

SCIENTIFIC SECTION

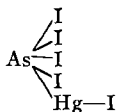
THE ARSENICAL SOLUTIONS.

No. 3. *Liquor Arseni et Hydrargyri Iodide (Donovan's Solution).*

(Continued from p. 511, June issue.)

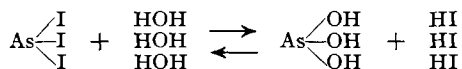
BY H. A. LANGENHAN.

A possible structural conception of a double salt of the two iodides that are supposed to be united in Donovan's Solution to a single molecule can readily be gained from the assumed formula which conceives the double salt as an arsonium iodide mercurio iodide.



In this connection it is noteworthy that, unlike the colorless double salt of lead iodide—ammonium chloride, which is formed with the aid of a little water and is decomposed again into its components with more water, this compound appears more stable for it remains seemingly unchanged no matter what the dilution. Moreover, in attempting to concentrate the solution, the compound distils over with the water vapor, seemingly unchanged, a phenomenon already observed by Donovan. Even sodium bicarbonate does not precipitate the HgI_2 , hence the assay of the arsenic as in Fowler's solution, by means of iodine, which is explained on the basis of the change of trivalent arsenic to pentavalent arsenic, may be regarded as contradicting the formula assumed.

Moreover, our general knowledge of the halides of the nitrogen subgroup of group five of the periodic system seems to contradict the assumption that Donovan's solution is that of a double halide, such as those of Bonsdorff, and the so-called *iodohydrargyrate of arsenic* by Donovan. The readiness with which arsenic trichloride is acted on by water with the formation of arsenous acid and hydrogen chloride has already been pointed out under *Liquor Acidi Arsenosi*. Because of the slow, rather than sparing, solubility of arsenic tri-iodide—the U. S. P. states that AsI_3 is soluble in twelve parts of water, but it requires time to effect solution at room temperature—this process naturally requires much more time. Yet with so large a ratio of water to arsenic tri-iodide as prevails in the finished product, the hydrolysis, indicated by the following formulas, may be regarded well nigh complete, though the reversibility of the reaction should not be lost sight of.



Hence, though the possibility of a separation of a double iodide of arsenic and mercury is by no means excluded under proper conditions, Donovan's Solution by no means seems to afford them. The fact is that it requires about the same amount of water to bring the arsenic tri-iodide into solution whether mercury di-iodide is present or not. The solution of mercury di-iodide under the conditions prevailing in Donovan's Solution readily explained by the presence of hydrogen iodide resulting as one of the products of hydrolysis of the arsenic tri-iodide. As is well known,

mercury di-iodide is readily soluble in aqueous solutions of iodides with the loss of the red color.¹ Hence interpreted in the light of our general knowledge of the chemicals involved, it would seem much more rational to assume that Donovan's Solution consists essentially of an aqueous solution of arsenous acid and a compound of mercury di-iodide with hydrogen iodide, and that other substances, such as a double halide, arsenic tri-iodide, arsenic hydroxyiodide, etc., are present in minor phases, if at all in recognizable quantities. That, with the change of conditions, such as ratio of solvent to solute, etc., these minor phases may become major phases and may be separated should not be overlooked.

It must become apparent from the above considerations that the chemistry of Donovan's Solution is by no means as simple as is assumed by the textbooks.² It would seem that a better understanding might be attainable if something were known about the interaction of arsenic tri-iodide and mercury di-iodide in solvents other than water. For this purpose a small number of solvents were chosen. Alcohol was selected because, like water, it has a hydroxy group and might be expected to yield hydrogen iodide as one of the products of interaction. Ethyl acetate was chosen because it was devoid of hydroxy hydrogen. Methyl salicylate was selected, not only because it is an ester with a much higher boiling point than the other substances, but also because it contains a hydroxy or more particularly a phenol hydrogen. Chloroform, in turn, was selected because it is devoid of oxygen in any form and because of the possibility of interaction, though scarcely to be expected, between the chlorine of the solvent and the iodine of the solutes. Finally acetone was added to the list because the chemistry of this solvent has received considerable attention in recent years. Hydrocarbons were excluded because an earlier preliminary experiment with heptane had shown that little, if any, reaction takes place.

