1814.

October 27th 1814.

Men associated themselves into societies for the purpose of more effectually protecting themselves against the rapacious beasts of the forest, and also for securing themselves against the tyranny and oppression of their fellow men. These desirable objects were obtained, but alas! Man thus made gregarious by his necessities, fears, and the ambition of his brethren, illicited other propensities which stamp him as the most barbarous of beings. Cunning, immorality, malignity and every vice which disgrace the human form, have defaced the "Human face Divine" have showed themselves in all their various gradations, so that we may doubt if society and civilization have not rendered man more wicked and more miserable. His intellectual faculties are indeed improved by the vice and imprudence of his fellow men and he gains a livelyhood by them. Quarrels concerning property have raised eminent and learned lawyers. The wickedness, which has been refined by the connection of the vicious with the innocent and the bad, has produced another order of professional men, the Clergy. The sluggishness debauchery and dissipation have made the Physician absolutely necessary to the welfare of what is called polite Society, and the Political Feuds which have harrassed this globe and spread desolation and horror over the fair face of Nature have roused into action the unknown energies of the Statesman. Thus has it been productive of both good and evil – has degraded human Nature below the most ferocious of animals and ennobled its prerogatives by the greatest refinements of the mind. Shame can scarcely stay the headlong current of vice. "Nothing can resist the impetuosity of a mind bent on greatness." However paradoxical fame will say that be found who will not exclaim "Our greatest evil" is "our greatest good".

Were vice banished from this world; or rather had it never been known, those exalted virtues which have ~~enabled~~ distinguished Man would never have existed even in imagination. Had oppression and tyranny, neither name nor existence Howard would not have lived upon the tongues of posterity as the most active of Philanthropists. ~~When~~ Would the names of Hippocrates, Sydenham Boerhaave, Cullen, Fothergill, ~~the~~ Bichat, The Hunters, or the Bells have stood in gilded letters on the roll of Fame, if diseases were not the inseperable concomitants of Human Nature, No! and we physicians would not have enjoyed "the luxury of doing Good". Were there no crimes committed against civil society, vigilance would fail, and insolence take the place of alertness. Justice would no longer stand balancing the beam of equity. As they have found their way into the world, we should believe that they were intended by an Almighty Creator to effect some purpose. They certainly do serve some very useful ones. They compell men to exercise their ingenuity, dexterity, courage or talents to evade, detect, prevent and punish them. They keep man on his guard; they keep his elastic mind always on the Spring. Thousands of instances could be cited but we do not wish to paint you particularly to but one, which depicts ~~states~~ the vice and malice of mankind in the most heinous forms, and on the other hand unfolds the goodness of a Merciful GOD, and the resources from which man is capable of ~~using~~ drawing every thing which is necessary to his own defence and the welfare of society. The Science of Medical Jurisprudence shows at once the baseness and the greatness of Man. Take the example of the servant who has been imitated by her master, and she takes her own vengence, by giving him arsenic in his food. Here we find the workings of the angry passions, against perhaps the oppression of an overbearing master, and the implacable hatred of unprincipaled murderers, and the secret influence of Malice Prepense. We see the wonderful effect of the minute quantities preparation of Arsenic, ~~which man has made,~~ ~~(in minute quantities)~~ upon the curious animal system of Man. We contemplate the curious mechanism of our frame which are thus liable to being operated upon by trifling causes; and we look with astonishment upon the ingenuity of our race in being able by chemical reagents to detect the minute quantities of this active poison after it is dissolved in the stomach and has "worked the work of death". We see likewise the vigilance of the police in detecting the criminal and all the means used for conviction, and the punishment of the offender, so as to deter others from like atrocities. We sees with pleasure the unbiassed sword and vacillating beam of Justice.

