

I. *An easy Method of procuring the Volatile Acid of Sulphur, by Ephraim Rinhold Seehl; addressed in a Letter to the President and Fellows of the ROYAL SOCIETY.*

Gentlemen,

*Read at a Meeting
of the Royal Society,
Jan. 19. 743-4.*

HAVING found that a commodious and cheap Method of obtaining the true volatile Acid of Sulphur was greatly wanting, I take the Liberty of laying such a Method before you, in order to its being disposed of as ye shall think proper.

The Difficulties which attend the making of the *Oleum Sulphuris per Campanam*, even after the Improvements of M. *Homburg*, are so great, the Process so tedious, and the Produce so moderate, that this Preparation is rarely to be met with in the Shops; but the Oil of Vitriol is commonly sold, and used, in its stead.

Nor, perhaps, if the true *Oleum Sulphuris per Campanam* could be obtained cheap, is this the Thing so much wanted in Chymistry, Pharmacy, and Physic, as the volatile Acid of Sulphur; containing not only the *Oleum Sulphuris*, as it is called, but, at the same time, the pure native *Gas*, or highly volatile Spirit, of the Sulphur; which in our Method is preserved; and which, we have Reason to believe, considerably increases its Virtues, both as a Menstruum, and a Medicine. But of this, Gentlemen, ye are the properest Judges; who are too well acquainted with the Writings and Discoveries of Mr. *Boyle*, *Becher*, *Homburg*,

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berg, and *Stahl*, upon this Subject, to receive any Information from me.

Permit me only to say, it was Dr. *Stahl's* Method of procuring the volatile Acid of Sulphur, that put me upon the Thought and Endeavour of doing the same Thing in a better Manner: And, indeed, I look upon my Method to be no more than an Improvement of his; and this will appear by the Process which follows: Tho' I have Two Ways of obtaining the Spirit of Sulphur; one by the means of fixed Alkali Salt; and the other by means of the same Salt and Quick-lime.

PROCESS I.

To make the volatile Spirit of Sulphur with Alkali Salt per se.

Take a Pound of the Flowers of Brimstone, and Five Pounds of dry fixed Alkali Salt; grind them together, and put the Mixture into an Iron Pot; add, by degrees, a little Water, so as first to dissolve the fixed Alkali; then gradually dispose the Whole to boil, in order the better to dissolve the Sulphur: When these have boiled for a Quarter of an Hour, add more Water by degrees; and, when the Sulphur appears to be dissolved, filtre the Solution; evaporate it to perfect Drincks in an Iron Pot, till it almost begins to melt; then take out the dry Powder when cool; put it into a tubulated Retort; which being placed in a Sand-heat, and a Receiver luted on, pour in at the Tube, by degrees, Two Pounds of rectified Oil of Vitriol; and immediately secure the Tube with a Stopple of Chalk, and Luting: Then give a gradual Fire for some Hours, till all the volatile Spirit of Sulphur

is come over; after which let the Fire go out; take off the Receiver, and carefully pour the Liquor into a Glafs Phial, to be stopp'd with a Glafs Stopper. The volatile Spirit, thus procur'd, will be about Twelve Ounces in Weight, and appear tolerably limpid, smell extremely quick, pungent, and *Gassy* or sulphureous, almost like the *Gas Sulphuris*, prove strongly acid to the Taste, and in all other Experiments; so that it may be used in the way of a general Acid; being, perhaps, the best, in all respects, that is hitherto known, except the following:

PROCESS II.

To make the volatile Spirit of Sulphur cum Calce.

Take a Pound of the Flowers of Brimstone, Four Pounds and an half of fixed Alkali Salt; grind and mix them well together; put the Powder into an Iron Pot set over the Fire; add a little Water, by degrees, to dissolve the Salt; then boil gently for a Quarter of an Hour; add more Water, and afterwards Three Pounds of strong Quick-lime; let all boil together for a while: When the Solution is complete, filtre the Lixivium, and evaporate to a dry Powder, as in the First Process; put this Powder into a tubulated Retort; and pour on, by degrees, a Pound and an half of rectified Oil of Vitriol; proceed to distil as before: Thus ye will obtain Eight Ounces of a more strong, more acid, and more volatile Spirit, than the former, and of a yellowish Colour.