The study of the action of these solvents on the reaction between arsenic tri-iodide and mercury di-iodide presupposed a knowledge of the behavior of these solvents towards the individual solutes. Hence the solubility of both substances in each solvent at boiling as well as room temperature had to be ascertained and changes in the appearance of the solute noted. In the course of the study of Donovan's Solution, two specimens of arsenic tri-iodide had been used. The one was a commercial sample which was dark brown and in solid masses as though it had been prepared by fusion of the elements. When triturated with the solvent this left a residue of, possibly elemental arsenic, a factor that interfered particularly with the study of the interaction of the two iodides in the presence of the several solvents. The other sample of arsenic tri-iodide had been specially prepared a year ago for the study of Donovan's Solution by the interaction of potassium iodide and arsenous acid in aqueous hydrogen chloride solution. This was a fine powder, orange in color, and left no interfering residues. Though preferable in this respect, its purity at times seems doubtful. The preparation made by precipitation as indicated, had white spots. Hence the experiments here recorded should be looked upon as first attempts to the complex problem and not as final records. In this connection it may be worth while to point out that an arsenic tri-iodide has been

¹ U. S. P. IX, p. 64; See also Dammar, "Handb. d. Anorg. Chem.," Vol. 3, p. 873 (1894).

² See "Remington's Practice of Pharmacy," ed. 6, Vol. 12, p. 941; Arny, "Principles of Pharmacy," ed. 2, p. 186; "Nat. Stand. Disp.," ed. 3, p. 934.

obtained by passing hydrogen iodide gas into a heptane solution of arsenic tri-chloride. This preparation is very dark brown as compared with the orange precipitate from the aqueous solution. Whether it is free from chloriodide has not yet been ascertained.

Tabulated results of the solubility experiments are herewith given:

Solvent 20 mils.	HgI ₂ and AsI ₃ 1 Gm. each.	HgI ₂ 1 Gm.	AsI ₃ 1 Gm.
Water	Sol. in boiling, clear, light yellow solution when cold.	Nearly insol. in boiling; slight red ppt. when cold.	Sol. in boiling; clear light yellow solution when cold.
Alcohol	Part. sol. in boiling, light yellow ppt. when cold. Liquid dark red-brown.	Nearly insol. in boiling; slight red ppt. when cold.	Part. sol. in boiling; light yellow ppt. when cold; liquid dark red-brown.
Acetone	Part. sol. in boiling; red-yellow ppt. when cold; liquid dark red-brown.	Nearly insol. in boiling; slight red ppt. when cold.	Part. sol. in boiling; red-yellow ppt. when cold; liquid dark red-brown.
Chloroform	Part sol. in boiling; red powder insol. portion; orange ppt. when cold; liquid red-brown, violet.	Nearly insol. in boiling; slight red ppt. when cold.	Part. sol. in boiling; orange ppt. when cold; liquid red-brown, violet.
Methyl salicylate	Nearly sol. in boiling; red - yellow powder insol. portion; orange ppt. on cooling; liquid yellow.	Sol. in boiling; yellow solution; red ppt. when cold.	Nearly sol. in boiling; red-yellow powder insol. portion; orange ppt. when cold.
Ethyl acetate	Sol. in boiling; few orange crystals when cold; liquid red-brown.	Part sol. in boiling; red ppt. when cold.	Sol. in boiling; orange ppt. when cold; liquid red-brown.

When arsenic tri-iodide is triturated with a little water a red-white mixture results. Further addition of water causes the red color to disappear, the white predominates, and finally upon the addition of sufficient water a clear solution results. This change was noticeable in the above experiments (excluding those of the mercuric iodide), varying to some degree with the solvent used.