We should consider ourselves happy if we could either cure or prevent a corporeal disease. But great would be our gratification could we cure or prevent a single moral one. Despairing of this however, we shall endeavour to elucidate the method detecting of one of the most heinous crimes; in order that we may hold out some reasons, founded upon the fear of detection & condign punishment that may deter the wicked from their flagitious designs, and by that means protect society from the evil which they may fear; and which is the only ~~justifiable~~ ground justifiable by the Christian Religion which we may take in the punishment of offenders. "Vengeance is mine saith the LORD", I will repay." We never ought to lift up our hands in punishment but to ~~bless~~ society from danger or to bring the sinner back to the paths of rectitude.

We must have servants, and they are necessarily engaged in cooking our victuals and when malice dictates they may infuse a deadly poison into the food which we take, for pleasure, and the sustentation of life. We consider it absolutely necessary to punish the persons who steal cloaths from the bleaching grounds of manufactories in the most exemplary manner, because they must be exposed to the air, and of course to the depredation of the wily. The law punishes Burglary with death, because society cannot well exist without peaceful rest at night, and a security against the mid night thief. In the case we have cited the terror to be held before the eyes of Malice should be sufficient to prevent the secret mischief. If we cannot prevent them, we should prove that we can detect, and the fear of detection by man, and the ignominious death which murderers suffer, goes further to prevent murders, than the idea of an allseeing God, or the vengeance of his offended All mighty hand. This secret murder is most usually perpetrated by arsenic, and it has been long a dideratum to detect it, in small quantities, when death has been supposed to have been produced by it. This is a subject meriting the attention of a Committee of Medical Men, who annually propose medical questions to the youth of this country for discussion and reward, if their exertions deserve it. Few Questions of such importance have been proposed, and much honor is due to you, Gentlemen of the Committee, for now offering it. Whether we are successful or not, we heartily wish success to those who engage in it. We shall in this Essay not confine ourselves to a few experiments which would detect arsenic to a certainty, but all the modes by which we may render it certain to others as well as ourselves. We may produce a precipitate by the colour of which we may say that we have said arsenic in solution, but we should offer numerous experiments, by the various appearances of which we should be able to prove to a certainty that no other substance caused

have given similar results. I conceive that it is not enough to render the existence of arsenic probable, by a few experiments, but to many them in such a manner that we non any person could doubt.

We should when called upon in a case of life and Death very deliberately experiment and be sure that we are not mistaken. We are liable to err, but we should rather err on the side of mercy. The life of a fellow being is not to be sported with. The Reputation of any person is too precious to themselves to be blasted by a cloud that may appears in your experimenting glass. Rather that ten wicked should escape than one innocent suffer.

That we may, so far as we are capable, point out the most certain means of detecting arsenic, when it has been suspected to have distroyed life we shall consider the effect which arsenic has upon the constitution. — The quantity which would distroy life. Then the modes of collecting the contents of the stomach, and the arsenic contained, whether it has been vomited up or examined after death — And lastly we shall with great care point out the modes of detecting the minutest portion of arsenic in solution, according to the best Chemists, from success in following them.

The arsenic of the Shops, vulgarly called Rats Bane, is the oxyde of a metal called arsenic. This metal so easily oxydizes that by simple exposure to the air it unites with oxygen. It is procured usually from the ores of Cobalts in Saxony & Cornwall. Sometimes it occurs native in the metallic forms. Colour is steel grey. Sometimes with Iron forming the Marcasite (Mispickel) Arsenical pyrites. They are white pyrites and are found in this Country in many places, as near New Slavers (Corn.). United with Silver (Silver Arsenical pyrites). The native oxyde. In union with Sulphur it forms those most beautiful ones, the brilliant polished bright yellow Sulphuret called Orpiment and the scarlet or deep scarlet Realgar. From these ores it is obtained, by sublimation, by roasting, in the form of the grey or white oxyde. It unites with several of the metals in nature forming Arseniates as of Iron from Cornwal and copper from the same place (the Wood copper). With Cobalt and Nickel it forms alloy and is a constituent of the sulphurets of those metals.

