *Yellow Copper ore*; 10th. to Arsenic and Iron, *White Copper ore*, and, 11th. to Lead, Antimony, Iron, Sulphur, Silex and Silver, *Grey Copper ore*.

Colour, *reddish*. Taste *nauseous*, *Styptic*. Specific gravity 7.788.

Hard, elastic, malleable, and ductile. Sonorous.

Rufts on exposure to air.

If heated changes colour, and is converted into a brownish red *oxyd*. Melts at 27° *Wedgw.* = 4587 *Farenh.*; and exhibits a bluish-green flame.

Soluble by the assistance of a boiling heat in concentrated *Sulphuric Acid*, forming with it a blue crystallisable salt (*Cuprum Vitriolatum* P. L.)

Diffolves very readily in the *Nitric Acid*, with a production of *Nitrous Gas*: the solution of a deep blue colour, and affords by evaporation a deliquescent salt, which detonates on being suddenly heated.

Of Copper

To prepare the Cuprum Ammoniacale take Sulphate of Vitriol and Carbonate of Ammoniac, but it is more elegant if you take a solution of the Sulphate of Copper, and adding to this a solution of Carbonate of Ammoniac, and lastly pouring a quantity of Spirits of Wine into the solution —

For ascertaining the presence of this metal in any solution, add to it a solution of Ammoniac, when you will have a very beautiful blue solution, it at first appears turbid but by adding a greater quantity of the Ammoniac it becomes blue.

But you will have this blue appearance if Nickel was in the solution, you must therefore evaporate the liquor and have the metal in its metallic state, when you easily distinguish it —

Of Copper

Is difficultly acted upon by *Muriatic Acid*.
Colour of the diluted solution green.

By the *Acetous Acid* is rather corroded than dissolved. If moistened with this Acid is, under exposure to air, converted into a green saline Oxyd (*Ærugo P. L.*)

Is more or less acted upon by all the Alkalis. To the solution of Ammoniac it communicates a beautiful blue colour, which disappears on the exclusion, and returns on the admission of air.

May be precipitated from its solution in Sulphuric Acid, by Arseniate of Potash, (*Scheele's green Pigment*): from Nitric Acid by Lime, (*Verditer*): from any of its solutions by Iron, (*Zement Copper*).

Detonates with melted *Nitre*, and, by the assistance of heat, decomposes *Muriate of Ammoniac*.

Unites with many of the metals, and forms very important compounds, particularly with *Platina*, *Gold*, *Silver*, *Tin*, *Arsenic*, and *Zinc*.

Unites also, by fusion, with *Sulphur* and with *Phosphorus*.

The oxyds of this metal give a greenish tinge to *Glass*.

Order of attraction, in the moist way, *Oxalic Acid, Tartareous, Muriatic, Sulphuric, Saccho-lactic, Nitric, Sebacic, Arsenic, Phosphoric, Succinic, Fluoric, Citric, Formic, Lactic, Acetous, Boracic, Prussic, Carbonic, Potash, Ammoniac, Unctuous Oils*; in the dry way, *Gold, Silver, Arsenic, Iron, Manganese, Zinc, Antimony, Platina, Tin, Lead, Nickel, Bismuth, Cobalt, Quicksilver, Alkaline Sulphurets, Sulphur.*

Application very extensive, employed chiefly in *Gunnery*, in the Construction of *different Utensils*, in the Composition of *Bell-metal* and *Alloys*, in *Enamelling, Dying, Painting* and *Medicine*.

Of Iron.

Found 1st. *Native*; 2d. united to a small proportion of Oxygen, *Grey Iron Ore*; 3d. to Carbonic Acid, and Alumine, *Hematite*; 4th. to Oxygen, Carbonic Acid, Alumine, and often Phosphoric Acid, *Argillaceous Iron Ores*; 5th. to Lime, Carbonic Acid and Manganese, *Spathose Iron Ore*; 6th. to Sulphuric Acid, *Native Sulphate of Iron*; 7th. to Sulphur, *Pyrites*.

As obtained from its ores, by the usual processes

of Copper

of Iron

On Iron

cess of reduction, assumes the form of *Crude Iron*, which freed from its impurities, by continued exposure to the combined action of *Heat* and *Air*, and subsequent hammering or rolling, is converted into *Bar Iron*.

Colour of this *bluish white*. Specific gravity 7.788. *Hard, elastic, ductile, tenacious, magnetical.*

Rufts easily on exposure to *Air*, or application of *Moisture* (*Rubigo Ferri P. L.*)

Is also, under access of air, easily affected by *Heat*, undergoing various changes of colour from superficial oxydation, long before it is ignited; but is extremely difficult of fusion.

The only metal capable of combustion by *Collision*.

When heated so as to become soft, different portions may be united into one mass by the operation of *Welding*.

If exposed to *Oxygen Gas*, when ignited, burns with great brilliancy and rapidity, and is afterwards found to be *oxydated*.

The vapour of water applied to heated iron,

also *oxydates* it, and furnishes *Hydrogen Gas*. (Vide page 10.)

When heated in close vessels, for a certain length of time, in contact with *Charcoal*, acquires *Weight*, becomes *fusible*, more *brittle* and *elastic*, and capable of contracting a great degree of *Hardness*, when ignited and suddenly cooled, (*Steel*).

May afterwards be deprived of these properties by cementation with earthy infusible powders, or the simple application of *Heat*.

Dissolves more or less perfectly in all the *Acids*. With most of them, in the act of solution, produces *Hydrogen Gas*.

Requires the assistance of heat to decompose concentrated *Sulphuric Acid*, but dissolves readily in it when diluted, and forms a pale green crystallisable salt (*Ferrum Vitriolatum* P. L.) A similar compound is obtained by the spontaneous decomposition of Iron Pyrites, (*Copperas*).

With *Nitric Acid* produces either a reddish brown or greenish solution, which changes to a bright red on the addition of *Carbonate of Potash*, or *Ammoniac*.

With

On Iron

The Sulphur which is in union with the Iron, decomposes the Atmosphere or Water to which it is exposed, and takes the form of Sulphuric Acid, which acting upon the Iron produces Copperas —

On Iron,

In the preparation of Vin: Ferri: the genuine
Rhenish wine is the only kind that should be
made use of —

Ink which turns ochre has too much Copperas in
the preparation, and the best way to prevent
this is to add a quantity of Spirits of Wine —

With the *Muriatic Acid*, a yellowish brown solution, miscible with spirit of wine, (*Tinctura Ferri Muriati* P. L.)

Soluble by digestion in the *Acetous Acid*; hence the chalybeate properties communicated by it to different kinds of wine (*Vinum Ferri* P. L.)

Also easily acted on by Acid of Tartar (*Ferum Tartarifatum* P. L.)

By uniting with *Prussic Acid*, forms *Prussian Blue*.

In combination with *Carbonic Acid* becomes soluble in water; hence the properties of *Chalybeate Springs*.

With *Gallic Acid* produces a black precipitate, the basis of common *Ink*.

Precipitates spontaneously from most of its acid solutions on exposure to *Air*. When thrown down from these by an *Alkali*, may be re-dissolved by the addition of a further portion of it.

Combines with the *Fixed Alkalis* by fusion.

Deflagrates with *Nitrate of Potash*; and sublimes with *Muriate of Ammoniac*, which it partially decomposes (*Ferum Ammoniacale* P. L.)

When in the state of *Oxyd*, promotes the fusion of several of the *Earths*, and communicates different tinges to *Glass*, according to the degree of *Oxydation*.

Unites by fusion with all the other metals, except *Quicksilver*, *Lead* and *Bismuth*. In combination with *Arsenic*, becomes brittle when heated, (*Red-short Iron*).

Has of all metals the strongest attraction for *Sulphur*, with which, when heated, it unites very readily.

Is also capable of entering into combination with phosphorus, (*Cold-short Iron*).

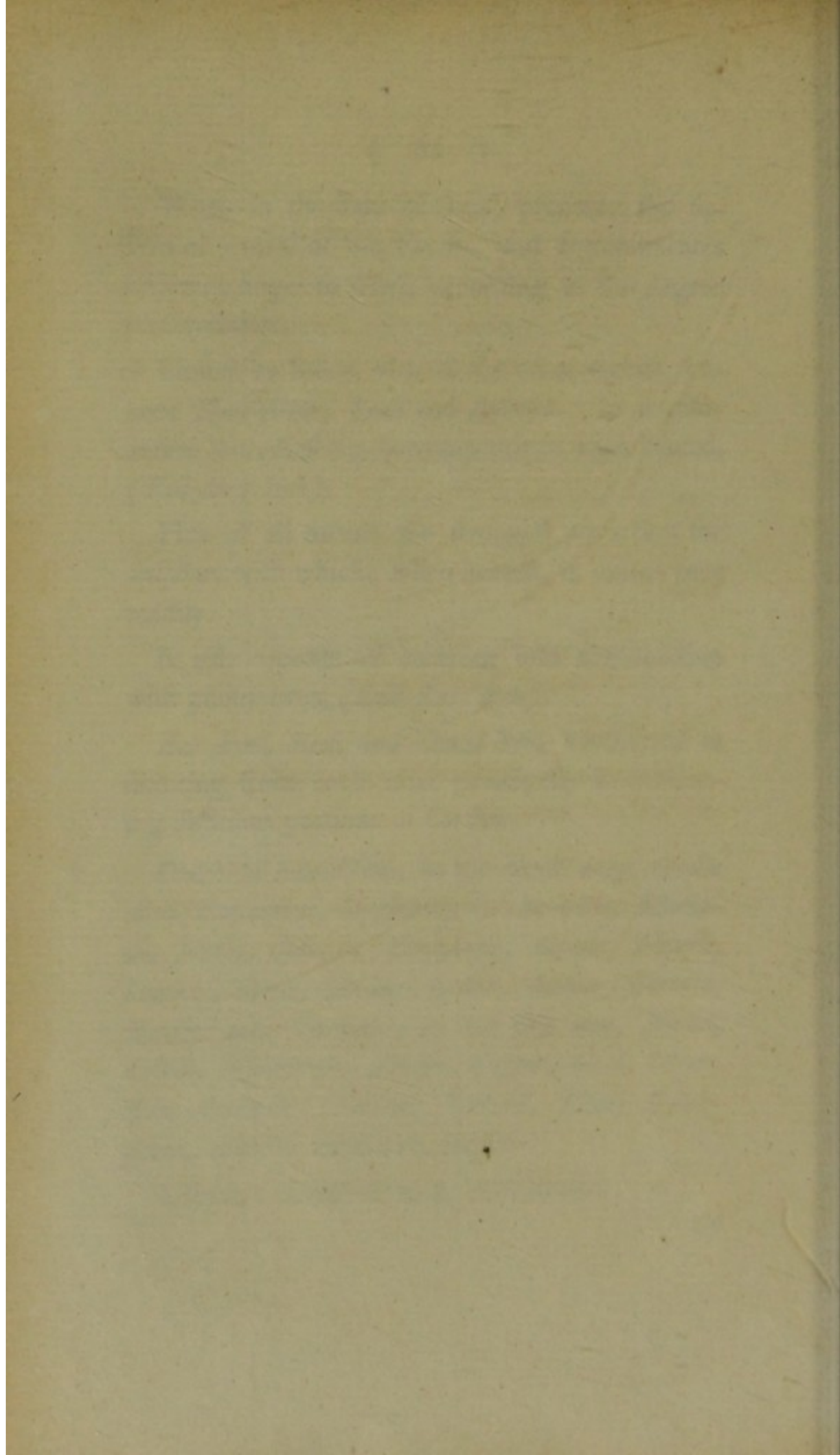
Bar-Iron, *Steel*, and *Crude Iron*, considered as differing from each other principally in containing different portions of *Carbon*.