OBSERVATIONS.

- I. The Proportions of the several Ingredients here set down, I have found, by repeated Trials, to be the best. Five Pounds of Alkali Salt are thus absolutely necessary to dissolve One Pound of Sulphur; tho', when Quick-lime is used, as here specified, Four Pounds and an half of fixed Salt are sufficient; or even Four Pounds, if the Quick-lime be very good and strong: So much doth the Lime strengthen the Lixivium, or enable it to dissolve the Sulphur.
- II. These Two Processes differ somewhat considerably, as to the Quantity and Quality, both of the Spirit and *Caput mortuum* they afford. The Spirit made with Lime is less in Quantity, but specifically heavier, and yet more volatile, than the other: And the *Caput mortuum* with Lime is much whiter, purer, and fitter for making the *Tartarus vitriolatus*, than that made without Lime.
- III. By mixing a Pound of fixed Alkali with the Sulphur at first, boiling them a little, and filtering the Liquor, then adding Two Pounds more of the Salt along with Two Pounds of Lime, I have found, that the Sulphur sooner dissolves, than if I put the whole Quantity in at once; and thus, after the second Filtration, I put in the rest of the Salt and Lime, till all the Sulphur is dissolved; as finding this the readier Way to perfect the Solution.
- IV. In the Distillation, a little of the Sulphur will sometimes sublime into the Neck of the Retort; and this seems owing either to making the Fire too

too fierce at the Beginning, or using the Oil of Vitriol too weak: But such a Sublimation of the Sulphur is no farther Detriment to the Operation.

V. When Lime is used in this Process, a considerable Proportion of fixed Alkali Salt may be saved, the Spirit be rendered stronger, and the *Caput mortuum* cleaner and whiter, so as to make an excellent Tartar of Vitriol, by Solution, Filtration, and Crystallization: But it must be observed, That the Produce of this Tartar of Vitriol, when prepared, is not near so large as when no Lime has been used in it; and accordingly I have found, that the dry Powder, remaining after the Solution and Evaporation of the *Sal Alkali* and Sulphur alone, weighs as much as they did originally: Whereas, when Lime has been used, the remaining Powder has weighed half a Pound less than the original Weight of the Sulphur and fixed Salt; which seems a curious Phænomenon; and might lead to farther Discoveries of the Relation betwixt Lime and fixed Alkali Salt, &c.

VI. The Advantages of this Method, in respect of M. *Homberg's*, are,

- (1.) That it gives a much larger Quantity of the Acid of Sulphur.
- (2.) That it gives a very volatile Acid; whereas his is fixed, so as scarce to differ from Oil of Vitriol.
- (3.) That it is obtained in a much more easy and cheap Manner.
- (4.) That this Spirit has, probably, much greater medicinal Virtues.
- (5.) That it is a much more powerful Menstruum; especially with regard to Metals, and particularly their Crystallization.
- (6.) That the *Caput mortuum* is a Medicine of great

great Use ; and may defray the Expence of the whole Operation ; being, perhaps, the best Way of making the *Tartarus vitriolatus* perfectly pure and neutral for medicinal Purposes ; its expected Virtues greatly depending upon its being clean and neutral.

VII. Our Method has also several Advantages over Dr. *Stahl's* ; tho' his indeed affords a volatili Acid. But then, (1.) His Method burns the Sulphur, and, consequently, destroys its Texture, and throws off, or exhales, Part of the Spirit or *Gas* ; whereas ours gently dissolves the Sulphur, and only divides it, so as to leave the Acid afterwards separable by a stronger or more ponderous Acid ; and no-way consumes or destroys the inflammable Part, as Burning does. (2.) Our Method is more neat or elegant than his, and affords a larger Produce, at a cheaper Rate, and in greater Perfection, both as a Medicine, and as a Menstruum ; leaving also the *Tartarus vitriolatus* cleaner, and fitter for Use as a Medicine.