The arsenic of the shops is the arsenious acid consisting of 75 of the metal, 25 oxygen, Spec. grav. 3.700, when vitrified by exposure to heat in closed vessels 3.000. Crystalizes. When sublimed smells of ~~arsenic~~ Garlic. Tastes sweet and reddens vegetable blues.

Arsenic acid consists of arsenious acid and oxygen in the proportion of 3. parts to that of ones or 65 arsen. & 35. oxygen. Spec. Grav. 3.391

* Related by Peter M. Roquet MD. in the New London Med & Phys. Journal for April 1812.
† Thomas. — ‡ Jaeger Dif: Inang: de Effectis Americi &c &c. Stuttgardiamus:
** Mr Soden. Sug: London Med: Rev: for 1811. — †† Med & Surg: Journal for 1800. — ‡‡. The Transactions of an Academy Society for impt. of Med & Chir: Knowl: Vol II p. 63 — § Soden —

††. Foaming at the mouth and Risus Sardonicus (Convulsive Laughter should not have been omitted

Of the Effect which Arsenic has upon the HUMAN Constitution.

Arsenic is a Mineral poison and is supposed to act mechanically by some, by means of the spicula or minute crystals or perhaps by the integrants or ultimate molecula, which are supposed sharp. Whether this be the case or not it produces sudden and violent effects. The other Theory and we shall attempt to decide which is the most worthy of credit, supposes that it acts powerfully upon the nervous system. The other is that it enters the absorbents and thus destroys animal life.

The first effect of arsenious acid, or as we shall in future call it arsenic, is upon the tounque, producing a sweetish taste. In one case* vomiting was induced after ten or all fifteen minutes. Arsenic of burning and pricking† in the stomach follows. When small quantities only have been taken we find an uneasiness about the praecordia and sense of heat in the stomach. Sometimes the next symptom‡ will be heat of the tounque mouth and throat, which occurs usually thro' out the continuance of effects, but in some cases** is never felt.‡ The tounque mouth and throat become rough and parched,** thirst prevails with great anxiety and restlessness. The countenance shows its power by its paleness very soon. The distress in inexpressible. Violent vomiting ensues and dreadful pain in the bowels stomach**. In the case related by John Yelloly M.D ‡‡ the poison killed without any pain in any part. The vomiting is very severe and frequently the cause of the injury is entirely ejected, while all the alarming effects continued and destroy life. These symptoms may occur within one hour and an half as I have ascertained. The pulse was quick in most cases. In one fatal case, the pulse was 40 at first, and it sunk to 30. In an other case it was tremulous ‡‡. When the quantity is large the pulse is depressed, but when small or when soon thrown up, the pulse is higher — as in Nugent case of recovery — 120. —

Violent pain in the bowels succeed the vomiting almost immediately, with as violent purging. I find but two cases in which purging was not remarkable. When the dose has been very large purging can not be produced as it becomes violent and then stopts altogether. The fluid is watery, glairy and sometimes bloody & green & fetid.

Cramps in the limbs follow, and coldness of some of the extremities.

Respiration is often difficult. Cold sweat, languor, faintishness and a tendency to sleep. One patient became comatose and soon slept the sleep of death. Two patients had bloody Urine§ and another passed large quantities of water. Convulsive twitching are not unfrequent. The mind is unimpaired in all its faculties. Hiccough and eructations supervene and death follows.

* Jaeger. —— — t. Yelloly —— — Baillie's Morbid Anatomy P. 138.

When the body is examined after death it appears pale and livid, and sometimes natural*. In the Girl mentioned by Dr Jaeger blue spots ~~appe~~ were seen after death.