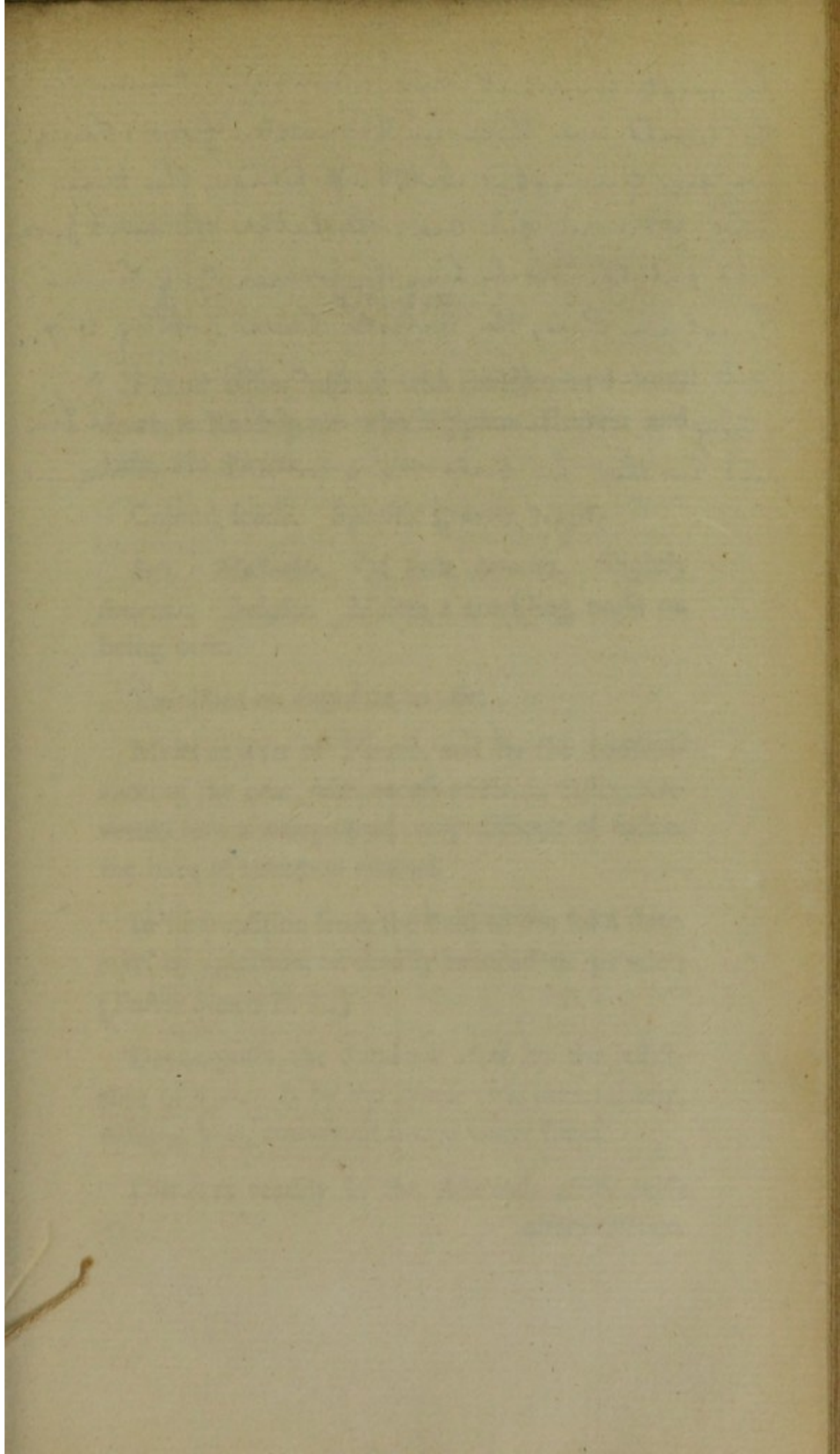
Order of Attraction, in the moist way, *Oxalic Acid*, *Tartareous*, *Sulphuric*, *Saccho-lactic*, *Muriatic*, *Nitric*, *Sebacic*, *Phosphoric*, *Arsenic*, *Fluoric*, *Succinic*, *Citric*, *Formic*, *Lactic*, *Acetous*, *Boracic*, *Prussic*, and *Carbonic*; in the dry way, *Nickel*, *Cobalt*, *Manganese*, *Arsenic*, *Copper*, *Gold*, *Silver*, *Tin*, *Antimony*, *Platina*, *Bismuth*, *Lead*, *Quicksilver*, *Alkaline Sulphurets*, *Sulphur*.

Uses too extensive to be enumerated.

Of

On Iron





On Tin

The most ancient and abundant mines in the World are those in Cornwall, from whence we are furnished with two kinds, the Mine and Stream Tin ore, the latter the most pure, and called Pollock Lin, the former Grey Tin — To colour Pins, the Artists have nothing to do but to scour them, and put them into a strong Solution of Cream of Tartar and Tin, and in this he boils them for a little time —

Of Tin.

Found either united with oxygen and iron, *Spatbose Tin-ore*; or with Sulphur, Copper and Iron, *Tin Pyrites*.

Colour, *white*. Specific gravity 7.291.

Soft. Malleable. Of little *tenacity*. Slightly *sonorous*. *Inelastic*. Makes a crackling noise on being bent.

Tarnishes on exposure to *Air*.

Melts at 410 of *Farenh.* and by the continuance of the heat, with access of air, is easily converted into a white *Oxyd*, very difficult of fusion, the basis of common enamel.

In its transition from the fluid to the solid state, may, by agitation, be readily reduced to powder, (*Pulvis Stanni P. L.*)

Decomposes the *Sulphuric Acid* by the assistance of heat. Is by the *Nitric Acid* immediately, without heat, converted into a white *Oxyd*.

Dissolves readily in the *Muriatic Acid*, with effervescence,

effervescence, and forms with it a crystallisable compound.

Dissolves also with still greater rapidity in the *Oxy-muriatic Acid* and *Aqua Regia*. These solutions remarkable for the property of giving a bright scarlet colour to the infusion of *Cochineal* and some other analogous substances. When united with *Oxy-muriatic Acid*, in the dry way, produces a colourless liquor strongly disposed to assume the gaseous form under the common pressure of the Atmosphere, *Smoking Liquor of Libavius*.

May be corroded by the continued application of the *Acetous Acid* in the form of vapour.

Capable of being acidified by a process similar to that used for the preparation of *Arsenic Acid*.

Is little affected, in the dry way, either by *Alkalis* or *Earths*, but decomposes the compounds of the former with the *Sulphuric Acid*. Detonates rapidly with *Nitre*; and decomposes *Muriate of Ammoniac*.

In the moist way, may be made to decompose *Nitrate of Copper* with an impetuosity productive of actual combustion.

May

Of Lin

Of the

May be united with all the other *Metals*, and in all proportions, occasioning in many of them an alteration in their malleability, fusibility, specific gravity, and hardness.

When melted with *Sulphur*, produces a dark striated compound, which if prepared by sublimation, is of a golden colour and spongy texture, *Aurum Musivum*.

May also be combined with *Phosphorus*.

Order of Attraction, in the moist way, *Sebacic Acid*, *Tartareous*, *Muriatic*, *Sulphuric*, *Oxalic*, *Arsenic*, *Phosphoric*, *Nitric*, *Succinic*, *Fluoric*, *Saccho-lactic*, *Citric*, *Formic*, *Lactic*, *Acetous*, *Boracic*, *Prussic*, *Potash*, *Ammoniac*; in the dry way, *Zinc*, *Mercury*, *Copper*, *Antimony*, *Gold*, *Silver*, *Lead*, *Iron*, *Manganese*, *Nickel*, *Arsenic*, *Platina*, *Bismuth*, *Cobalt*, *Alkaline Sulphurets*, *Sulphur*.

Employed in the composition of *Solder*, *Powder*, *Bell-metal*, *Printer's Types*, &c. in the construction of *Mirrors*, in *Tinning*, *Enamelling*, *Medicine*, &c.

The Semi-metals are, *Bismuth*, *Nickel*, *Arsenic*, *Cobalt*, *Zinc*, *Antimony*, *Manganese*, *Tungsten*, *Uranite*, *Molybdena*, and *Manachanite*.

Of Bismuth.

Found 1st. *Native*, 2d. in union with Oxygen, *Native Oxyd*, 3d. with Sulphur, *Sulphuret of Bismuth*.

Colour, *yellowish white*. — Specific gravity 9.822.

But little subject to tarnish. Melts at 460 *Farenh*.

In close vessels sublimes without alteration, and in cooling crytallizes into cubes.

If kept in fusion with access of *Air* is converted into a greenish grey *Oxyd*. — Heated to redness burns, with a small blue flame, and emits yellowish smoke, condensable into an *Oxyd* of a similar colour, (*Flowers of Bismuth*), which by increase of heat melts into a greenish *Glass*.

Dissolves most readily in the *Nitric Acid*, and furnishes a salt, which detonates readily when exposed to sudden *Heat*; and which may be decomposed by the affusion of *Water*, yielding a white *Oxyd*, (*Magistery of Bismuth*). It may also
be

Of Bismuth

of Bismuth

be decomposed by the *Alkalis* and *Alkaline Sulphurets*.

The precipitate by *Sulphuret of Ammoniac* of a similar appearance to that which it produces in solutions of *Lead*.

Deflagrates with *Nitre*, without detonation, and is converted into an *Oxyd*, which facilitates the fusion of the *Earthy Bodies*, and also of the other *metallic oxyds*; may therefore be used in place of *Lead* in the refinement of *Gold* and *Silver*.

