A CASE
OF
RECOVERY
FROM THE EFFECTS OF ARSENIC;
WITH
REMARKS ON A NEW MODE OF DETECTING THE PRESENCE
OF THIS METAL.

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THE white oxyd of arsenic, when taken in sufficient quantity, is in general so violent and so certain a poison, that the following instance of recovery, after many formidable symptoms had appeared, will perhaps be not unworthy of the attention of this Society ; more especially as the plan of treatment that was pursued, has not, as far as I can learn, been hitherto put in practice under similar circumstances.

A girl of nineteen years of age, of a sanguine temperament and delicate constitution, having met with a severe disappointment, formed the resolution of putting an end to her existence. With this intent, on the 12th of February last, she purchased sixty grains of white arsenic, and leaving her house at eight o'clock in the evening, that she might execute her purpose unobserved, she strewed the powder upon a piece of bread and butter, and eat the whole. In about ten minutes after she had swallowed the last portions, an effort to vomit took place ; but only a small quantity of the bread was rejected from the stomach ; and during the remainder of her walk, no further vomiting occurred.

About an hour after she had taken the poison, she returned home ; and her sister, observing that she looked exceedingly pale, inquired if she was well. She made a sign that she felt very ill, and hastened immediately to her bed. She had not lain down above a few minutes, before she was seized with violent pain in the stomach, which was soon followed by severe vomiting. The vomiting was fortunately promoted by large draughts of warm water, with which her mother supplied her, but which it required much persuasion to induce her to take : they were returned almost as soon as swallowed. It was at this period, that, from the extreme agitation and distress which the patient appeared to suffer, the idea first occurred to her mother of her having possibly taken poison ; but

the young woman, whenever questioned on the subject, denied the accusation with vehemence. The vomiting continued to recur from time to time, and was attended with considerable griping in the bowels, and with copious watery evacuations by stool. The fluid that was vomited was of a yellowish or greenish colour, and on two occasions was observed to contain a small quantity of florid blood.

The anguish of the patient had now risen to such a pitch, that her resolution gave way to the urgent wish for relief, and she acknowledged the cause of her sufferings. An apothecary in the neighbourhood was immediately applied to, and, at about one o'clock in the morning, she took by his directions five grains of sulphur made up into a pill, together with three spoonfuls of a mixture of $\mathfrak{zss}$ of sulphate of magnesia, $\mathfrak{zj}$ of subcarbonate of potass, and a grain of tartarised antimony in $\mathfrak{zviij}$ of peppermint water. Of this mixture three doses were taken in the course of the night, but none of them remained above a few seconds on her stomach. It is proper to notice, that some hours afterwards, on emptying the vessel into which the patient had vomited, a quantity of white powder was found at the bottom involved in a glairy fluid. As this substance had been thrown away before I came, I had no opportunity of examining it.

About twelve o'clock on the following day (the

13th) the mother of this young woman applied to the Northern Dispensary for assistance, and I went immediately to see her. She was suffering intense pain at the pit of the stomach, much increased by pressure, and accompanied with frequent retching, and occasional fits of vomiting. There was general tension over the abdomen. The face was flushed, the respiration hurried, anxious, and often interrupted by spasmodic catchings approaching to hiccup. The pulse was 120, small, and extremely quick: the tongue white, but moist. The voice was tolerably firm, and the speech perfectly distinct and collected. I directed a vein to be opened in the arm, but could not procure a very full stream of blood. When about eighteen ounces had been obtained, the patient grew pale, complained of being sick, and vomited about half a pint of fluid of the appearance of thin gruel. Deliquium being at hand, the bleeding was stopped, and immediately afterwards the pulse ceased at the wrist, and the patient fainted. She remained about a quarter of an hour in a state of insensibility; the pulse gradually returning, and beating 60 in a minute. In the course of an hour it had again risen to 120, but was much softer, slower, and more equable than before the venesection. The pain of the stomach was somewhat alleviated, and the sickness was entirely removed: the breathing was more tranquil; but the countenance continued exceedingly pale. The patient complained much of a feeling of excessive coldness, particularly in the extremities,

although to the hand of another person they appeared to be of the natural warmth. These sensations of chilliness recurred frequently in the course of the day.