The Stomach has been said to distend after death, but it does not seem to have been remarkable from those cases, which we have read. The cardia has been inflamed, and other parts of the stomach. Effusion of coagulable lymph had taken place in spots †. Jaeger saw in the girl who died under his care "red spots about the cardia, a discoloration at the bottom of the stomach and a brown spot where the villous coat seemed as if superficially burnt." Erosions never were observed. In Yellally's case the dark spot was very similar to the girls. Its edge was defined and the arsenic adhered to its surface. Arsenic evidently produced inflamation‡ in this organ, but death, before erosion, ulceration or gangrene could follow. The pylorus and greater curvature suffer most from the weight of the poison. Jaeger found the villous coat of most animals softened as if macerated. The birds were less affected. The Gallinæ (Granivorous birds) shew no marks of inflamation. The human stomach was corrugated and contained a fluid like that previously vomited.

The intestines were inflamed and most in the majority of cases been highly so, to have effused blood or red mucous. They are said to be clearly inflamed thro' their whole course and much thickened. All the mucous membranes inflame; the bladder contracts. The liver is perhaps not affected. Adhesions are mentioned by the recorders of cases, with many other things, which I have repeatedly seen in subjects who died from widely varying causes. Some say that the blood was red & fluid and others say that it was black and coagulated. The general idea is that it is more fluid, but we believe that it varies, as it does in all cases by the violence of action, the state of the lungs, freeness of respiration and the state of the weather. It is however well to record all the circumstances which may occur. Let us collect facts and then by Lord Bacon's Induction draw conclusions.

The lungs shew signs of inflamation. The lungs of animals were so much so that fluid was effused. The Pleura and Peritoneum also.

Dr Flemming of Virginia in experiments made for an Inaugural Dissertation, concluded that an inflamation of the stomach was produced by inserting Arsenic under the skin, sooner than when thrown into the Stomach. Similar experiments have been made, proving, that arsenic and other mineral poisons are taken up by the absorbents and produce baneful consequences thro' their medium. (Med'd Phys. Journal P. 543.)

Arsenic when continued a long time produces Œdema called Œdema Arsenicale and appears on the back of the hands and the upper part of the foot.

‡ Mr Brodie in a communication to the Royal Society says that in the animals killed by Arsenic, the inflamation of the stomach was scarcely perceptible and he therefore concludes, with the addition of reason of the suddenness of death, that inflamation does not destroy, but the operation of A. is upon the nervous power.

Why Cases are not here Adhesions Bodmatic

The Quantity of Arsenic required to Destroy Life.

The quantity necessary to distroy the human system has not been well ascertained. Dr John Johnstone's Essays upon Mineral poisons affords us testimony which is very respectable that proves that a few grains are sufficient. One sixteenth of a grain is considered a dose to begin with. Fowlers solution may be given in the quantity of 8 or 12 gtts. and increased once twice and often in 24 hours. Some give 2 or 3 gtts every hour or every two hours. Some gentlemen have given the solution in much larger doses. When continued to the quantity of three grains its use had better be stopt. It generally produces its beneficial effects by that time and manifests its power by the peculiar Oedema —

The modes of Obtaining Arsenic which has been taken.

We may be called to patients who are vomiting from the effects of Arsenic. We should be careful to examine that which was ejected and by ligatures secure the weighty poison, in order to submitt it to chemical examination. Suspicions of attempts to murder should no longer be held their they can be proved. We should never fail to recollect what Dr Black has proved that the arsenic may have been all thrown up, and the symptoms remain as violent, "the impressions which the poison has made upon the coats of the stomach, are not of a nature to subside on the removal of the cause that had produced it". It is therefore absolutely necessary for precaution to obtain that which was vomited first, as when the patient dies, no poison may remain in the stomach.

The stomach however should be examined carefully. Take a ligature about each orifice and then dissect it out. Wash the contents in water and the oxyde will fall to the bottom. We should wash well the mucous, left the poison be covered and so involved as to float. It is usually of a greyish white

* Dr B. read a paper upon this subject before the Liverpool Medical Soc.

The Different Modes of Detecting Minute Portions of Arsenic which had been in the Human Stomach.