Combines with most of the other *metallic Substances*, rendering them for the most part more fusible.

Unites easily with *Sulphur* into a bluish-grey striated compound.

Order of Attraction in the moist way, *Oxalic Acid*, *Arsenic*, *Tartareous*, *Phosphoric*, *Sulphuric*, *Sebacic*, *Muriatic*, *Nitric*, *Fluoric*, *Saccho-lactic*, *Succinic*, *Citric*, *Formic*, *Lactic*, *Acetous*, *Prussic*, *Carbonic*; *Ammoniac*; in the dry way, *Lead*, *Silver*, *Gold*, *Quicksilver*, *Antimony*, *Tin*, *Copper*, *Platina*, *Nickel*, *Iron*, *Zinc*, *Alkaline Sulphurets*, *Sulphur*.

Used

Used in the composition of *Pewter*, *Solder*, and *Printer's Types*, in *Affaying*, *Painting*, *Imitation of Silvering*, &c.

Of Nickel.

Found 1st. alloyed by Iron, *Native Nickel*; 2d. in combination with oxygen, *Native Oxyd*; 3d. with Iron, Arsenic, Cobalt and Sulphur, *Kupfer-Nickel*.

Difficult to obtain it pure.—Colour *reddish white*.—Specific gravity 7.88. *Hard*, somewhat *malleable*, *magnetical*. Very difficult of *fusion*.

Yields a green *Oxyd*, which communicates an hyacinthine tinge to *Glass*.

All its solutions of a green colour; that in the *Nitric Acid*, (in which it dissolves most readily) affords rhombic crystals, and like the others changes to a blue on the addition of *Ammoniac*.

Detonates, like most other metals, with *Nitre*.

Unites by fusion both with *Arsenic* and *Cobalt*.
Unites also by fusion with *Sulphur*.

Order of attraction, in the moist way, *Oxalic Acid*,

Of Bismuth

Of Nickel

The Regulus of Nickel obeys the Magnet as the Regulus of Iron, but it is a doubt whether this does not depend upon a certain proportion of Iron with which it is in almost an inseparable union, and Dr Babington has lately been informed by some of his Chemical Friends, that they have been able to separate the Iron so as to leave the Nickel without the power of obeying the Magnet —

of Nickel

of Arsenic

Acid, Muriatic, Sulphuric, Tartareous, Nitric, Sebacic, Phosphoric, Fluoric, Saccho-lactic, Succinic, Citric, Formic, Lactic, Acetous, Arsenic, Boracic, Prussic, Carbonic, Ammoniac; in the dry way, *Iron, Cobalt, Arsenic, Copper, Gold, Tin, Antimony, Platina, Bismuth, Lead, Silver, Zinc, Alkaline Sulphurets, Sulphur.*

This metallic substance not as yet applied to any use.

Of Arsenic.

Found 1st. alloyed by Iron, *Native Arsenic*; 2d. combined with Oxygen, *Native Oxyd*; 3d. with different proportions of Sulphur, *Realgar, Orpiment*; and 4th. with Sulphur, Iron and sometimes Silver, *Mispickel*.

Colour, *steel-grey*. Texture, *scaly*. Specific gravity 5.76. Much disposed to tarnish.

Volatile in close vessels at 356 of *Farenh.*

If exposed to *Air* under the heat of ignition, burns with a blue flame, and is converted into a white Oxyd (*Common white Arsenic.*)

This

This soluble in about 15 times its weight of boiling water.—Taste, *caustic*.—Less volatile than the *Regulus*.—Emits a garlic smell on the application of *Heat*.—*Vitreſcible*.—Promotes the fusion of *Earthy Bodies*. When melted with *Sulphur*, produces different shades of colour, according to the degree of *Heat*; hence artificial *Orpiment* and *Realgar*.—By treatment with the *Nitric Acid*, becomes more completely *oxygenated*, (vide page 23).—Decomposes *Nitre* in the dry way, producing a neutral cryſtallifiable ſalt, *Arsenical Salt of Macquer*.—If diſtilled with unctuous matter, reſumes the form of *Regulus*.

In its *metallic* ſtate, decomposes moſt of the *mi-neral acids*; the *nitric* moſt readily.

Unites with moſt of the other *Metals*; rendering brittle thoſe which are ductile, and in a remarkable manner increaſing the fuſibility of ſome, and diminiſhing that of others.

To the red and yellowiſh metals communicates a ſilvery whiteness.

Soluble in *Alkaline Sulphurets*. Soluble alſo in *Unctuous Oils*, with which it forms a conſiſtent mixture.

Moſt

Of Arsenic

Of Arsenic

If you wish to detect the presence of Arsenic in any substance, it will be easy from the Vapour and Garlic smell it gives out on being heated, also the bright silver colour it gives to Copper when heated upon it with a little grease and Charcoal, and you may also know it by its turning black upon being exposed to the Vapour of the Volatile Liver of Sulphur—

Of Cobalt

Most of the preparations of this metal in a high degree *noxious*, when ignorantly administered; the detection of their presence therefore often of great moment.

Order of attraction, in the moist way, *Muriatic Acid, Oxalic, Sulphuric, Nitric, Sebacic, Tartareous, Phosphoric, Fluoric, Saccho-lactic, Succinic, Citric, Formic, Lactic, Arsenic, Acetous and Prussic, Ammoniac, Unctuous Oils, Water*; in the dry way, *Nickel, Cobalt, Copper, Iron, Silver, Tin, Lead, Gold, Platina, Zinc, Antimony, Alkaline Sulphurets, Sulphur.*

Used principally in *Glass-making, Painting, and Medicine.*

Of Cobalt.

Found 1st. alloyed with Arsenic, *Grey Cobalt Ore*; 2d. united to Oxygen, *Native Oxyd*; 3d. to Arsenic Acid, *Cobalt Bloom*; 4th to Sulphur, *Sulphuret of Cobalt*; and 5th. to Arsenic, Iron, and Sulphur, *White Cobalt Ore.*

Colour, *light grey.* Specific gravity 7.811. *Compact, brittle.*

H

Fuses

Fuses with difficulty. When heated in contact with air, yields a brownish Oxyd, *Zaffre*, which fused with *Silex* produces a blue glass, *Smalt*.

Dissolves with more or less facility in several acids; most easily in the *Nitric Acid*.

With the *Muriatic* and *Oxy-muriatic Acids* forms compounds, the reddish solutions of which, as often as exposed to heat, change to a beautiful green, *Sympathetic Ink*.

Detonates feebly with *Nitre*.

Unites by fusion with most of the other *Metals*.

Combines difficultly with *Sulphur*; more readily with *Alkaline Sulphurets*.

Its *Oxyd* soluble in *Ammoniac*.

Order of Attraction, in the moist way, *Oxalic Acid*, *Muriatic*, *Sulphuric*, *Tartareous*, *Nitric*, *Sebacic*, *Phosphoric*, *Fluoric*, *Saccho-lactic*, *Succinic*, *Citric*, *Formic*, *Lactic*, *Acetous*, *Arsenic*, *Boracic*, *Prussic*, *Carbonic*, *Ammoniac*; in the dry way, *Iron*, *Nickel*, *Arsenic*, *Copper*, *Gold*, *Platina*, *Tin*, *Antimony*, *Zinc*, *Alkaline Sulphurets*, *Sulphur*.

Used

Of Cobalt

Of Cobalt

Of Zinc

Used to colour *Glass*, in *Glazing*, *Enamelling*,
Painting, *Washing*, &c.

Of Zinc.

Found 1st. in combination with Oxygen, Oxyd
of Iron, Silex, and Alumine, *Calamine*; 2d.
with Carbonic Acid, Water, Silex and Iron, *Car-*
bonate of Zinc; and 3d. with Sulphuric Acid and
Water, *Sulphate of Zinc*.

Requires for its reduction to be treated in close
vessels.

Colour, *bluish-white*. Specific gravity 7,190.

Somewhat *malleable*. Texture *laminated*.

When heated is easily pulverised; and like
iron is capable of decomposing *Water*. Melts at
about 700 of *Farenh*.

In contact with air, burns soon after ignition,
with a brilliant flame, and furnishes a white
flocculent Oxyd (*Flores Zinci* P. L.), convertible
by an increase of heat into a yellowish *Glass*.

Is readily acted on by Acids. During its
solution in the *Sulphuric* and *Muriatic* Acids, Hy-

H 2

drogen

drogen Gas is evolved. Produces with the former Acid, a styptic crySTALLIFABLE salt.

May be precipitated from its solutions by *Earths* and *Alkalis*.

Decomposes, in the dry way, *Sulphate of Potash* and many other compounded salts. Detonates violently with *Nitre*. By simple trituration decomposes *Muriate of Ammoniac*. Is also capable of precipitating *Alum*, in the moist way.

Unites with all the other metallic substances except *Bismuth*; giving to *Copper* additional elasticity, durability, and hardness.

In its *metallic form* cannot be combined with *Sulphur*; but when *oxydated* unites readily with it.

Order of Attraction, in the moist way, *Oxalic Acid*, *Sulphuric*, *Muriatic*, *Saccho-lactic*, *Nitric*, *Sebacic*, *Tartareous*, *Phosphoric*, *Citric*, *Succinic*, *Fluoric*, *Arsenic*, *Formic*, *Lactic*, *Acetous*, *Boracic*, *Prussic* and *Carbonic*, *Ammoniac*; in the dry way, *Copper*, *Antimony*, *Tin*, *Quicksilver*, *Silver*, *Gold*, *Cobalt*, *Arsenic*, *Platina*, *Bismuth*, *Lead*, *Nickel*, *Iron*.

Used in the Composition of brass Pinchbeck.
and in Painting and medicine. Of

of Zinc

of Antimony

Of Antimony.

Found 1st. *Native*; 2d. alloyed with Arsenic, *Native Arsenical Antimony*; 3d. in union with Oxygen, *Native Oxyd*; 4th. with Muriatic Acid, *Muriate of Antimony*; 5th. with Arsenic Acid and Sulphur, *Red Antimonial Ore*; 6th. with Sulphur only, *Grey Antimonial Ore*; and 7th. with Iron, Arsenic, Sulphur, and sometimes Silver, *Plumose Antimonial Ore*.

Colour *silvery white*. Specific gravity 6.702. Texture *laminated*. *Very brittle*.

Melts soon after ignition. Is volatile in close vessels. When heated in contact with *Air*, is converted into a light white *Oxyd*, *Argentine Flowers of Antimony*, which are soluble in *Water*, and fusible into an *Hyacinthine Glass*.