I now ordered a large blister to be applied over the region of the stomach.

I visited her again at five in the evening, along with my friend Dr. Marcet, and noted the following particulars. The pain in the stomach continues to be intense, and though it occasionally remits, at other times it returns with increased violence, and is attended with slight efforts to vomit : there is also much pain in the fore part of the head. She complains of a burning heat in the fauces, rendering deglutition painful ; the mouth is clammy, and there is much thirst, although the secretion of saliva is considerable. The burning sensation descends into the stomach, and is diffused over the whole chest. The skin is hot, the pulse 120, and wiry. Great uneasiness is felt on the approach of a candle to the eyes. The voice is stronger, and she appears to have in a great measure recovered from the sudden debility produced by the bleeding. But her mind is still agitated by the recollection of her misfortunes ; and notwithstanding the assurances that have been given to her, that the principal subject of her affliction would be done away if she recovered, she declares that her only wish is to end her anxieties in death.

As she had had no stool since the morning, I directed $\mathfrak{z}$ i of Oleum Ricini to be given in divided doses.

At seven o'clock she was seen by the apothecary to the Dispensary. He found her pulse at 140 ; she was anxious and restless ; and conceiving that the blister was the chief cause of her uneasiness, insisted on its being removed. In this wish she was indulged by her friends, who imagined that it was useless to torment her any longer. She complained of being very cold ; and on being raised in bed that she might take some tea, suddenly fainted away, and continued in a state of syncope, with slight convulsions, for half an hour. When she came to herself, the castor oil was given to her, and remained upon her stomach without exciting nausea. After this she had half an hour's sleep, but awoke with the pain as severe as before.

At eleven at night, I again called with Dr. Marcet. There have been more complete remissions of pain, though it is still occasionally violent, but unattended with any inclination to vomit. When severe, it is always relieved and nausea repressed by a draught of barley water, of which fluid about a quart has been taken since six o'clock. In the intervals of pain she is more tranquil, and much disposed to sleep. Her strength, however, appears to diminish : she has frequent hiccup, constant sensation of burning in the throat and stomach, and an extremely pallid countenance. The

eyes are kept constantly closed from the uneasiness which light produces: the conjunctiva is pellucid, and the pupil contracts, but slowly.

On calling the next morning (the 14th) at eight o'clock, I was told that at midnight she had had a very violent attack of pain, and threw up about a tea cup full of fluid. Soon after this effort, the pain subsided, she became composed, and had three or four hours of continued and refreshing sleep. In the course of the night she had a copious thin stool, in which globules of the castor oil were visible. The blister has discharged abundantly. No appearance of buffy coat is exhibited by the blood drawn yesterday; the crassamentum is even softer than usual, and bears a large proportion to the serum. She is this morning quite free from sickness or pain in the stomach; takes tea and milk with relish; has more strength of voice, and bears the light much better than yesterday. The pulse is 112, and small. The colour has returned to her lips and cheeks: her spirits are revived, and she is now anxious to recover; a change that may partly be ascribed to fresh hopes having been held out to her with respect to her future prospects in life, if she survived the effects of her rashness.

In the evening I found that no material change had occurred. She has had a strong disposition to sleep; but whenever it is indulged, she is disturbed with frightful dreams, and awakes in much alarm.

The least sudden noise occasions violent starting : the breathing is interrupted by frequent sighs, and involuntary catchings during inspiration. She has often the feeling of emptiness and sinking about the præcordia, which threatens syncope, and is generally relieved by taking liquids. The head-ach is distressing ; the pulse 120, and soft : the skin somewhat hotter than natural. The Ol. Ricini was ordered to be repeated if she should have no spontaneous motion.