After having washed the contents of the stomach, or the matter vomited, throw the greyish powder upon a filter and then dry it.

Boil a small quantity of this powder, supposing it to be Arsenious Acid or the white oxyde of Arsenic, in a few ounces of water in a Florence flask and filter the Solution. Arsenious acid is soluble in 80 parts of water at 60° of Fahr: and at 212° or boiling point, in 15 parts. This solution has an acid taste, and reddens vegetable blues, hence the substance is called an acid instead of the white oxyde, and is soluble in 80 parts of boiling alkohol, from which, as well as from the aqueous solution regular tetrahedrons are obtained.

1st. Add to this solution an alkaline ~~Sulphuret~~ Hydro sulphuret, and a bright orange coloured cloud will appear. The sulphuret of ammonia ~~will~~ may be used.

Dr Babtock* of Liverpool diffused ten drops of a strong solution of the sulphuret of Potash in one drachm of water, and then added four drops of a saturated arsenical solution, and orange coloured cream formed upon the surface, and in 24 hours subsided in a precipitate of the same colour. The sides of the vessel were slightly tinged also, but the fluid was transparent. He made the same experiment with tartar Emetic (Tartras Antimonii et Potassæ). The same effect is produced, but larger quantities are required. He experimented upon the salts of other metals and found none produced similar effects. With the nitrate of Quicksilver red patches were produced, which sunk. The solution then became of a dirty brown and then a dull grey. With the oxygenated muriate of Mercury

a dull olive precipitate was formed, which became black, and left the supernatant fluid of a dirty yellow. With the Nitro-muriate of tin a copious, dense, brick coloured ~~pre~~ substance was precipitated, which in 24 hours became a muddy brown, leaving a transparent fluid. With the nitro-muriate of Platina, a copious olive coloured powder fell down. If the sulphur be precipitated from any of the solutions, by an acid, the precipitate will be yellow, not orange. The Hydro-sulphurets of arsenic and antimony are very similar which is very important, because the medicine which produced bad effects might have been exhibited without ~~a~~ the intent to destroy. The Quantity required to produce the change only can govern, and this is fallacious and not to be depended upon excepting as a collateral proof.

2°. Add to this solution water saturated with sulphureted hydrogen and the precipitate will be the same. This test is likewise only to be considered as collateral proof. Dr Bostock says that it discovers arsenic with great delicacy. Sixty grains of water, to which one grain only of the liquid sulphuret was added was almost instantly rendered opake by 1-30th of a grain of of arsenious acid in solution.

3. The next mode of detecting the presence of arsenic is by the production of Scheele's green. To the solution add a drop of the weak solution of carbonate of Potash, and afterwards a solution of the ~~Carbonate of potash~~ Sulphate of Copper or Boil a small quantity of the suspected powder in a dilute solution of Potash, and by the sulphate of copper you will produce the same green coloured cloud. Dr Bostock ascertained with accuracy the proportional quantities of the different substances that would give the deepest colour. This he did with much care, because he believed that it is the most certain and therefore most deserving ~~the most~~ careful attention. He says that they should be added to one another in the proportions to each other of one, three and five respectively." For instance says he "of one grain of arsenic, and three grains of potash, be dissolved in two drachms of water, and in an other equal quantity of water five grains of the sulphate be dissolved, ~~and~~ we have two transparent fluids." Add them together the whole becomes of a beautiful grass green, from which a copious precipitate of the same hue slowly subsides, in in transparent colourless fluid. Add five parts of the sulphate of iron to three of the solution of potash and a sky blue becomes evident. In making these experiments upon suspected powders always have them going forward with what you know to be arsenic, that they may be contrasted. Compare the various results with each other. Mr Murray approves of the proportions used by Dr B. The Dr dissolved one fortieth of ~~the white oxyde~~ a grain of the white oxyde in 80 grains

grains of water forming $\frac{1}{2400}$th of the weight of the fluid. He added the proper quantities of sulphate of Copper and potash, and compared the appearance with that produced by the Copper and Alkali without arsenic, and the difference was very obvious. Dr Bostock hints very judiciously that the fluids should be viewed by reflected light, not transmitted. Transmitted light may be best observed, by receiving it upon paper. The day time should be deemed preferable for such nice experiments.