Decomposes both the *Sulphuric* and *Nitric Acids*, the former with, the latter without, the assistance of *Heat*. Requires digestion for its solution in the *Muriatic Acid*; but in the *Oxy-muriatic* dissolves with great facility.

Decomposes, in the dry way, most of the sa-

line compounds of the *Sulphuric Acid*. Detonates readily with *Nitre*; and decomposes *Muriate of Quicksilver*.

Combines with most other *Metals*.

Unites with *Sulphur* in all proportions, and forms with it a grey striated compound, *Antimony of the shops*.

This when exposed for a continuance to low heat, yields a grey *Oxyd*, which by fusion is converted into a yellowish *Glass* (*Vitrum Antimonii* P. E.)

If roasted with *Hartshorn*, and afterwards ignited, yields a white *Oxyd*, (*Pulvis Antimonialis* P. L. *Antimonium Calcareo-Phosphoratum* P. E.).

When deflagrated with *Nitre*, is more or less decomposed according to the degree of combustion, (*Antimonium Calcinatum* P. L. *Antimonium ustum cum Nitro* P. E. *Crocus Antimonii* P. L. and P. E.)

Reduced to powder and boiled in a solution of *Potash*, deposits, on cooling, an orange coloured precipitate (*Kermes Mineralis Pb. Suec.*); on the addition of the *Sulphuric Acid* to the solution whilst hot, a brownish red precipitate, (*Sulphur Antimonii præcipitatum* P. L. and P. E.)

A mixture

Of Antimony

Of Antimony

A mixture of *Crocus* of *Antimony* and common *Salt*, with the addition of *Sulphuric Acid*, produces, by distillation, a butyraceous compound (*Antimonium Muriatum* P. L. and P. E.), which on the affusion of common water, or by the addition of Potash, furnishes a white oxyd; *Powder of Algaroth*. The combination of this with acidulous Tartrate of Potash, forms a triple salt, (*Antimonium Tartarifatum* P. E.) Other Antimonial Oxyds give a similar preparation, (*Antimonium Tartarifatum* P. L.)

Order of Attraction, in the moist way, *Sebacic Acid*, *Muriatic*, *Oxalic*, *Sulphuric*, *Nitric*, *Tartareous*, *Saccho-lactic*, *Phosphoric*, *Citric*, *Succinic*, *Fluoric*, *Arsenic*, *Formic*, *Lactic*, *Acetous*, *Boracic*, *Prussic* and *Carbonic*; in the dry way, *Iron*, *Copper*, *Tin*, *Lead*, *Nickel*, *Silver*, *Bismuth*, *Zinc*, *Gold*, *Platina*, *Quicksilver*, *Arsenic*, *Cobalt*, *Alkaline Sulphurets*, *Sulphur*.

Used in the composition of *Types*, in *Medicine*, &c.

Of Manganese.

Found, 1st. *Native*; 2d. in union with Oxygen, *Native Oxyd*; and 3d. with Oxygen, Silica, Iron, and Alumina, *Siliceous Manganese*.

Colour, *dull white*. Texture *granular*. Specific gravity 6.850. *Hard*. *Brittle*.

Extremely difficult to fuse; but very easily oxydated.

Soluble in the diluted *Sulphuric*, in the *Nitric*, *Muriatic*, and several other acids.

In the state of *Oxyd*, occasions in the *Muriatic Acid* a striking change of properties, by imparting to it a portion of its Oxygen. Vide page 18.

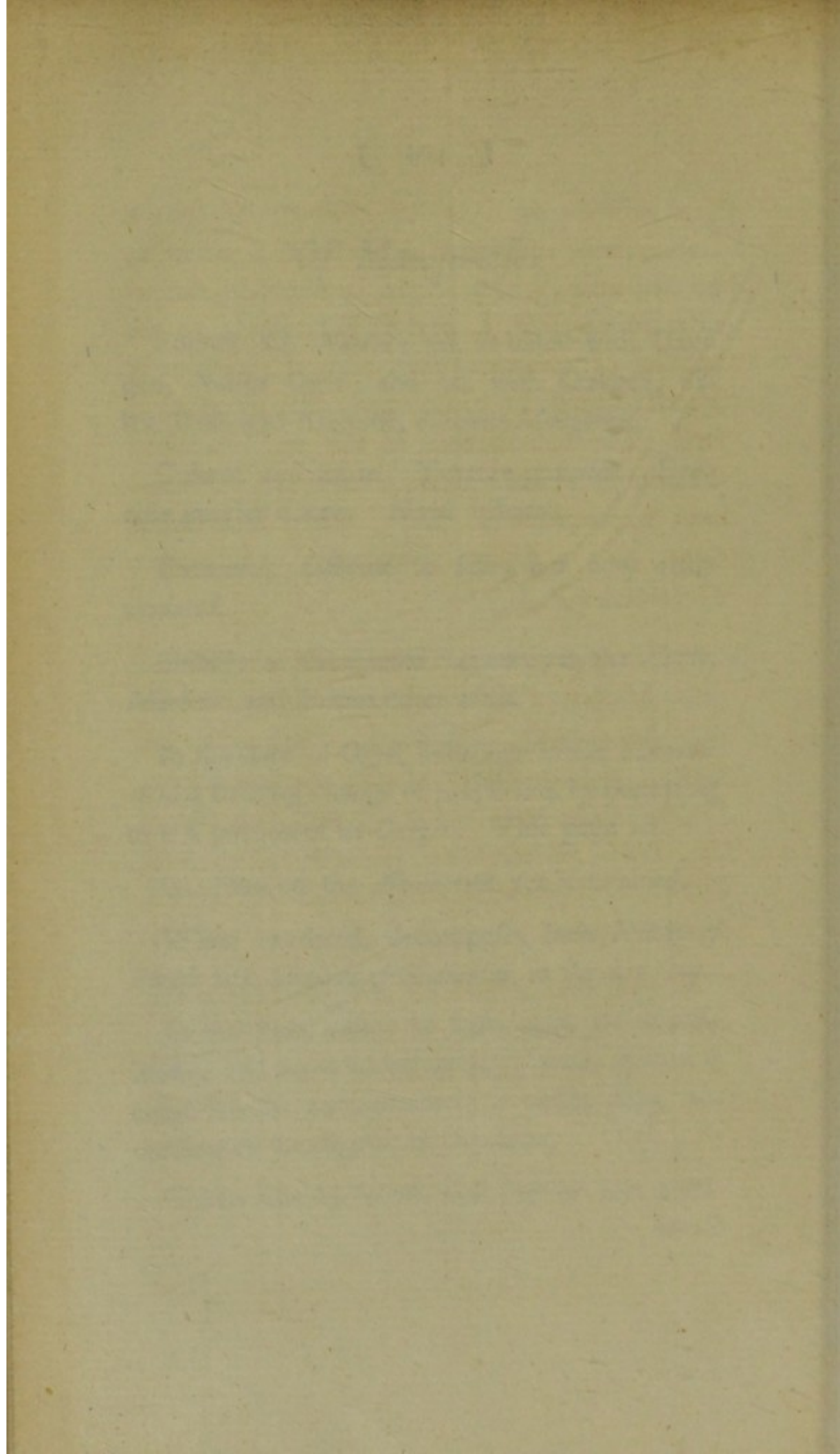
Its action on the *Alkalis* not yet ascertained.

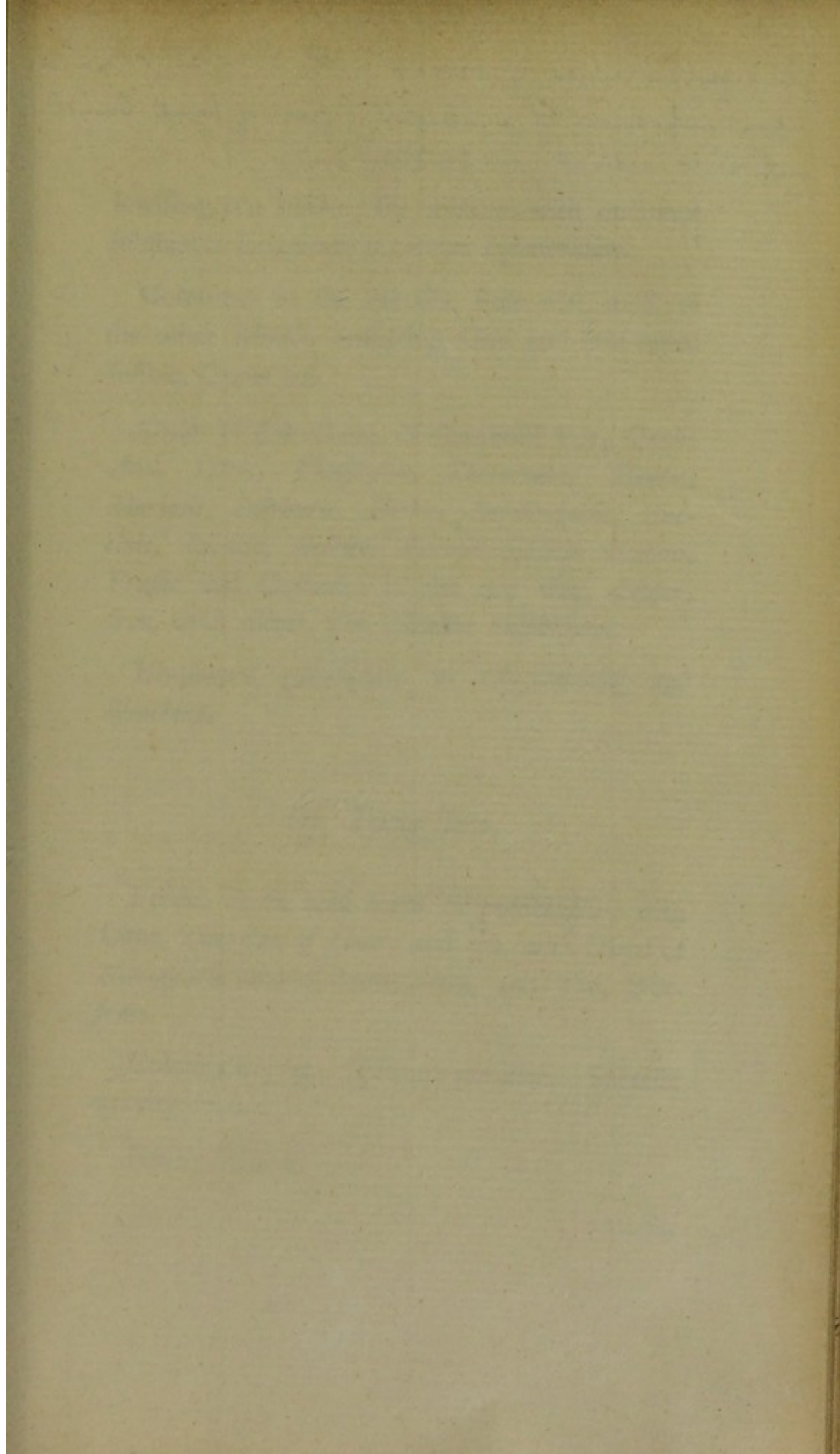
When oxydated, decomposes both *Nitrate of Potash* and *Muriate of Ammoniac*, in the dry way.