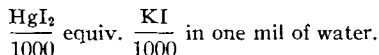
From a brief survey of the table it seems feasible to say that if a combination results when mercury di-iodide and arsenic tri-iodide are brought into solution this combination is readily broken up again. For in comparing the results recorded in column one and three of the table, it is quite apparent that the precipitate formed and the appearance of the liquid remaining are approximately the same. That is, the same results are obtained from a solution containing the two iodides and a solution of the arsenic tri-iodide alone, in the same solvent.

Mercury di-iodide is considered practically insoluble in water, but soluble in the presence of iodides. Whether other halides would have a similar effect on the solubility of the insoluble mercury di-iodide was investigated in the following manner:

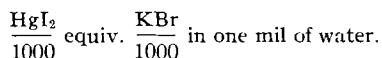
One-thousandth of a gram molecule of mercury di-iodide was triturated in a mortar with the gram molecular equivalents of potassium iodide, potassium bromide, potassium chloride and ammonium chloride, respectively. To each of

the mixtures one mil of water was added and the effect noted. A second, third, etc., equivalent of the respective halide was added in an attempt to dissolve the mercury di-iodide in the limited amount of water.

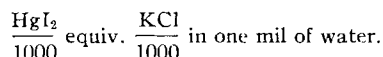
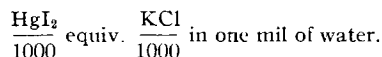
The following results were obtained:



Three equivalents were necessary to effect a solution of the mercury di-iodide in the limited amount of water. No apparent change took place upon diluting the solution up to 25 mils.

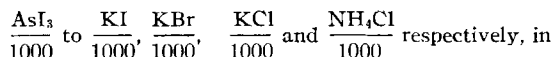


Three equivalents of potassium bromide were necessary to effect the solution of the mercury salt. Upon diluting the mixture to 25 mils a red precipitate was formed.



Up to twenty equivalents of each halide were added in each case without effecting a solution. Furthermore, no solution resulted when the mixtures were diluted up to 25 mils.

A similar series of tests were conducted using arsenic tri-iodide in place of the mercury di-iodide. The following results were obtained:



one mil of water was treated in the same manner. Three gram molecular equivalents of each halide were added to separate portions of arsenic tri-iodide without effecting solution in the one mil of water. Upon diluting the mixture, solution took place after 25 mils of water had been added. However, under the same conditions 25 mils of water were sufficient to dissolve the arsenic tri-iodide alone. (This does not represent the solubility of arsenic tri-iodide in water, for if the mixture be allowed to stand for some time or if it be warmed less water is required to effect a permanent solution.)

From the results of the tests it may be assumed that the addition of potassium iodide facilitates the solution of the mercury salt in water; that the addition of potassium bromide facilitates the solution in certain concentration, while the addition of chlorides does not seem to aid to any perceptible degree. Furthermore, the addition of soluble halides does not facilitate the solution of arsenic tri iodide in water.

10. *Volume of finished product.*—According to Donovan's original formula eight fluid ounces of product were prepared. The Dublin Pharmacopœia of 1851

brought the volume up to eight fluid ounces and six fluid drachms. In the British Pharmacopœia of 1885, the volume was brought up to 10 fluid ounces; in 1898 to one pint (Imperial); and in 1914 up to 1000 milliliters.

The 1850, 1860 and 1870 revisions of the U. S. P. diluted the solution of the iodides up to one pint; the 1880 revision up to 100 parts, regardless of the volume prepared; the 1890 revision up to 1000 cc. and the 1900 and 1910 revisions up to 1000 grams.