P. Dr Henry considers the reduction of the arsenious acid to its metallic form as decidedly the most certain proof. At first it seems best, but however inequivocal it may be when the arsenic is found in considerable quantities, yet minute portions could not be detected. One grain is the smallest quantity that can with accuracy be discovered. Dr Bostocks description of the process necessary to reduce the metal is so good and particular that the reader will excuse its transcription — "The most convenient size of the tube to be used in this process is about one fourth of an inch or less in diameter and about eight inches in length. In order to close the tube, when a blow pipe is not to be procured (which we may suppose will often be the case) the end is to be placed in the common fire untill it is completely softened, and a pair of small tongs being at the same time made red hot, the tube is to be withdrawn from the fire, so the heated end pinched by the tongs, and at the same time bent up at an acute angle, so as to be brought parallel to the body of the tube. The tube is then again heated, and being again firmly pinched by hot tongs, the end will be compleatly impervious. Mr Murray recommends that the tube be coated with clay and sand. It may be proper to mention, that this part of the process should not be omitted, and that the best proportions for coating are, ~~[illegible]~~ one part of common clay to three parts of sand, which are to be well kneaded together, and reduced to such a state of tenacity, that the lute will readily adhere to the tube, and its different parts will unite without forming a visible seam. The black flux is not often procured, but powdered charcoal answers the same purpose". Dr Henry recommends two parts of very dry carbonate of potash (Sal Natris officinarium) and one of powdered charcoal. A smaller quantity of black flux than that usually directed will answer

answer the same purpose. The materials must be pressed into the tube with a wooden rammer, and a tube of a quarter of an inch in diameter, coated with the before mentioned lute, requires a brisk coal fire acting upon it one quarter of an hour. Dr. Bostock says that, when less than three quarters of a grain was used, he could not determine whether the lute had any metal about it or not, there detected 1/8 gr. mixed with animal matters.

Altho' Dr B. has been particular in telling how to fix the tube and prepare it, and the time the tube should be heated, he has passed over several circumstances which should be mentioned. We ourselves should have failed in the experiment from that cause, had not accident corrected us. We shall now state these little circumstances.

Close the open end of your tube, which you have charged, ~~lonely~~ and place the end, which contains the substance to be tested, and which has been hermetrically sealed in the fire. The tube, unless thin, will break by placing it upon hot coals. If a thin one can not be obtained you will carefully and gradually apply heat. This is a very important consideration, because you may lose what you are experimenting upon, or the quantity remaining will be insufficient to try again. The upper part of the tube must be clean, or the sublimations of the metal will not be seen. When the experiment is successful the inner surface of the upper part of the tube will be covered with arsenic, & you may break the tube and test the brilliant coating according the methods here laid down.

Notwithstanding this very particular method of performing this experiment, you may be assured that it may be performed in a thumb bottle, should no other means be near. We cannot be too accurate where the life and reputation of a fellow being and his family are in ~~jeopardy~~ jeopardy;

7th. When arsenic or arsenious acid are burnt with a combustible substance the fumes have a garlic odour. The tenth of a grain may be discovered in this way. Throw a little of the dried powder upon burning charcoal. Dr Henry says that the smell of sulphur arises first and is followed by that of garlic. The sulphur smell is not exact but it is distinct from that which succeeds. Burn it with sugar and you have the same result.

The fumes are white, dense and rise rapidly. No flame is emitted and the arsenic does not appear luminous, and when pure entirely ~~evaporates~~ sublimes. These experiments are however fallacious and are only serviceable by rendering it probable that the substance is arsenic. When taken with the more certain it has its weight, and we should for the sake of justice and humanity endeavour to try every way by which truth can be attained. We do not think it inconclusive from the imperfection and difference in the olefactory organs only, but phosphorus and zinc emit similar odours; besides, when mixt with other matters from the stomach they may be deceptive and always doubtful.