In this state, unites by fusion with the *Earthy Bodies*, and when added to *Glass*, either renders it colourless or communicates a violet tinge, according to the degree of *Oxydation*.

Unites also, by fusion, with *Sulphur*, into a yellowish

Of manganese





Of Manganese

The lighter oxides if mixed with Linseed Oil, will
upon exposure to a slight degree of heat burst
out into actual combustion —

Of Limestone

lowish-green mass. By mixture with unctuous substances sometimes occasions *Inflammation*.

Combines in the metallic state with most of the other *Metals*, rendering *Gold* and *Iron* more fusible, *Copper* less.

Order of Attraction, in the moist way, *Oxalic Acid*, *Citric*, *Phosphoric*, *Tartareous*, *Fluoric*, *Muriatic*, *Sulphuric*, *Nitric*, *Saccho-lactic*, *Succinic*, *Sebacic*, *Arsenic*, *Formic*, *Lactic*, *Acetous*, *Prussic* and *Carbonic*; in the dry way, *Copper*, *Iron*, *Gold*, *Silver*, *Tin*, *Alkaline Sulphurets*.

Employed principally in *Glass-making* and *Bleaching*.

Of Tungsten.

Found in an acid form in combination with *Lime*, *Tungstate of Lime*; and 2d. with Oxyd of *Manganese* and of *Iron*, *Silex*, and *Tin*, *Wolfram*.

Colour *steel grey*. Texture *granular*. Specific gravity 17.6.

Nearly *infusible*.

Yields

Yields a yellow Oxyd.

Insoluble in the *Sulphuric, Nitric, Muriatic, and Oxy-muriatic Acids.*

Combines with the other *Metals.* Does not lessen the ductility of *Silver* or *Copper*; but renders *Iron, Tin, Bismuth, Antimony, and Manganese* harder.

Order of Attraction, in the moist way, *Lime, Potash, Ammoniac*; in the dry way, *Potash, Lime, Iron, Manganese.*

Not as yet applied to any use.

Of Uranite.

Found 1st. united to Carbonic Acid and a little Copper, *Calcolite*; and 2d. to Sulphur, *Pick Blende.*

Has not as yet been perfectly *metallised.*

Of Molybdena.

Found in an acid form in combination with *Sulphur.*

Colour

Of Tungsten

Of Uranite

Of Molybdena

Of molybdena

Of manachanite

Colour *grey*. Specific gravity not ascertained. *Brittle*.

Less fusible than either *Platina* or *Manganese*.

Yields a white *oxyd* when heated in contact with *Air*, or digested in *Nitric Acid*, or deflagrated with *Nitre*.

When combined with *Iron*, *Copper*, and *Silver*, renders them friable.

In union with *Sulphur* regenerates *Sulphuret of Molybdena*.

Order of Attraction unknown.

Not yet applied to any use.

Of Manachanite.

Found either amorphous, or in grains of a *grey* colour, *ponderous* and attractable by the *Magnet*.

Supposed to contain a *Metal* of a particular kind.

OF INFLAMMABLE SUBSTANCES.

These, such as are more especially remarkable for exhibiting the phenomenon of *Combustion*, when heated to a certain degree in contact with *Air*.

The changes produced on the *Air* in this process, and the alteration which the *inflammable Substances* themselves undergo, already particularly treated of. Vide page 7.

In their *Form, Consistence, Weight, Volatility, &c.* the substances of this class differ widely from each other. They are comparatively *lighter* than most other bodies.

The principal mineral inflammable substances are, *Hydrogen Gas*, (vide page 11.) *Bituminous Bodies, Amber, Sulphur, Plumbago*, and the *Diamond*.

Of Bituminous Bodies.

Found either liquid and devoid of colour, *Naphtha*; or more or less liquid and of a dark colour, *Petroleum, Barbadoes Tar*; ^{or less liquid than this matter} or solid, black, and

Of Inflammable Substances

These are either simple or compound. Some of them emit light and heat in Oxygen, in this case there is no decomposition of the substance but an absorption of Oxygen. When they go into combustion they are decomposed and lose part of their substance. —

The simple inflammable substances are, Hydrogen Gas, Phosphorous, Sulphur, Charcoal, Phosphor.

Of Bituminous Bodies

Coal has such an analogy to Charcoal, and it is supposed that all Coal has its origin from wood, but the great quantity that has been found makes it appear difficult to account in what manner the wood got collected —

You may know the goodness of Coal by mixing with it a quantity of Nitre, and that which burns with the greatest rapidity with the smallest quantity of Nitre is the best —

Of Bituminous Bodies

Of Amber

and of a compact or flaty texture, *Asphaltum*, *Jet*, *Coal*.

The principle of *Inflammability* apparently the same in all, the more liquid being, by continued exposure to *Air*, convertible into the more consistent, and all yielding similar products in distillation. In the different kinds of *Coal* there exists more or less *earthy* admixture, and often *Iron Pyrites*.

The *bituminous* bodies immiscible with *Water* and insoluble in *Spirit of Wine*.

They appear from a variety of circumstances to be of *vegetable* origin.

Of Amber.

Found for the most part in irregular masses more or less transparent, and of a brownish or yellowish colour.—Specific gravity from 1.055 to 1.000. Emits a peculiar odour on friction and becomes *electric*. Melts at 550 *Farenheit*. Burns with a whitish flame. In distillation yields *Water*, *Empyreumatic Oil*, (*Oleum Succini* P. L.) and a concrete *Acid*, (*Sal Succini* P. L.) Vide page 22.

Insoluble

Insoluble in *Water* and nearly so in *Spirit of Wine*, also in all the acids, the *Sulphuric Acid* excepted, in the solutions of the *Alkalis*, and in *essential* and *expressed Oils*; but the *Balsams* dissolve it readily.

Of the methods usually employed for rendering *Amber* transparent.

This substance also, probably of *vegetable* origin.

Of Sulphur.

Found either uncombined, or deposited by water, or sublimed by subterranean fire, *Native Sulphur*; or in combination with other bodies, more especially with different *Metals*.

May be obtained artificially by the decomposition of *Sulphuric Acid*.

Colour, *pale Yellow*.—Specific gravity 2.033. *Hard, brittle, insipid, insoluble*. Very easily melted. Sublimes in close vessels into light yellow flowers, (*Flores Sulphuris* P. L.)

Burns with a blue flame, and by absorbing *Oxygen* from the Air, is converted into *Sulphureous*

Of Amber

Amberose appears nearly allied to Amber, it is insoluble in Water, but soluble in about 12 times its quantity of Alcohol, and is entirely soluble in other essential Oils &c. Its origin is not known, but it is supposed to be the Excrement of a Species of Whale

Of Sulphur

Of Pulpit

ous Acid Gas, Sulphureous or Sulphuric Acid, according to the proportion of this principle.—Similar effects are produced on it by deflagration with *Nitre*.

Is little affected by *Acids*.

Unites readily with the *Alkalis*, and also with the *saline Earths*, producing liver-coloured compounds (*Sulphuret of Potash*, &c.) which are soluble in *Water*, and may be decomposed by all the *Acids* (*Sulphur præcipitatum* P. L.).

When intimately mixed with certain proportions of *Potash* and *Nitre*, produces a compound which when gradually exposed to heat explodes with great violence (*Pulvis fulminans*).

With *Nitre* and *Charcoal*, in mixture, it constitutes *common Gunpowder*.

Combines by fusion with all the metals except *Platina, Gold, and Zinc.*

Is insoluble in *Spirit of Wine*, but unites with *oily* matter of every kind, and with all the liquid *bituminous* bodies, into compounds of increased consistence (*Balsams of Sulphur*).

Order of Attraction; in the moist way, *Lead,*
 6 *Tin,*

Tin, Silver, Quicksilver, Arsenic, Antimony, Iron, Potash, Ammoniac, Baryt, Lime, Magnesia, unctuous Oils, essential Oils, Æther, Spirit; in the dry way, Potash, Soda, Iron, Copper, Tin, Lead, Silver, Cobalt, Nickel, Bismuth, Antimony, Quicksilver, Arsenic.

Employed principally in *Bleaching*, in the manufacture of *Sulphuric Acid*, and of *Gunpowder*, frequently also in *Medicine*.

Of Plumbago.

Found in different parts of the world, of different degrees of purity.

Colour, *blackish-blue*.—Feel, *unctuous*. Texture, *granular* or *compact*.—Specific gravity 2.00.

Insoluble in *Water*, and unalterable on exposure to *Air*.

When ignited in contact with this fluid, undergoes *slow Combustion*, leaving behind only a small portion of *Oxyd* of *Iron*.

In close vessels it suffers no change.

It decomposes *Sulphuric Acid* by the assistance of

Of Sulphur

Of Plumbago

Of Plumbago

Of the Diamond

The Diamond has Chemical properties Analogous
to Charcoal —

of heat, but is insoluble either in the *Nitric* or *Muriatic Acid*, yet dissolves in the *Oxy-muriatic Acid*, and on deflagration with *Nitre*, produces *Corbonate of Potash*.

From these and other circumstances, considered as analogous to *Charcoal*.

Used in the manufacture of *Pencils*, *Razor-strops*, *Crucibles* and other chemical vessels, in polishing *Shot*, defending the surface of *Iron* from rust, lessening the friction in mill-work, &c.

Of the Diamond.

Found principally in certain parts of India, in crystals of different colours and sizes.

Figure of its crystals *octohedral*. Specific gravity, 3.521. Hardness greater than that of any other body.

Ascertained, by various experiments, to be capable of *Combustion*, but only in the most intense heats.

The *Sulphuric Acid* the only menstruum that has any effect on this gem.

Valued chiefly on account of its *Splendour* and *Durability*.

The principal vegetable inflammable substances are, *Alcohol*, *Essential Oils*, *Balsams*, *Resins*, *Expressed Oils*, *Camphor*, *Charcoal*.

Of Spirit of Wine (Alcohol).

Obtained from such substances as have undergone the *Vinous Fermentation*, of which those containing *saccharine Matter* are alone susceptible. This process materially influenced by *Rest*, *Dilution*, *Temperature*, and *Exposure to Air*.

Repeated distillation and digestion on *Potash*, necessary to bring this fluid to its ultimate degree of purity.