On calling early the next morning (the 15th) I found that she had passed a sleepless night ; and that the head-ach, the oppression of breathing, and the sensation of sinking had considerably increased. At five in the morning she took $\bar{z}$ i of Ol. Ricini, which in half an hour brought away a large quantity of feculent matter. She complains this morning that the burning sensation of the throat, impeding deglutition, has returned ; while at the same time she has frequently the feeling of a stream of cold water running down the back. At times darting pains are felt in the stomach, as if needles were passing through that organ. The pulse is 125, and very small : the tongue white, but not dry. There is a good deal of vertigo, and the eyes are again painfully affected by light.

Capt. statim Aq. Menth. pip. & Mist. Camphor. fort. ana $\bar{z}$ ij cum Aq. font. $\bar{z}$ ss. et repetatur secundâ quâque horâ.

On my visiting her at one o'clock, she expressed herself much relieved by the camphorated julep : all the symptoms were alleviated, and the appetite had returned. In the evening she took another dose of castor oil ; the operation of which was speedy, but accompanied with sharp pains in the lower part of the abdomen.

On the succeeding day (the 16th) the symptoms still continued, but in a milder degree. She had slept the whole of the night : the pulse was 100, and the tongue cleaner. The darting pains of the stomach still at times recurred, and were extending to the left side of the chest. The cough was frequent, but more loose. Cold shiverings were occasionally felt, together with aching pains in the extremities, and a sensation of tingling in the skin. There was a great disposition to start on any sudden impression. Her appetite being good, she was tempted to eat some animal food at dinner. In the evening she was more hot and feverish, and the pain of the side had somewhat increased.

The next morning (the 17th) I collected the following report. The night has been passed with but little sleep, with much restlessness, and alternate states of cold and heat. The pulse is 112, of moderate quickness ; the tongue is loaded with a white fur. The pain under the margin of the ribs on the left side is constant and severe, and much aggravated by the cough, which has increased in

violence. The bowels are free from pain, and there is no longer any sensation of sinking and oppression about the præcordia. The thirst is urgent, as well as the burning sensation in the throat. The vertigo and headach still continue, together with the pains in the limbs and tingling in the skin.

The camphorated julep was now discontinued ; seven leeches were applied to the side, where the pain was most felt ; and a blister ordered to be laid on the same spot, after the leeches had performed their office. An ounce of Ol. Ricini was directed to be taken in the evening.

At eight o'clock, P. M. the pain in the side was somewhat easier : the cough was attended with expectoration. There was much thirst and occasional chills, followed by increased heat : the pulse was at 108 : and the castor oil had operated freely.

R Aq. Ammon. Acetat. ℥ss.

Liquor. Antimon. Tart. ʒi.

Mucilag. Acaciæ.

Aq. Menth.

Syrup. comm. ana ʒi M. Capt. tertiis horis.

On the 18th, I learned that the pain and cough had increased in the fore part of the night, but were relieved on the breaking out of perspiration. The catamenia have made their appearance this morning. She has had a natural motion, has

slept for above two hours since daylight, and finds herself at present considerably better. The pulse is 96, and soft. The expectoration is scanty and difficult.

Add^r. singul. dosibus Mist^a. Oxymel. Scill. 3ss.

On the 19th, I found that she had slept well the preceding night. She is this morning quite free from pain : the cough continues to be troublesome, but the expectoration is more free. She complains of being very weak, and has occasionally the sensation of emptiness in the stomach. At ten o'clock in the evening, after having exerted herself in conversation on subjects in which she was deeply interested, she had a return of pain in the left side ; and, at about eleven o'clock, suddenly went off in a fit, during which she was completely insensible ; the left arm and leg were agitated with strong convulsions : there was considerable foaming at the mouth, which was drawn to the left side, while the other features of the face were much distorted, and frequently convulsed. These symptoms lasted nearly two hours ; and during the remainder of the night the patient continued insensible, with occasional moaning and twitching in the limbs.

In the morning (the 20th) I found her lying in a comatose state, with the eyes closed, unable to answer questions or perform any movement unless when strongly roused. The pulse was 92, soft, and

of equal strength in both wrists. The bowels were sufficiently open; there was no difficulty in swallowing: the pupils were somewhat dilated, but contracted on the admission of light. She sighed and moaned frequently, but otherwise the respiration was tranquil. On inquiring if she felt any uneasiness, she complained of violent headach, and also of pain on the left side of the abdomen, nearly in the region of the spleen, and she could not bear it to be pressed. There were occasional tremors in the limbs.