6th. Arsenic forms with copper a white alloy. Chemist usually recommend placing it upon a polished plate of copper and surrounding it with carbonaceous matter. Some inflamable matter must be used in every attempt to reduce the metal because it unites freely and strongly with oxygen. Dr Bostock made this experiment, in imitation of all others, with great accuracy and he heated the copper plates, with powder of charcoal and oil, without any arsenic and he found the result so similar to those made with arsenic that they differed only in degree. He rubbed the plates with sand and found that the surface was permanently white. He observes that the copper was white all over and that soon this scale flew off in small pieces. Not having copper plates we used cents and with precisely the same results. This experiment then should not be depended upon. Other substance produce the same effects. Some have depended upon this mode as the most certain, yet it is fallable. Many in this country would have felt certain that he had ~~detect~~ detected arsenic. Such may be the result of careful examination into the rationale of all the other experiment which we may offer.

6th Boget, in the case of recovery from the effects of this virulent poison, states the method used by Dr Marcet, which is new and interesting and perhaps not among the least decisive.

Dip the end of a glass tube, wet with a solution of pure ammonia, into the filtered solution before mentioned, and another clean rod wet with a solution of nitrate of Silver, (Lunar Caustic). A bright yellow cloud appears at the point of contact, which readily subsides. The precipitate is soluble in Ammonia, particular care should be taken lest it be in excess. The quantity of nitrate of silver or ammonia can scarcely be too small. Dr Marcet added Ammonia and nitrate of Silver to distilled water and no precipitate appeared. A yellow cloud becomes evident when Fowlers solution was used. Brick red appears in a solution of arsenic acid. Potash give a yellow cloud, but its effects are less distinct. The effects of the tests upon solutions of zinc, iron copper, mercury and lead were very unlike those so observable in solutions of arsenic. Dr Marcet says that arsenic may be detected notwithstanding the other metals. Sulphate of iron he though rather improved the effect. These things are undoubtedly true. They are worthy the attention of better chemists than myself. To mention the result of our own experiments we do in giving those of others. Our evidence can hardly add to the force of credit which is attached to these gentlemen. Dr Hume proposed boiling the suspected matter with a solution of Carbonate of ~~Ammonia~~ potash, and bringing into contact with it the dry nitrate of silver. This less convenient than the former

You can excuse the copy of a paragraph from the communication of Boget concerning the minute delicacy of this new test. ——

"We dissolved" says he, "a grain of white arsenic in a known quantity of water, and by successive additions of water, to successive portions of this solution, prepared other solutions, containing respectively $\frac{1}{2000}$ $\frac{1}{20000}$ & $\frac{1}{200000}$ of their weight of Arsenic. By applying the test to a small quantity, in a watch glass, we found that when it contained only one 25,000th of a grain of arsenic, ~~by applying~~ the precipitate was of a yellow colour. It was distinctly yellow when the quantity of arsenic was reduced by dilution to one 50.000th of a gr. When further diluted, the yellowness was gradually less and less discernible, and the precipitate appeared of a light blue. It retained this colour untill its quantity became too minute for observation. A bluish cloud, was however very distinctly visible when the fluid examined contained only the one 250,000th part of a grain of Arsenic."

* Jaeger

8th. Notwithstanding the minuteness of the 8th test we have still another and not less worthy the notice of the Philanthropist, the Chemist and the Medical Juror. This is lime water —

The lime water must be fresh, and it will detect 1-30th of a grain when dissolved in 100 grains of water or one 160th in 50 gr*. This will be sufficient we can scarcely suppose it necessary, to require a nicer test. At least we would be very fearful of giving our opinion when it was found upon the 250.000th of a grain or even the 20,000th or 20000th. One circumstance we would urge is never to be forgotten. Experiment upon the water used to form the solution and be sure that the effect of the lime water do not result from it. Almost all water contains sulphuric acid and this itself give a white cloud upon the addition of lime water.