When pure *colourless* and *transparent*.

Taste *hot* and *pungent*. Specific gravity 0.817.

Miscible with *Water* in all proportions.

Burns with a bluish flame, producing in combustion *Carbonic Acid Gas* and *Water*.

Undergoes

Of the Diamond

Of Alcohol

In the purification of Sp^r of Wine the best method is to mix with it a quantity of common Alum, and then to proceed to Distillation as before —

Sp^r of Wine or pure Alcohol contains 98 parts of Oxygen, 30 of Carbone and 10 of Hydrogen. —

If pure and mixed with Gunpowder and set fire to it burns first and when all evaporated the Powder explodes. —

To detect the presence of Lead in Wines drop the following solution into any quantity when you will have a copious precipitate, Sulphuret of Lime q^r 10 Cream Tart q^r 20 Acq font 3j This solution ought to be made at the time you are using it. —

Of Alcohol

Ather is composed of the very same materials as Spirits of Wine, but united in different proportions. Water will dissolve about one tenth of Ather. Ather is decomposed in the oxy muriatic Gas, and is a very beautiful experiment. If a solution of Gold be added to Ather it is decomposed, and the acid falls to the bottom colourless, while the gold is held in solution in the Ather and if this is laid upon a metal the Ather will be decomposed and a layer of gold will cover its surface.

Of Essential Oils

These oils possess the same Odour as the Vegetable we get them from. —

By long keeping and exposure to the Air they lose some of their distinguishing properties, as Colour, smell, & consistence are changed, they becoming insipidous and thicker. —

These are sometimes contaminated with oil of Turpentine and unctuous oils, the way to know this is to drop them into Spr of Wine, when the liquor will become turbid if either of these unctuous oils are in, the oil of Turpentine being one

Undergoes singular changes in its properties by treatment with the different *Acids*; hence the preparation of *Æthers*, *Oleum Vini*, &c.

Diffolves the *Alkalis*, and many of the *compounded neutral Salts*, particularly such as are deliquescent. Also diffolves *Soap*, and acts readily as a solvent on *Essential-Oils* and *Resins*, on *Balsams* and on *Camphor*; hence the preparation of various *Spirituos Liquors*, *Tinctures*, *Varnishes*, &c.

Considered by *Mr. Lavoisier* and others, as a compound of *Hydrogen*, *Carbon*, and *Oxygen*, produced by the decomposition of the sugar, in the act of *Fermentation*.

Order of Attraction, *Water*, *Æther*, *Essential Oils*, *Ammoniac*, *Potash*, *Alkaline Sulphurets*, *Sulphur*.

In general use for various *technical* as well as *dietetical* and *medical* purposes.

Of Essential Oils.

Obtained from most fragrant vegetables, by expression, or distillation with *Water*.

Taste *pungent*. Odour, colour, and consistence, *various*. Most of them lighter, some few heavier than *Water*. *as Al-Sassafras &c.*

Thicken and become inodorous when exposed to *Air*. *By absorbing Oxygen -*

Sparingly soluble in *Water*; but readily so in *Spirit*.

Volatile in close vessels, without decomposition, but highly *inflammable* when heated in contact with *Air*.

Decompose the stronger *Acids*; in some instances with such rapidity as to occasion actual *Combustion*.

May be united with the *Alkalis* and *Lime* so as to form *Soaps*.

Combine intimately with *Sulphur*.

Combine also with *Phosphorus*, *Unctuous Oils*, and *Camphor*.

Purity ascertained by solution in *Spirit*, or exposure to *Heat*.

Nature of their composition not yet thoroughly investigated; but supposed to be compounds of *Carbon* and *Hydrogen*.

Of

Of Essential Oils

essential oil does not produce this effect, but its presence may be known by the smell, or by dropping them on paper and holding them above a candle, if only essential oil the paper is not greasy after the evaporation, but if containing mucious oil it will appear stained greasy.

Of Balsams and Resins

Of Unctuous Oils

Of Balsams and Resins.

These also vegetable products, differing from each other principally in respect to consistence.

In most of their properties, they are analogous to the foregoing, which assume these forms when combined with different portions of *Oxygen*.

Of these and the *Essential Oils* the uses various.

Of Unctuous Oils.

Obtained, sometimes by boiling, but mostly by pressure, from certain *Fruits, Kernels, Pippins, and emulsive Seeds.*

Insipid. Inodorous. Unctuous. Colour and consistence various. Specifically lighter than *Water*.

Insoluble both in *Water* and *Spirit*.

Become rancid and more consistent, on exposure to *Air*, apparently by the absorption of *Oxygen*.

Yield, by distillation in close vessels, an acid

Phlegm, a lighter and a denser *Oil*, a large quantity of *Hydrogen Gas* mixed with *Carbonic Acid Gas*, and leave behind a small proportion of *Charcoal*.

Afford *Water* and *Carbonic Acid Gas* by inflammation in contact with *Air*.

By mixture with the stronger *Acids*, produce, in some instances, *saponaceous Compounds*; in others, occasion *Combustion*.

Unite more perfectly with the *Alkalis*, more especially with *Potash* and *Soda*; with the latter, form common *Soap*.

Unite also into saponaceous compounds with *Baryt*, *Lime*, and *Magnesia*.

Have no action on any of the *Metals* except *Copper* and *Iron*, but assisted by heat dissolve most of the *metallic Oxyds*, and when separated again from these, are found to be soluble in spirit of wine.

Form with *Sulphur* a brownish red fluid of a disagreeable smell (*Balsamum Sulphuris* P. L.) Combine also by the assistance of heat, with most of the *Bituminous Bodies*.

Considered as differing principally from the *Essential Oils*, in containing different portions of *Mucilage*.

Employed

Of unctuous Oils

Of Unctuous Oils

Of Camphor

Camphor burns upon the contact of flame, but does not when applied to a red heat, it all flying off in vapour. —

Employed in *Painting*, *Varnishing*, *Soap-making*,
in *Mechanics*, for *Fuel*, in *Diet*, *Medicine*, &c.

Of Camphor.

Obtained by distillation with water, from a particular species of laurel, (*Laur. Camph. Lin.*) and some other vegetables.

Requires the addition of a small quantity of *Lime*, in its subsequent refinement by sublimation.

White. Transparent. Friable. Taste pungent and bitterish. Specifically lighter than Water.

Evaporates completely if kept exposed to the air.

Burns with a white flame, and is entirely consumed.

Sparingly soluble in *Water*; but readily so in *Spirit of Wine*, and *Æthers*, in *Unctuous* and *Essential Oils*.

Dissolves both in the *Sulphuric* and *Nitric Acid*, without decomposition; by repeated distillation with the latter, is converted into a peculiar *Acid*.
Vide page 36.

Chiefly employed in medicine.

Of Charcoal.

Obtained from *Vegetable, Animal, and Bituminous* substances, by incomplete combustion, or by the application of heat in close vessels.

Varies in its form, quantity, and purity, according to the nature of the substance from which it is prepared.

The charcoal of common wood, *black, light, brittle, sonorous, insipid, inodorous*, and of great *durability*.

Capable of sustaining the most intense degrees of *Heat* in close vessels, without alteration; but upon access of *Air*, burns with a white flame, and yields *Carbonic Acid Gas*, leaving behind a small quantity of *earthy saline Ashes*.

Decomposes the *Sulphuric Acid* and all its compounds, by the assistance of *Heat*.

Decomposes also the *Nitric Acid* without *Heat*, and sometimes with such rapidity as to occasion *Combustion*. Detonates with *Nitre*.

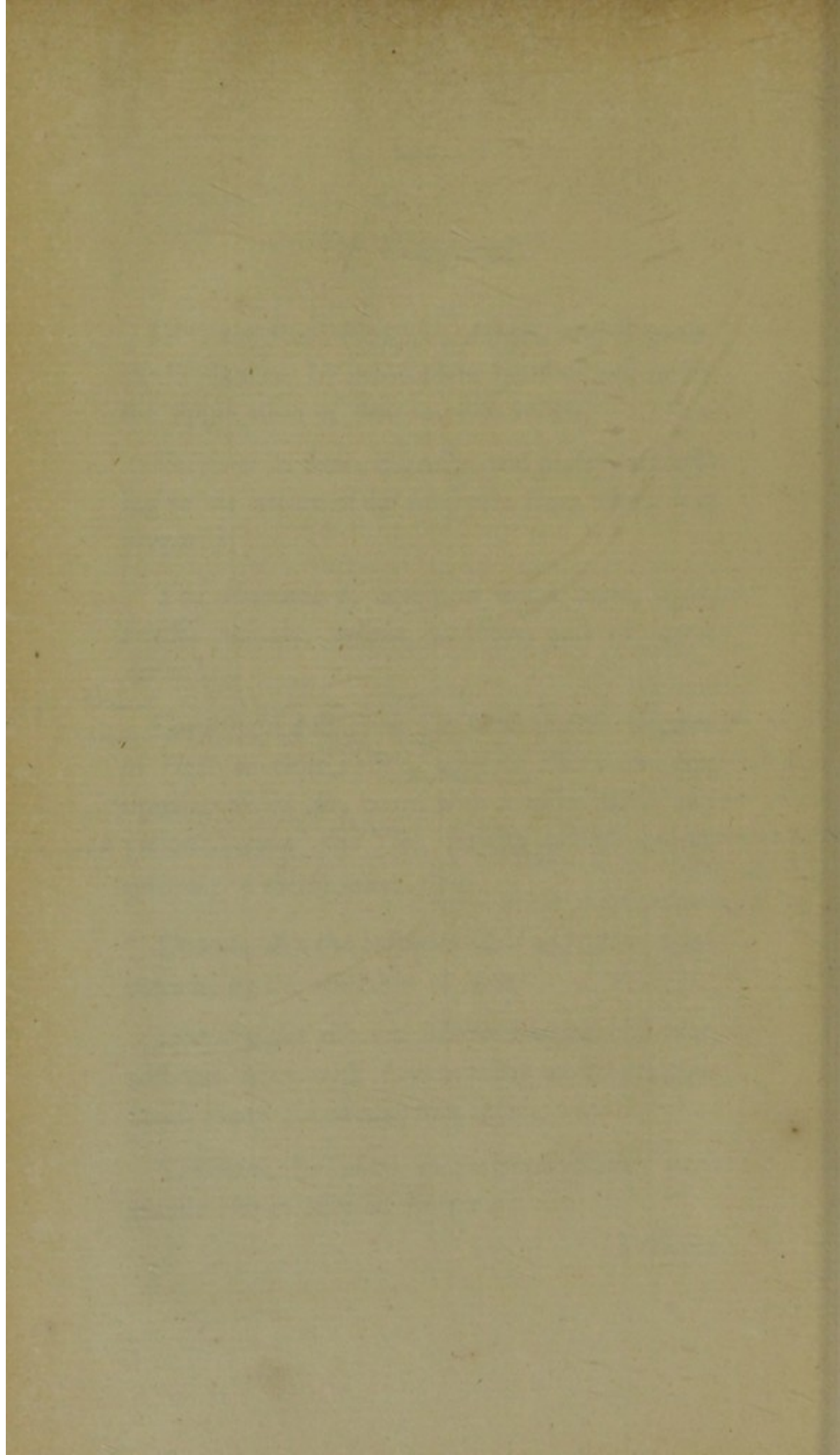
Dissolves, by fusion, in the *fixed Alkalis*; very readily also in *Alkaline Sulphurets*.