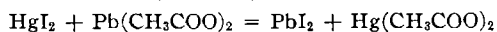
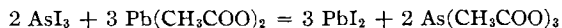
The following table gives the ratio of ingredients to finished product on an approximate percentage basis:

	AsI ₃ .	HgI ₂ .	Vol. of product.	Ratio.
Donovan	36.8 gr.	34.7 gr.	8 f. oz.	$\left\{ \begin{array}{l} 0.958 \text{ AsI}_3 \text{ to 100 mils} \\ 0.904 \text{ HgI}_2 \text{ to 100 mils} \end{array} \right.$
Dublin Ph.	36.5 gr.	36.25 gr.	8 f. oz. 6 dr.	
B. P. 1885	45 gr.	45 gr.	10 f. oz.	1.10 to 100 mils
B. P. 1898	87 $\frac{1}{2}$ gr.	87 $\frac{1}{2}$ gr.	20 f. oz. } 1000 cc. }	1.00 to 100 mils
	10 Gm.	10 Gm.		1.00 to 100 mils
B. P. 1914	10 Gm.	10 Gm.	1000 Gm.	1.00 to 100 Gm.
U. S. P. 1850	35 gr.	35 gr.	8 f. oz.	0.901 to 100 mils
U. S. P. 1860				
U. S. P. 1870				
U. S. P. 1880	1 part	1 part	100 parts	1.00 to 100 parts
U. S. P. 1890	10 Gm.	10 Gm.	1000 cc.	1.00 to 100 mils
U. S. P. 1900	10 Gm.	10 Gm.	1000 Gm.	1000 to 100 Gm.
U. S. P. 1910				

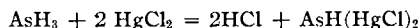
It would seem that an attempt had been made to follow the formula offered by Soubeiran *viz.*, a one p. c. solution of each iodide.

11. *Appearance of the finished product.*—All of the pharmacopœias containing this solution direct that it shall be filtered through paper. The U. S. P. of 1850 is the only one that directs the solution to be heated to boiling point before filtering. No reason for the heating has been found thus far, in the literature available. According to Donovan (see report) such a treatment would tend to decrease the strength of the solution, for in commenting on the volatility of the compound in solution he states "When the solution is evaporated by heat the salt passes off with the water, such is its volatility."

12. *Qualitative tests.*—The U. S. P. of 1890 is the first to describe this solution. The 1910 revision contains two tests. The first is a test for "iodide." The addition of lead acetate T. S. to the diluted solution causes a precipitate of bright yellow lead iodide. This may be expressed in the following manner:



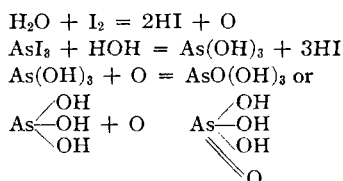
The second is a test for arsenic. Nascent hydrogen is formed by the action of hydrochloric acid on zinc. This reduces the arsenic tri-iodide to arsine. This gas coming in contact with the mercuric chloride, contained in the test paper, forms a yellow stain. This has been expressed in the following reaction:¹



¹ *Ber. d. Deut. Chem. Ges.*, 31, p. 594, Vol. 1, 1898.

12. *Assay*.—Only the 1910 revision of the U. S. P. gives a quantitative test for this solution. It consists of two parts. The first part is an assay for arsenous iodide.

As with Fowler's solution, the assay serves a double purpose. It is not only a check on the amount of arsenous iodide used in preparing the solution but also on the possible deterioration caused by the change of the trivalent arsenic to the pentavalent arsenic, due to the presence of oxygen, as expressed by the following reactions:



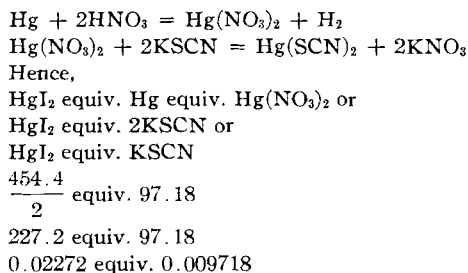
The amount of trivalent arsenic is determined by the use of *N*/10 iodine V. S.

$$\begin{aligned} \text{I}_2 \text{ equiv. O equiv. AsI}_3 &\text{ or} \\ 126.92 \text{ equiv. } \frac{455.72}{2} &\text{ or} \\ 0.012692 \text{ equiv. } 0.022786 & \end{aligned}$$

Apparently the U. S. P. assumes that this solution contains AsI_3 and HgI_2 each in simple solution, or in such weak combination that each can be determined separately.