Applicetur Emplastr. Lyttæ abdomini quâ dolet; & capt. sextis horis Mist. Camph. & Aq. Menth. ana 3vj cum Spt. Ammon. Aromat. m xv.

The account I collected the next day (the 21st) was, that she had a convulsive fit last night of the same kind, and occurring at the same hour, as the preceding; and that she had continued since in a state of torpor. The bowels are regular. At two o'clock, P. M. of the same day, she was considerably revived; there was no longer any intolerance of light, and every uneasy sensation, excepting that of weakness, had vanished. The pulse was natural; the tongue nearly clean. In the evening she had some return of pain in the abdomen, but in a lower situation than before, and it was still accompanied with great tenderness on pressure. The part to which the blister had been applied, was free from pain. Relief was experienced from

the mixture, which procured a discharge of flatus from the stomach.

Feb. 22.—The convulsions did not return in the night, but at eight this morning she was attacked with a fit which lasted till twelve. From this fit her recovery, which happened in my presence, was more sudden and complete than before. She seemed to awake from a sound sleep; she declared that she felt perfectly well, and was desirous of getting up and taking food. Her only complaints were of violent itching of the skin over the whole body, and of slight vertigo on attempting to sit up. In the evening she fell asleep, and soon after had a return of convulsive motions, which continued at intervals during the greater part of the night. They were less violent, but more continued, than during the preceding day.

On the morning of the 23d she made no complaint except of headach, itchiness of the skin, and burning sensation in the throat. The convulsions returned with violence about noon, and continued for an hour and a half: they no sooner ceased, however, than she again awoke free from complaint, excepting a violent itching of the nose, and a numbness in three of the fingers of the right hand.

On the 24th, and for several succeeding days, the convulsions still returned during sleep, but they gradually became milder, and at length

amounted only to irregular twitchings of the tendons. On the 31st these had entirely left her. The strength had in the mean time been improving, and the only symptoms which remained were occasional flatulence, and oppression of the stomach after meals; and sometimes dyspnœa, and a sense of pain and constriction across the lower part of the thorax. With the assistance of some antispasmodic medicines these symptoms have been much relieved, but they are still apt to recur on any agitation of mind. Her natural appetite has returned, but she remains much thinner, and has by no means recovered the same degree of health and strength that she enjoyed before her desperate attempt upon her life*.

In reasoning upon the phenomena recorded in the preceding narrative, many topics of inquiry might be suggested, and various conjectures formed as to the morbid states corresponding to each train of symptoms. But I shall not trespass upon the time of the Society any further than to state my own ideas on the different conditions through which the patient passed, and the views which led me to adopt the mode of treatment that was employed.

The case before us affords a proof of the possibility of recovery when an unusually large quantity

* I take the opportunity of the publication of this third edition to state, that she was soon after completely restored to health, and has remained well to the present time (*April 22, 1817.*)

of arsenic has been swallowed, and under very unfavourable circumstances: and it also furnishes arguments in favour of a mode of practice directed to the removal of the effects of the poison, when it would be in vain to attempt its immediate evacuation or destruction. The protracted nature of the case gives us the opportunity of observing distinctly the peculiar train of symptoms that are excited by this powerfully deleterious agent, and which are either obscurely discernible when a smaller quantity has acted upon the system, or confusedly blended together in those instances which run through a more rapid course.

We may remark, that the first operation of the arsenic was that of a violent emetic and purgative; and to this circumstance I am inclined to think the patient owed her only chance of safety. The corresponding effects began to take place about an hour after its reception into the stomach, and were promoted by copious dilution, by which I should imagine that nearly the whole of the poison was evacuated. It appears, indeed, from the testimony of a number of authors*, that a few grains is in general sufficient to occasion death: had any considerable portion of the sixty grains, therefore, remained longer upon the stomach or intestines, the consequences would have been irretrievably fatal. From the analysis of the fluid vomited at the time I

* See Dr. John Johnstone's Essay on Mineral Poisons, p. 21, 22.

first saw the patient, and of which I shall afterwards give an account, it would appear that none of the arsenic was at that time present in the stomach.