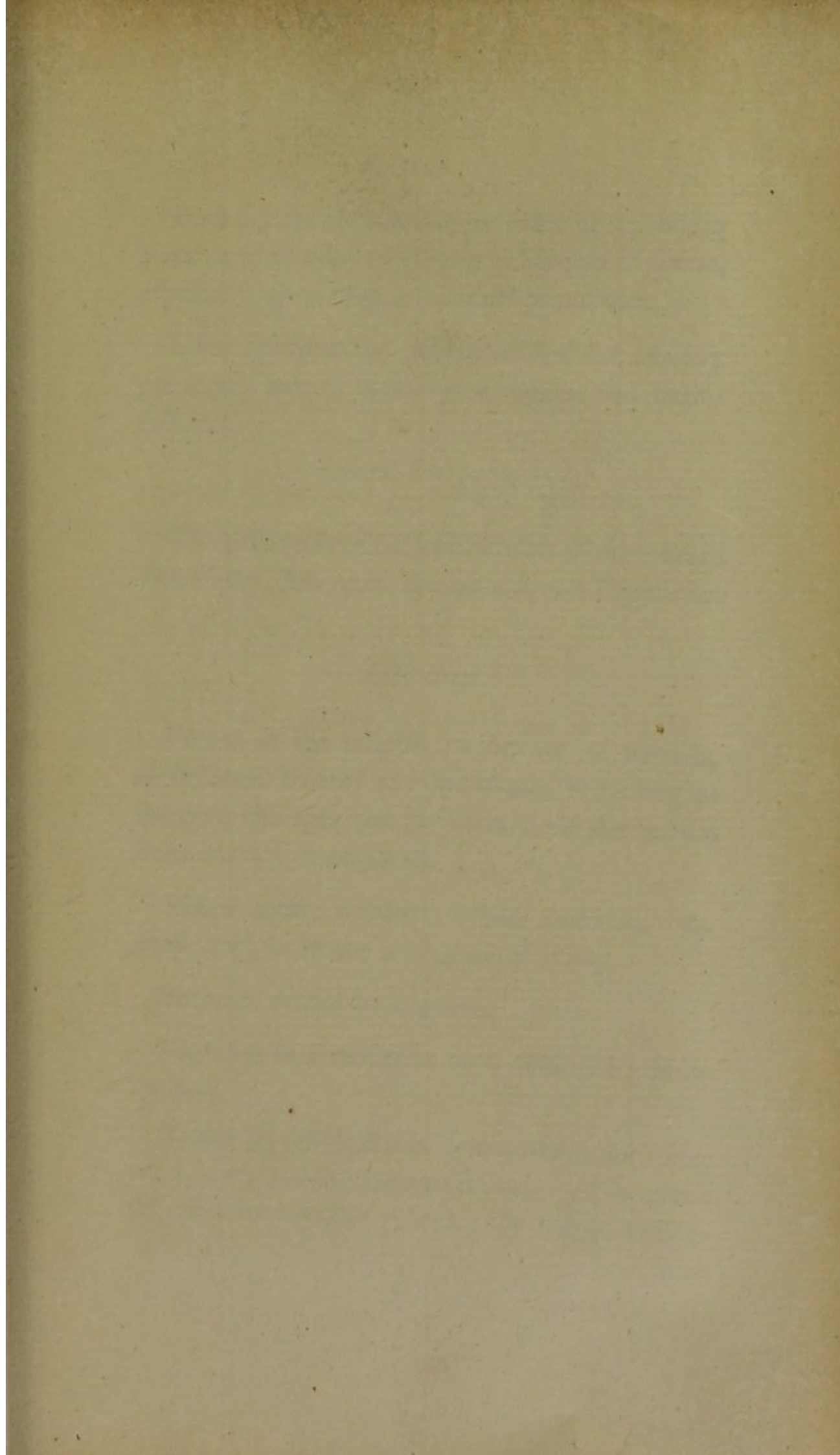
Possesses

Of Charcoal

It is one of the worst conductors of heat we know of, and has been proposed to be used to coat furnaces with in chemical processes. —

Charcoal is found in its purest form in the Diamond and by combustion the Diamond may be wholly formed into Carbonic Acid Gas. —





Of Charcoal

Of Heat

Possesses the remarkable property of correcting *Fætor*, and of depriving many substances of *Colour*, especially when used in its fresh-burnt state.

Used chiefly as an article of *Fuel* for culinary purposes, and in certain arts, trades, and manufactures.

The principal animal inflammable substances are *Fat*, *Butter*, *Bees-wax*, *Sperma-ceti*, and *Phosphorus*.

Of Fat.

Found in the adipose membrane of animals, of different colours and consistence according to the part, the age, and the species, of the animal from which it is obtained.

When fresh, *unctuous*, *insipid*, *inodorous*. *Insoluble* both in *Water* and *Spirit of Wine*.

Becomes rancid by keeping.

Liquifies in a moderate heat, and congeals by cooling.

Yields by distillation in a water-bath, an *Aqueous Liquor*, which contains *Mucus*, and is much disposed to become putrid. By simple distillation

tion affords a peculiar *Acid* (vide page 41), an *Oil* partly liquid and partly concrete, and leaves a small proportion of *Charcoal*.

Burns readily in contact with *Air*.

Forms saponaceous compounds with the stronger *Acids*, *Alkalis*, and *Lime*.

Acts on *Lead*, *Copper*, and *Iron*, in their metallic form, and on the *Oxyds* of these and most of the other *Metals*.

Combines in all proportions, as well with the *Essential* as with the *Unctuous Oils*.

Combines also intimately with *Sulphur*.

Considered as differing from *Unctuous Oils*, principally, in the peculiar *Acid* which it yields.

Uses nearly the same.

Of Butter.

Collected from milk after the spontaneous separation of its constituent parts.

Differs in no material respect from the foregoing, either in its properties or uses.

Of

Of Fat

Of Butter

Of Bees-Wax

Lac very much resembles Wax, and it is repositied
by Insects on the baws of plants, in other Countries. —

Of Pherma-ceti

Of Bees-Wax.

Deposited by the *Bee* in the construction of the *Honey-comb*. Colour *yellow*. Taste *insipid*. Insoluble in *Water*.

Becomes white on exposure to *Air*, or treatment with the *Oxy-muriatic Acid*. *Gas*.

Yields in distillation an *acid Phlegm*, a *Butyraceous Oil*, and a small quantity of *Charcoal*.

Unites with the *Alkalis* and forms *Soap*.

Combines in all proportions with *Oils*, *Resins*, and *Fat*; hence the preparation of several *Cerates*, *Ointments*, and *Plaisters*.

Employed also in several of the arts, but principally in making *Wax candles*.

Of Sperma-ceti.

Obtained from the brain of a particular species of whale, (*Cetus dentatus* Lin.) thence called the *Sperma-ceti* whale; obtained also in small quantity from the oil of the same fish, and from the oil of some other fish.

After

After refinement, *white, semitransparent, crystalline, friable, insipid, inodorous, insoluble in Water.*

Changes colour and becomes rancid by keeping.

Little altered by distillation, nor easily acted upon by *Acids* or *Alkalis*.

Combines in all proportions with *Sulphur*; also with *Unctuous* and *Essential Oils*, *Resins* and *Animal Fat*, like the foregoing.

Supposed to have the same relation to *Unctuous Oils* that *Camphor* has to the *Essential*.

Used chiefly for making *Sperma-ceti* candles, and in the composition of *Ointments*, *Plaisters*, *Medicine* &c.

Of Phosphorus.

Obtained, by decomposing calcined *Bones* by means of diluted *Sulphuric Acid*, evaporating the supernatant liquor to the consistence of a syrup, mixing it with powdered *Charcoal*, and distilling in the open fire; or by adding *Nitrate* or *Acetite* of
Lead

Of Phosphorus

Under a slow Combustion Phosphorous Acid is formed, while under a rapid one the Phosphoric Acid.

It is not dissolved in water altho a small quantity of it may be held in solution in water. It may be dissolved in Essential Oils and Ether. Alcohol also dissolves it, and when the solution is dropped into water it makes the water appear luminous. It may be dissolved by

Others of the gases without undergoing combustion. If you put Phosphorus in a bottle and cover it with lime and stopp it closely, and apply a slight degree of heat, it will light matches when rubbed upon it. Phosphate of lime when dropped into water forms the Phosphoric Hydrogen Gas, which no sooner comes in contact with the air than it takes fire and detonates.

Of Phosphorus
By striking Phosphorus and Nitrate of lead, which is
on Silver together with a hammer, a violent detonation
takes place. —

Lead to common *Urine*, collecting the precipitate, mixing this with *Charcoal* and distilling as above.

Purified by cautious re-distillation, or straining it, when melted, through leather.

Colour *pearly-white*. *Semitransparent*. *Waxy*.
Insoluble in *Water*. *Very fusible*.

When exposed to air, at a low temperature, emits a white fume, and is luminous in the dark; if heated, burns with great rapidity; and in both cases acquires acid properties. Vide page 37.

Decomposes the *Nitric Acid*, occasioning combustion by the sudden separation of its *Oxygen*.

By treatment with the *fixed Alkalis* or *Lime*, yields a permanently elastic fluid, which explodes on admission of *Air* (*Phosphoric Gas*).

Dissolves in *Essential* and *Unctuous Oils*, *Spirit of Wine*, and *Æthers*.

Unites by fusion with *Sulphur*.

Unites also with several of the *Metals*, and decomposes most of their *Oxyds*.

Used

Used only in the preparation of *liquid Phosphorus*, *Phosphoric Matches*, and portable *Phosphoric Bottles*.

OF SPONTANEOUS ANALYSIS.

(*Fermentation.*)

Organised bodies, or their products, alone capable of becoming the subjects of this *Analysis*.

Takes place under particular circumstances of *Temperature*, *Humidity*, *Accumulation*, and *Exposure to Air*.