The second part is an assay for mercuric iodide. This is based indirectly on the total mercury content, obtained by the reduction of the mercury salt to metallic mercury by formaldehyde in an alkaline solution. Hence any reduction of HgI_2 to HgI in the solution previous to the assay (with the possible simultaneous oxidation of the arsenic tri-iodide to arsenic penta-iodide) is not indicated. (Compare with the assay of arsenous iodide part 1.)

The metallic mercury is dissolved in nitric acid with the formation of mercuric nitrate, and this titrated with volumetric solution of potassium sulphocyanate. This may be expressed in the following manner:



13. *Dose*.—A dose for this solution is given for the first time in the revision of 1900, expressed as—"Average dose, -.01 cc. ($1\frac{1}{2}$ minims)". The same dose is given in the 1910 revision expressed as—"Average dose, -Metric, 0.1 mil. Apothecaries, $1\frac{1}{2}$ minims." As the solution contains one per cent of each iodide, the amount of each per average dose of the solution is 0.001 Gm.; or 0.002 Gm. of total

iodides. The U. S. P. average dose for arsenous iodide is 0.005 Gm. and for mercuric iodide is 0.003 Gm. Apparently the combination of the two iodides in the solution is considered more toxic. Hence the dose of each in that form is considerably decreased.

APPENDIX.

On a new Chemical Combination of Arsenic, Mercury, and Iodine; and on its Employment as a Therapeutic agent.

BY M. DONOVAN, ESQ. (*The Dublin Journal of Medical Science*, 16, p. 277, 1839).

"About thirteen years since the iodide of arsenic was introduced on the continent as a therapeutic agent; but was little known as such in the British Isles until lately, when it was recommended by Dr. A. T. Thomson in the cure of psoriasis.

Judging from the medical effects of arsenic, mercury, and iodine, coincident as they are in some diseases, several practitioners have used them in conjunction. Circumstances led me to make experiments on the chemical agency of these three substances on each other; and as the results appear likely to prove useful, I am induced to publish them.

The red iodide of mercury has been shown by Bonsdorff to act in some respects as an acid, and to be capable of combining and forming crystallizable salts with several compounds which, in these cases, act the part of bases. These salts he denominates iodo-hydrargyrates.

I observed that when iodide of mercury, and iodide of arsenic, are triturated with as much water as is sufficient to render them moist, the scarlet color of the former, and the brown color of the latter disappear, and the resulting color is yellow; a sufficient indication that a chemical combination has taken place.

I found also, that when iodide of mercury, and iodide of arsenic, mixed, are heated in a glass tube, they melt, and form a compound so volatile, that, at a moderate temperature, it boils, evaporates, and produces concussions of the tube. This compound is very fusible; on cooling, after being melted, it concretes into a reddish brown, crystalline mass. Its vapour has the property of tinging flame of a pale violet hue.

The liquid obtained by presenting the crystalline mass to a large quantity of water, is yellow. When this solution is evaporated by heat, the salt passes off with the water, such is its volatility. Towards the end of the process, however, the solution becomes more concentrated, and its color deepens to brown. If the brown liquor be now distilled in a retort, the water and salt still come over together, and the liquor in the receiver is also brown. A small quantity of light shining, minute crystalline plates appear in both retort and receiver.

From these facts, it is plain that the crystalline, reddish brown mass, obtained by combining the iodides of mercury and arsenic, is an iodo-hydrargyrate of arsenic, according to the nomenclature adopted by Bonsdorff.