9th. A Saturated Solution of Ammoniuret of Copper is more delicate 1-500th according to Jaegar give a green colour. The Ammoniuret of Copper is of a superb blue. A solution as weak as that produced by the addition of it should be made in a seperate glass so as to contrast the result. This should be done in all the experiment and cannot be scrupulously pursued. 1-500th of a grain may be discovered in 50 grains of water

Recapitulation.

Having, gentlemen, been particular in relating the different modes of detecting arsenic, we shall now be ~~particular and recapitulate~~ general and state in as few words as possible the results of our inquiries, by way of recapitulation

1st. We would judge by the Symptoms under which the patient laboured. —

2dly By the examination of the matter vomited or found in the stomach after death. —

For the last purpose you will,

— — — 1st Collect carefully the matter and by washing and filtration procure the heavy powder.

— — — 2d Boil some of this powder in water.

— — — 3d. Add to this Solution an Alkaline=Hydro=sulphuret and a bright orange clouded precipitates. With a solution of Tartar Emetic (Tartras Antimonii et Potassæ) a cloud appears very similar, from the addition of the Hy. Sul

— — — 4th. Add sulphureted Hydrogen and the orange precipitate forms.

5th. Add to the solution a drop of the solution of carbonate of potash and afterwards a drop of the solution of the ~~Carbonate~~ Sulphate of Copper and a green clouded precipitates.

6th — Take a tube, one fourth of an inch in diameter and eight inches long and lute the internal surface of that end which is hermetically sealed. Ram into it the suspected powder mixt with charcoal powder. Expose the end which is sealed to a red heat, and the reduced metal will be sublimed to the inner surface of the other end of the tube, which should only be loosely closed.

7thly Arsenic emits white, dense fumes, smelling first like sulphur and finally like garlic. Other substance emits similar odours.

8th. Arsenic forms a white alloy with copper, when heated to reddness between to plates, with carbonaceous matter. The same white appearance may be seen when coal has be used without arsenic.

9th. Dip the end of a glass tube, wet with a solution of pure ammonia, into the suspected solution, and another clean rod, wet with a solution of Lunar caustic, and a bright yellow cloud appears at the point of contact.

10th. Lime Water produces a precipitate when added to an acid solution. —

11th. The Saturated solution of Ammoniaret of Copper gives the solution a green tinge.

12thly Arsenic acid and Arsenious acid (white oxyde) both redden vegetable blues. — —

13th. Arsenic is soluble in 80° parts of water at 60° of Farh: and in 15 parts at 212°.

14th. It is soluble in 80° parts of boiling Alkohol.

15th. It crystalizes in regular tetrahedrons.

The properties of Metallic Arsenic.

As one of the most certain means of detecting Arsenic is the reduction of the oxyde or the acid to a metal, we should omit a very important criterion should we not give the characters by which that metal may be known.

1. It colour is steel gray.
2. It is brilliant.
3. Friable.
4. Specific Gravity 8.310. & 5.703.
5. Oxydizes by exposure to the atmosphere and becomes the black oxyde.
6. Readily fusible.
7. Volatilizes at 356° or 540° according to some.
8. Inflames at red heat. Flame blue. Fumes white, of a garlicky odour.
9. Sublimes in the form of white oxyde.
10. All the Mineral acids act upon it, particularly when heated
11. Burns vehemently in oxygenized Muriatic acid.
12. With oxy=muriate of Potash it detonates.
13. It combines with Phosphorus, sulphur, and many of the metals.
14. It is soluble in hydrogen Gas.

Arsenic in its metallic state not poison.

Dr. Daniel's case.

Used as an escharotic.

Carbon used as an Antipoison