Divisible into different stages; the *Vinous*, productive of *Alcohol*; the *Acetous*, affording *Vinegar*; and, the *Putrid*, generating *Ammoniac*.

These changes may be promoted or retarded by various means. *Ferments*.

Of Spontaneous Analysis

Of Animal Matter.

Coagulable lymph affords ammonia on distillation, it is insoluble in alcohol or water. In Caustic Alkalies it forms soap. Albumen is that which separates from the coagulable lymph, called also Serum, all the white of an egg is nearly of this substance. It coagulates at about 160 degrees of heat, when coagulated it is insoluble in water, but concentrated Alkalies and Earths dissolve it. In many respects it resembles Vegetable Gluten. Gelidity is got by boiling animal substances, in great quantities as Pandons Vrs glue is solid Gelidity, it is soluble in alkalies and acids, but not in alcohol — — —

Vegetable Matter

Gum is in a state of solution in Vegetables, but oozes out when exposed to heat, it is soluble in water in all proportions, but not at all in alcohol. It softens and swells when applied to heat, but neither burns or melts. Gluten is insoluble in cold water, but soluble in oils, alcohol, ether and hot water.

Of the Analysis of Mineral Waters

It is only in a general way we shall speak of this subject. Water is a fluid which is capable of uniting with a variety of substances, and of holding many in solution. Waters are divided most naturally as they fall from the heavens, in the form of Rain, Hail, Snow. We have Spring water, Water from Lakes, and the great body of the Ocean. River Water is found purer than the purest spring. And the more hard ^{the body} and rapid the force of the River the purer the Water. The more stagnant the more impure. The Sea water is made salt with Muriat of Soda, also Muriat of Magnesia, and Lime, and the Sulphuret of Magnesia, and it is this which renders it bitter. Another distinction is in regard to the Temperature, in some parts of Italy the Sea is nearly at the boiling point from being near burning Islands. But we find in Springs, some as high as the 212 and some as low as the 40 and this temperature never varies in Winter or Summer. The most remarkable springs of the hot kind are at Bath and of Bath, some foreign springs are hotter than these, as at Aix la Chapelle, where it is constantly at the boiling point. The cause of these springs never varying in their temperatures, at Bath there are extensive strata of lime in a caustic state, and the Water coming into contact with it, it is saturated with increase of temperature, but this does not account for the uniformity of temperature. Spring water the hardest, River water next, Rain water next and the softest of the four is distilled water, and their hardness depends upon their containing either some loose acid, or more

Vegetable Matter continued.

Gum is insoluble in cold water or Alcohol, but in hot water it forms a jelly. Tanning resides in those Vegetables which are the most astringent, any animal Jelly as a solution of Isinglass &c. shows the presence of this by an insoluble precipitate being deposited. India Rubber oozes out of some plants, it is insoluble in water, and in acids when cold, but when heated is soluble in the Sulphuric and Nitric, Oils, Alkalies, and others dissolve it. It melts at the same temperature as Resins, but never again regains its elasticity.

OF THE ANALYSIS OF MINERAL WATERS.

Firstly, by *Tests* or *Re-agents*.

Secondly, by *Distillation* and subsequent examination of their *gaseous* and *solid* contents.

generally from its holding ^{THE END.} in solution some metallic or earthy salts, more especially earthy salts, therefore by adding wood ashes to water (alkali) it is rendered soft, by the alkali taking up the salt in question. Medical Distinction, acidulous Waters, are rendered so by containing Carbonic Acid Gas, and almost all waters are impregnated with it, it is this which renders water so sparkling and pleasant, being rather sour, this is called Seltzer Water, and may be made artificially so pure as not to be distinguished from it by the nicest judges. Hepatic Waters are those impregnated with Hepatic Gas, the most remarkable are Harrogate, and Kettleby, this also contains a quantity of saline matter. Saline Waters are Epsom, and this contains the Sulphate of Magnesia, Cheltenham also contains this and the Sulphate of Soda, it is also Cheltenham. Chalibeat Waters have their character from the presence of a quantity of Iron. These Springs are numerous; the most reputed are those of Ambridge Wells, but this arises from the situation, more than the quality of it above others.

Mineral Waters Continued.

The principal distinction, is whether these hold in solution the Sulphate or of Carbonate of Iron. On Examination of Mineral Waters. The substances we expect to find are certain loose acids, Alkalies, Earths, bodies, and metallic bodies. more especially Iron. Aeriform substances are also contained in them. The Chemical Tests, are, for acids, the Infusion of Litmus, but the test for ascertaining the presence of Carbonic Acid gas, is the lime water, but be it the Stomachic water, and at first you will have a white precipitate, but if you add a greater proportion the acid will dissolve the precipitate and render it again colourless. To ascertain the presence of an alkaline, add to it either the symp of Nucleus, or paper stained with Tourmeret, the tint will be stained green, and the paper pink. The presence of Iron is ascertained by adding to it either infusion of Iron pink of Galls, or Prussiate of lime. The prussiate of lime makes the liquor a beautiful blue. For ascertaining the presence of lime add to it a small quantity of the acid of Sugar, when there will be a white deposition. For the presence of Earths add the fixed alkali when there will be a copious precipitation. For ascertaining any of the soluble forms of Barytes add to it, Sulphuric Acid, when a white insoluble compound is produced. The Nitrate of Silver a very delicate test for ascertaining the murietic acid in any form, for it precipitates a white compound. Hepatic Gas is known by its colouring Silver black, and also by its changing the colour of Assesin. You collect the Gases by heat, and those you must look for are Common Atmospheric Air, Carbonic Acid Gas, and Hepatic Gas. Atmospherical Air is known by combustion blowing in it. Carbonic Air by its being readily absorbed by water, heavier than Atmospherical Air, and changing an infusion of litmus red, destroying light and life. Hepatic Gas by its smell, and changing oxyd of Arsenic and Stake black.

Exp. 112

CHEMICAL NOMENCLATURE.

TAB. I.

SIMPLE BODIES		— RENDERED INTO GAS BY CALORIC.		— COMBINED WITH OXYGEN.		— GASEOUS OXYGENATED.		— OXYGENATED WITH BASES.		— COMBINED, BUT NOT RENDERED ACID.	
NEW NAMES.	FORMER NAMES.	NEW NAMES.	FORMER NAMES.	NEW NAMES.	FORMER NAMES.	NEW NAMES.	FORMER NAMES.	NEW NAMES.	FORMER NAMES.	NEW NAMES.	FORMER NAMES.
Light.											
Caloric.	Matter of heat.										
Oxygen.	Base of vital air.	Oxygen gas.	Dephlogisticated air.								
Hydrogen.	Base of inflammable air.	Hydrogen gas.	Inflammable air.	Water.	Water.						
Azote, or Nitric radical.	Base of phlogisticated air.	Azotic gas.	Phlogisticated air.	Base of nitrous gas.	Base of nitrous gas.	Nitrous gas.	Nitrous acid gas.	Nitrate of potash.	Common nitre.	Ammoniac.	
Carbon, or Carbonic radical.	Pure charcoal.			Carbonic acid.	Fixed air.	Carbonic acid gas.	Fixed air, or aerial acid.	Carbonate of lime, potash, iron, &c.	Mild calcareous earth, mild alkali, &c.	Carburet of iron.	Plumbago.
Sulphur, or Sulphuric radical.				Sulphuric acid.	Firewater acid.	Sulphureous acid gas.	Sulphureous acid gas.	Sulphate of potash, &c.	Firewater tartar, &c.	Sulphuret of iron, arsenic, &c.	Iron pyrites, common antimony, &c.
Phosphorus, or Phosphoric radical.				Phosphoric acid.	Phosphoric acid.			Phosphate of potash, soda, &c.	Phosphated kali, soda, &c.	Sulphureted hydrogen gas.	Hydrogen gas.
Muriatic radical.				Muriatic acid.	Muriatic acid.	Muriatic acid gas.	Muriatic acid gas.	Muriate of potash, soda, &c.	Salt of Sylvius, Common salt, &c.	Sulphurated hydrogen gas.	Hydrogen gas.
Boric radical.				Boric acid.	Boric acid.			Borate of potash, soda, &c.	Vegetable borax, Common borax, &c.		
Fluoric radical.				Fluoric acid.	Fluoric acid.	Fluoric acid gas.	Fluoric acid gas.	Fluorate of lime, &c.	Fluor spar, &c.		
Succinic radical.				Succinic acid.	Salt of amber.			Succinate of potash, &c.			
Acetic radical.				Acetic acid.	Distilled vinegar.			Acetate of potash, ammonia, lead, &c.	Distilled vinegar, Mordant of iron, Sugar of lead, &c.		
Tartaric radical.				Tartaric acid.				Acidulous tartaric potash.	Cream of tartar.		
Pyro-tartaric radical.				Pyro-tartaric acid.	Empyreumatic acid of tartar.			Tartaric acid.	Soluble tartar.		
Oxalic radical.				Oxalic acid.	Acid of sugar.			Acidulous oxalate of potash.	Salt of tartar.		
Gallie radical.				Gallie acid.	Acid of gall.			Oxalate of soda, lime, iron, &c.			
Citric radical.				Citric acid.	Acid of lemon.			Gallate of potash, lime, iron, &c.			
Malic radical.				Malic acid.	Acid of apple.			Citrate of potash, lime, &c.			
Beronic radical.				Beronic acid.	Acid, or flower of benjamin.			Malate of potash, &c.			
Pyro-lignic radical.				Pyro-lignic acid.	Acid of wood.			Berionate of lime, &c.			
Pyro-mucic radical.				Pyro-mucic acid.	Spirit of honey, sugar, &c.			Pyro-lignite of potash, iron, &c.			
Camphoric radical.				Camphoric acid.	Acid of camphor.			Pyro-mucate of magnesia.			
Lactic radical.				Lactic acid.	Acid of milk.			Ammoniacal pyro-mucate, &c.			
Saccharo-lactic radical.				Saccharo-lactic acid.	Acid of sugar of milk.			Camphorate of potash, &c.			
Formic radical.				Formic acid.	Acid of ants.			Lactate of potash, &c.			
Prussic radical.				Prussic acid.	Acid of Prussian blue.			Succinate of lime, &c.			
Sebacic radical.				Sebacic acid.	Acid of fat.			Ferriate of ammonia, &c.			
Urbic radical.				Urbic acid.	Acid of urinary calculus.			Prussiate of potash, of iron, &c.	Prussian alkali.		
Bomblie radical.				Bomblie acid.	Acid of silk worm.			Schizate of soda, of lime, &c.	Prussian blue.		
								Lithiate of soda, &c.			
								Bomblate of iron, &c.			

ACIDIFIABLE BASES.