The medicinal effects of the three elements, iodine, mercury, and arsenic, of which this salt is composed, appear from the testimony of several writers, to coincide in their influence over certain diseases, as lepra, several forms of psoriasis and lupus. A chemical combination might possess increased efficacy: there is no doubt that it would be convenient, and that it would afford a greater security and certainty, in exhibition, than the three elements administered in any form. The mercury is here in such a state of combination that it may be exhibited in solution: and it is probably to the solubility of corrosive-sublimate, and hence to its absorbability, and transmissibility to the extreme vessels, that its superior power of quickly arresting the progress of syphilis, and of acting on the skin, is attributable. By the same causes also, the analogous effects of bromide of mercury may be produced. Pearson considered corrosive-sublimate 'peculiarly efficacious in promoting the desquamation of eruptions.' Willan believes it the only mercurial that is of any use in lepra. Perhaps the iodo-hydrargyrate of arsenic, as containing mercury in the soluble state, may support the same character, and even exceed it, by containing other useful elements. Corrosive-sublimate has been hitherto the only mercurial that could be exhibited in solution.

But there are obstacles which embarrass the exhibition of the solid combination of iodine, arsenic, and mercury, some of which arise from the difficulty of obtaining, for its preparation, pure iodide of arsenic of unvarying strength; and others, from its own nature.

The iodide of arsenic has been prepared by various processes. M. Henry merely melts 100 parts of iodine with 16 of arsenic. M. M. Serullas and Hottot recommend the same method; but add that the mass should be sublimed. M. Plisson boils 100 grams of iodine, 30 of levigated arsenic and one liter of water, until all smell disappears and the liquid becomes of a light yellow color. The solution, filtered when cold, is to be evaporated with free access of air; crystals will form, and when they are very nearly dry they are to be melted by heat: a feeble heat will expel all the water. In order to obtain a neutral compound, all the crystals which form on the side of the capsule must be continually returned into the liquid. (Plisson: *Annales de Chimie et de Physique*, XXXIX. 265.)

If Henry's process be inadequate without sublimation, Plisson has shown that sublimation causes decomposition of a portion of the iodide into metallic arsenic and iodine. And there is this difficulty in Plisson's process, that there is no obvious criterion whereby the total expulsion of the water can be judged; hence the iodide is liable to variation of strength. I have found in the iodide of arsenic prepared for sale, so much as one-twentieth of its weight of metallic arsenic. When such iodide of arsenic is dissolved in water, by means of iodide of mercury, the metallic arsenic remains undissolved.

An iodo-hydrargyrate of arsenic and mercury, formed from such an iodide of arsenic, will be liable to uncertainty of strength.

When iodo-hydrargyrate of arsenic is intended for administration in the form of pills; or when pills are formed (as is sometimes done) by combining the iodides of arsenic and mercury; there are other sources of uncertainty, which cannot fail to produce detrimental effects. One arises from the difficulty of weighing and mixing such minute quantities of the materials without loss; of diffusing them equally through a pill mass, and dividing it into pills containing perhaps but one-sixteenth of a grain of each ingredient. Add to this the chance that some injury is done by the substance employed to give bulk, or to form a mass, and the certainty that spatulas, and other metallic instruments, whether of brass, silver, or steel, will produce decomposition of these minute quantities to a considerable extent. All these considerations evince the inexpediency of this form of exhibition. It is even questionable how far a pill is safe consisting of three escharetic substances, exerting their concentrated power on a single spot of the stomach, in consequence of their being in the solid state.

The form of solution is by much the best when proper precautions are taken. In order to render the exhibition of these active ingredients safe, the formula must be capable of furnishing a solution, which, when prepared by different hands, from different materials, and at different times, will always be of the same composition and strength. Without this quality, a practitioner, who has urged the dose of a weak solution, may, by persevering in the same dose with a strong one, do great mischief.

To insure this equality of composition, and therefore of strength, at all times, the first condition is, that the three component ingredients shall be perfectly pure. The metallic arsenic of commerce should be powdered and sublimed from black flux: the iodine should be washed with water, strongly pressed between folds of bibulous paper, and sublimed; and the mercury should be recovered from red precipitate by distillation.

The next requisite for constancy of composition is, that the quantities of the ingredients employed must be entirely dissolved in the solution; we must be sure that the three substances are in full operation to the fullest extent of their quantity.