But the impression which the poison had made upon the coats of the stomach, was not of a nature to subside on the removal of the cause that had produced it *. The inflammation excited in that organ, and the symptoms of which, at the time I first saw the patient, were strongly marked, would probably, if left to its natural course, have run through all its stages, and terminated in gangrene. I considered that dilution had been largely employed, and that the evacuations from the stomach

* This point is sufficiently established by the experiments of Dr. Bostock, which were made on the occasion of a remarkable trial for murder at Lancaster, and which are related in a pamphlet, entitled, "A Vindication of the Opinions delivered in Evidence by the Medical Witnesses for the Crown, &c. Liverpool, 1808;" and of which a further account is given in the Edinburgh Med. and Surg. Journal, Vol. V. p. 14. Two dogs were killed by receiving a metallic poison into the stomach, although the whole of the poisonous substance, as far as could be ascertained by the nicest chemical tests, had been evacuated previous to death; and dissection shewed marks of inflammation in the coats of the stomach and intestines. I had an opportunity of observing a fact of a similar kind, in a girl who was brought into the Manchester Infirmary, after having swallowed a large quantity of corrosive sublimate. I could not discover any of the metallic salt in what she had vomited 24 hours after the poison was taken. She lived for ten days. I examined with great care the state of the primæ viæ, and although marks of high inflammation were visible in the stomach and duodenum, I could discover no traces of mercury in their contents, nor of any portion adhering to their inflamed coats.

and intestines had been abundant. The stomach was in so irritable a state, that no medicine could be exhibited with any prospect of advantage. I concluded that the principal and more immediate source of danger consisted in the inflammation of the stomach ; and viewing the matter in this light, was induced to adopt the treatment proper for idiopathic gastritis *. The bleeding was pushed to deliquium ; a large blister was applied to the epigastric region, and the bowels kept open by frequent doses of *Oleum Ricini*. The employment of these remedies was productive, indeed, of great debility, which, however, was but temporary : the advantages procured were more permanent ; these were the occasional remission of the pain, and the immediate cessation of the vomiting, which never afterwards returned, excepting once in the course of the following night. An effectual check was given to the inflammatory process ; and a remission of the symptoms was obtained for about thirty-six hours ; during which the system shewed a tendency to return to its natural condition.

To this state of comparative convalescence, there

* Since this paper was written I have found that the employment of copious blood-letting in cases of poison from arsenic, had already been suggested by Dr. Yelloly, on the principle of removing inflammation. "Analogy," says he, "seems to indicate its employment; but its particular fitness can only be determined by experience." *Edinburgh Medical and Surgical Journal*, Vol. V. p. 393. I believe the case I have related is the first in which the experiment has been tried.

succeeded a new train of symptoms, threatening danger of a different kind, but of no less magnitude than the former. These were of a nervous nature, apparently resulting from the sedative action of the poison upon the nervous system. To this cause may be referred the sense of coldness and numbness over the body, of void in the stomach; the somnolency, the severe headach, the tremors and convulsions; the anxiety, and constant tendency to fainting. These, conjoined with the deadly paleness of the countenance, inspired me with apprehensions that nature would sink under the struggle. Assistance might have been afforded by stimulant remedies; but these were contra-indicated by the presence of many symptoms of irritation in the throat and *primæ viæ*, by the sensation of burning heat in these parts, by the hardness of the pulse, and occasional sharp pains in the region of the stomach, which implied that a disposition to inflammation still existed. I therefore ventured only upon small doses of camphor with peppermint water; and from these medicines relief was evidently experienced.

In the course of a day or two the above-mentioned symptoms had subsided; but it was only to give place to another state of disease of as formidable a kind. The pain in the stomach had gradually extended to the lungs, and was now accompanied with all the characters of pneumonic inflammation. Notwithstanding the exhausted

condition of the patient, I had again recourse to the antiphlogistic treatment, conjoined with diaphoretics, and with the same success as before. The pneumonia was subdued, and weakness was all that remained.