VIII. Persons but little versed in chymical Philosophy, and the Operations it makes use of, might be apt to suspect, that this Spirit of ours is not a pure Spirit, or Acid of Sulphur ; but mixed with the Oil of Vitriol, here used as the Medium to separate the Spirit from the Sulphur and fixed Alkali : But ye, Gentlemen, very well know it to be an universal Law, that an heavier or stronger Acid, used in a suitable Proportion, constantly, in these Cases, separates a weaker, and leaves it free to rise by itself in Distillation, as it remarkably does in the present Operation ; where all the
Oil

Oil of Vitriol employed unites with the fixed Alkali, so as to make the true *Tartarus vitriolatus*; and leaves the lighter Spirit quite detached and free to rise, and come over the Helm in Distillation: So that this volatile Spirit and the fixed Oil of Vitriol are by no means the same Thing; nor should the one be used for the other, especially in Physic.

IX. But tho' the Oil of Vitriol be allowed to differ from the volatile Acid of Sulphur, some may imagine, that there is no Difference betwixt this volatile Acid and the volatile Spirit of Vitriol, as it comes over in the Rectification of Oil of Vitriol; or betwixt our Spirit and the *Gas Sulphuris*, which is extremely pungent and volatile: But whoever attentively examines and compares the volatile Spirit of Vitriol, or the *Gas Sulphuris*, with our Spirit, will soon be convinced of a great Difference; tho', indeed, they agree in the Point of *Gassy* Volatility: For the volatile Spirit of Vitriol is only an impure Phlegm of Vitriol, containing very little Acid, and is chiefly impregnated with the wild Fumes of the Vitriol; so as, upon standing a while, to quit the Liquor, and leave it nauseous, vapid, and gross; whereas the volatile Spirit of Sulphur long preserves its Volatility, the purer *Gas* being here lodged in a pure acid Liquor, less dense and gross than Oil of Vitriol; so that when, by being long unstopped, this acid Spirit loses of its Volatility (as it will do), yet it never loses of its Acidity; and even then appears to be the most pure and perfect Mineral Acid we can any way procure. And, as to the *Gas Sulphuris*, when

when made in Perfection; this is no more than the Fumes of burning Brimstone catch'd and detain'd in Water: So that this Preparation, wanting the Acid, cannot be compared, in that respect, with our Spirit, which has it in Perfection.

X. What the Medicinal Virtues and Uses of our volatile Acid of Sulphur may be, I humbly submit to you, and the learned Physicians, to whom it belongs; only beg Leave to observe, that if what we find in numerous learned Physic-Books be just, there are Hopes, that it may prove a noble Medicine in many Kinds of Fevers the Small-pox, and even in Plagues. In some of these Books we read, that malignant Fevers are owing to a Superabundance of volatile alkaline Salts in the Body; and, if that be the Case, one might hope to neutralize or destroy such a Superabundance of volatile alkaline Salts, by the prudent Use of this fine volatile Acid; which is capable of being mixed with Water, Julaps, and most Sorts of Drinks.

XI. I likewise find, That the Origin of all Pestilences and Plagues has been assign'd to the following Causes; *viz.* (1.) The Carcases of Men, Horses, or Cattle, kill'd or slain, and putrefying above-ground by Heat and Moisture, and thus infecting the Air by their noxious, volatile, urinous alkaline Salts, that copiously issue from them in such a putrefying State. (2.) Dead Fish, thrown out of the Sea, and putrefying on the Shore; or Swarms of dead Insects, bred in Fens and Marshes, drowned in the Ocean, and thrown on Shore by the Tides, and left to putrefy in hot moist Climates. (3.) Woollen Goods, Silks, and Apparel,
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packed up or worn by infected Persons, or those that attended the Sick, or that came from infected Places. (4.) Unwholsome Diet, or corrupted putrefying Meats, abounding with too subtilized, or too rarefied, volatile, urinous Salts. (5.) Mineral, arsenical, and poisonous Damps, Vapours, Exhalations, &c. arising from Vulcano's, Mines, Grotto's, by means of subterraneous Heats and Fermentations.

XII. It were easy, by natural Reasoning upon these Causes assign'd of the Plague, to shew that Distemper consists in a kind of putrefactive State of the Body, when the Salts are volatilized, unsheath'd, and let loose to tear and wound the Solids, after destroying the Texture; and, consequently, that the volatile Acid, here shewn to be easily procurable, is a natural Remedy in such Cases: But, being sensible how fallible all such kind of Reasoning may be, I intirely submit the Whole to your maturer Judgments; and remain,

Gentlemen,

Your most humble Servant,

Ephraim Rinhold Sechl.