Lastly, the compound must be permanent, not liable to spontaneous decomposition, nor to injuries arising from careless exposure to light or air.

I believe that all these conditions are fulfilled in the following process:

Triturate 6.08 grains of finely levigated metallic arsenic, 15.38 grains of mercury, and 50 grains of iodine, with one drachm measure of alcohol, until the mass has become dry, and from being deep brown has become pale red. Pour on eight ounces of distilled water; and after trituration for a few moments, transfer the whole to a flask; add half a drachm of hydriodic acid, prepared by the acidification of two grains of iodine, and boil for a few moments. When the solution is cold, if there be any deficiency of the original eight ounces, make it up exactly to that measure with distilled water. Finally filter.

The theory of this process need scarcely be adverted to. By the long-continued trituration of arsenic, mercury, iodine, and alcohol, the metals are converted into iodides, which combine.

The mass by solution in water is converted into an hydriodate of arsenic and mercury. The quantities of the two metals are so adjusted, that, when converted into protoxides by decomposition of a portion of the water in which they are dissolved, there will be eight grains of protoxide of arsenic, and sixteen of protoxide of mercury. The quantity of water is such that each drachm measure of the solution will contain exactly one-eighth of a grain of protoxide of arsenic, and one-fourth of a grain of protoxide of mercury. I conceive that the quantity of mercury ought to be double that of the arsenic, in order to insure a slow and moderate, yet adequate mercurial action, along with the proper effect of the arsenic.

Of this *liquor hydriodatis arsenici et hydrargyri*, each drachm measure consists of

Water, one drachm.

Protoxide of arsenic, one-eighth of a grain.

Protoxide of mercury, one-fourth of a grain.

Iodine (converted into hydriodic acid) four-fifths of a grain.

The color of the solution is yellow, with a pale tinge of green; its taste is lightly styptic. It cannot be properly conjoined with tincture of opium or with sulphate, muriate, or acetate of morphia; for all these produce immediate and copious precipitates in it. Hence if opiates are to be used during the exhibition of this arsenico-mercurial liquor, they must be taken at different periods of the day. Tincture of ginger produces no bad effect. The following formula is proper:

℞ *Liquoris Hydriodatis Arsenici et Hydrargyri* drachmas duas.

Aquae Destillatae uncias tres cum semisse.

Syrupi Zingiberis semunciam, Misce.

Divide in haustus quatuor. Sumatur unus mane nocteque.

Thus one-sixteenth of a grain of protoxide of arsenic, and one-fourth of a grain of protoxide of mercury, would be taken in each dose, along with two-fifths of a grain of iodine, which, being in the state of combined hydriodic acid, will be much diminished in energy of medical effect. This is no doubt the proper dose to begin the exhibition of arsenic with; but it will be very soon necessary to increase it.

The division into draughts is here necessary: first, to insure accuracy of the dose, so essential in the case of this active medicine: and next, to prevent injury to the ingredients by the use of a metallic spoon as a measure—the general way in which, unfortunately, the dose of a medicine is determined.”

LOSS ON IGNITION OF TALC.*

BY JOSEPH L. MAYER.

A few months ago I was retained in a case involving loss on ignition of a sample of talc, upon which two competent chemical laboratories had reported results that differed widely.

The United States Pharmacopœia under Purified Talc says “Purified Talc when subjected to ignition at red heat loses not more than 5% of its weight.”

The several cars of talc which were the subject of this controversy were not intended for pharmaceutical or toilet purposes, but nevertheless it appeared to me that “red heat” would be the proper temperature to observe in making the analyses.

Walker and Wilson—U. S. Department of Agriculture, *Bureau of Chemistry Circular*, No. 101, page 2, “The Ignition of Precipitates without the Use of the Blast Lamp”—report the following results of a series of tests they made of temperature measurements with various types of burners, by inserting a thermo element through a hole in a platinum crucible cover: “To the surprise of the experimenters there was practically no difference in temperature when different types

* New York State Pharmaceutical Association, 1925.