It might now have been presumed that no further obstacle to recovery would arise, and that the arsenic had exhausted its power of doing mischief. The fallacy of such expectations was soon apparent. It was still lurking in the system, although some days elapsed without its exhibiting any marked effect. On a sudden its activity was again exerted, and a new order of symptoms of the convulsive kind were excited. The fits were completely epileptic, being accompanied and followed by insensibility, which in the beginning was of such long duration as to excite fears for the event. These apprehensions were dissipated by the fits becoming every day shorter, and the recovery from each more rapid and complete. In the course of a week they had entirely ceased, and the patient has since remained free from any urgent complaint; although the constitution has evidently been injured by the deleterious influence of the poison.

It will be seen, by referring to the history of the case, that most of the symptoms which are enumerated by authors, as the ordinary consequences of arsenic, were exemplified in the present instance. There are, however, some which appear to me to

deserve particular notice, as I have reason to believe they are of unusual occurrence. These are, first, the severe pain in the forehead, which distressed the patient during several days; secondly, the great intolerance of light, that prevailed when the headach was most intense: thirdly, the various inflammatory affections of some of the viscera in the neighbourhood of the stomach, such as the lungs and spleen, which seemed to be secondary effects of the original affection of the stomach: and lastly, Epilepsy. This last disorder I do not find mentioned, by any author that I have consulted, as one of the secondary effects of arsenic; convulsions being only noticed among the violent primary symptoms which lead to a speedy death*.

I shall beg leave to subjoin a few observations on the method of analysis that was employed, with a view of determining whether arsenic was contained in the fluid that was rejected from the stomach of this patient at the time that I first saw her. Dr. Marcet was so obliging as to assist me in this

* Morgagni De Sedib. & Caus. Morb. LIX. 4. Lieutaud Hist. Anat. Med. Tom. I. obs. 154. Gmelin Apparat. Medicam. Vol. I. p. 253. Epilepsy is sometimes a consequence of the poison of lead. It is mentioned as such by Dr. Warren in the Medical Transactions, Vol. II. p. 86; and also by Sir George Baker, Ibid. III. 412.

inquiry ; and to him I am chiefly indebted for the following particulars.

The fluid, by being at rest for two or three days, had spontaneously separated into a thick mucilaginous sediment, and a clear supernatant liquor. The latter was filtered, and concentrated to a very small bulk. It was then of a brownish hue, and manifestly acid. The application of the usual fluid tests, namely, of water impregnated with sulphuretted hydrogen gas, and of sulphate of copper, with the previous addition of carbonate of soda, did not give the slightest indications of the presence of the suspected metal. The thicker part of the contents of the stomach, evaporated to dryness, and thereby reduced to a spongy coaly mass, burned without emitting any arsenical fumes.

The negative conclusion, deducible from these experiments, is still better established by the result of our trials with another test, which occurred to Dr. Marcet while engaged in the examination of the substance in question, and which I am happy in having this opportunity of communicating to the Society. Let the fluid, suspected to contain arsenic, be filtered : let the end of a glass rod, wetted with a solution of pure ammonia, be brought into contact with this fluid ; and let a clean rod, similarly wetted with a solution of nitrate of silver, be brought into contact with the mixture. If the minutest quantity of arsenic be present, a precipi-

tate of a bright yellow colour, inclining to orange, will appear at the point of contact, and will readily subside to the bottom of the vessel*.

In examining the circumstances attending the agency of this test, the following particulars were observed. On adding successively ammonia and nitrate of silver to distilled water, no precipitation takes place. Fowler's arsenical solution affords a precipitate of a yellow colour, similar in appearance to that produced by a solution of the white oxyd; but a solution of arsenic acid gives a precipitate of a red brick colour. The fixed alkalies, when substituted for ammonia, likewise produce a yellow precipitate; but the results are less distinct, since, in the circumstances in which the experiment is made, they decompose the nitrate of silver, an effect which ammonia does not produce. We found by comparative experiments, that the precipitates thrown down by the same re-agents, (namely, ammonia and nitrate of silver,) when either zinc, iron, copper, mercury, or lead, was contained in the fluid, had an appearance totally different from that produced by arsenic; and that the latter could readily be detected by the same means, notwithstanding the presence of these metals. The salts

* As this precipitate is soluble in ammonia, particular care should be taken to avoid adding it in excess; indeed, the quantity of either ammonia or nitrate of silver employed, can scarcely be too small for the purpose of detecting the presence of arsenic.

of copper or of lead, when previously mixed with a solution containing arsenic, occasioned no difference in the results. With a solution of oxymuriate of mercury, ammonia alone will occasion a white precipitate; but if arsenic be also present, on the addition of nitrate of silver, the precipitate immediately acquires a yellow colour. The efficacy of this compound test is not weakened, but, on the contrary, seems to be rather increased by the presence of sulphate of iron. Sulphate of zinc was not found to interfere with its operation, any otherwise than requiring a larger quantity of ammonia, in order to saturate the sulphuric acid; but when this has been effected, and the whole of the zinc precipitated, the addition of nitrate of silver produces the same yellow tint as in the other experiments. There is therefore reason to presume, that no admixture of metallic or other salts will occasion ambiguity, or enable the arsenic to escape detection, when the above test is properly applied*.

Being curious to determine the limit of minuteness in the quantity of arsenic discoverable by this test, we dissolved a grain of white arsenic in a known quantity of distilled water, and by successive additions of water to determinate portions of

* In referring to the different tests that have been recommended for the detection of arsenic, Dr. Marcet pointed out to me a paper, published in the Philosophical Magazine for May, 1809, in which Mr. Hume has proposed boiling the suspected matter with a solu-

this solution, prepared other solutions, containing respectively $\frac{1}{20000}$, $\frac{1}{200000}$, and $\frac{1}{2000000}$ 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, the precipitate was of a bright yellow colour. It was still distinctly yellow when the quantity of arsenic was reduced by dilution to one 50,000th of a grain. When further diluted, the yellowness was gradually less and less discernible, and the precipitate appeared of a light blue. It retained this colour until its quantity became too minute for observation. A bluish cloud was, however, very distinctly visible when the fluid examined contained only the 250,000th part of a grain of arsenic*.

If, along with the extraordinary degree of deli-

tion of carbonate of potash, and bringing into contact with it a stick of dry nitrate of silver; a method of proceeding, which is somewhat analogous to the one I have described, but which appears much less convenient in its practical application. See Henry's Experimental Chemistry, Vol. II. p. 389.

* Dr. Bostock, in instituting a comparison between the different methods hitherto recommended for detecting minute portions of arsenic, says, that "he has no hesitation in giving it as his opinion, that the most convenient, the most delicate, and the most decisive process, is the one in which the green precipitate is formed by the addition of the sulphate of copper." And he states it as the result of his endeavours to discover the degree of minuteness to which this test is capable of being carried, that it could detect arsenic when it formed one 2400th of the weight of the fluid. Edinburgh Med. and Surg. Journal, Vol. V. p. 170 and 174.

cacy of this test, we take into consideration the extreme facility of applying it, and the greater convenience of operating upon fluids than upon solid bodies, as we are obliged to do when we have recourse to the usual methods, it appears decidedly entitled to preference. I would, therefore, wish to point it out as deserving the attention of analysts, whenever the existence or the absence of arsenic in any substance is the object of their research*.

* *Note to the 2d Edition.*—See a paper by Dr. Marcet in the third volume of the Medico-Chirurgical Transactions (p. 342), containing remarks on the chemical nature of the yellow precipitate obtained by this test, and pointing out certain precautions to be used in its employment.

Note to the 3d Edition.—See also a note, by the same, in the sixth volume of these Transactions, p. 663; in which some other important circumstances respecting the detection of arsenic are noticed, and the most eligible way of obtaining a tangible quantity (however minute,) of reduced arsenic, is pointed out.