

Remarks on arsenic, considered as a poison and a medicine : to which are added five cases of recovery from the poisonous effects of arsenic, together with the tests so successfully employed for detecting the white metallic oxide, in which those satisfactory methods peculiar to Mr. Hume, were principally adopted, confirmed, and compared with others formerly in use / by John Marshall.

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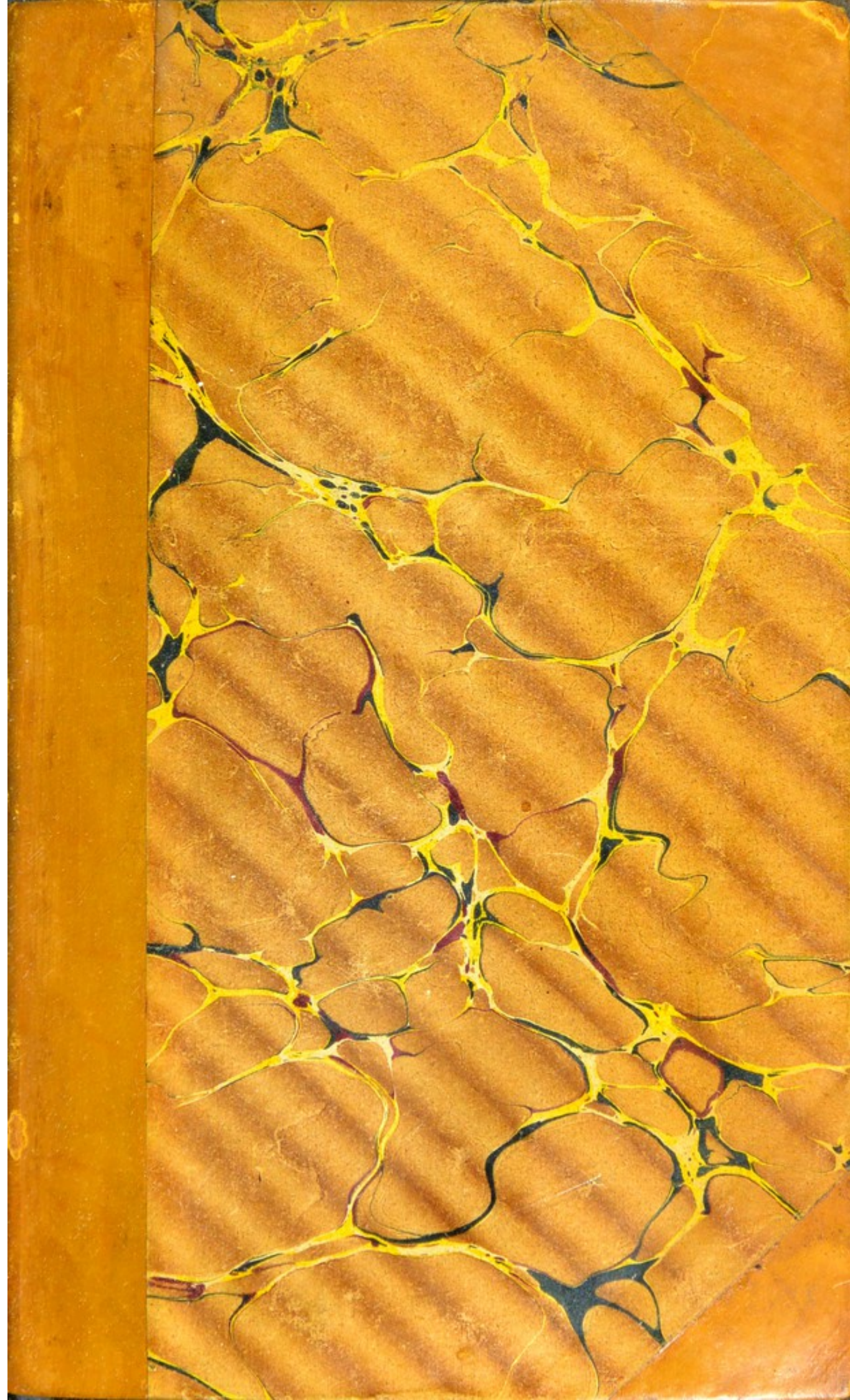
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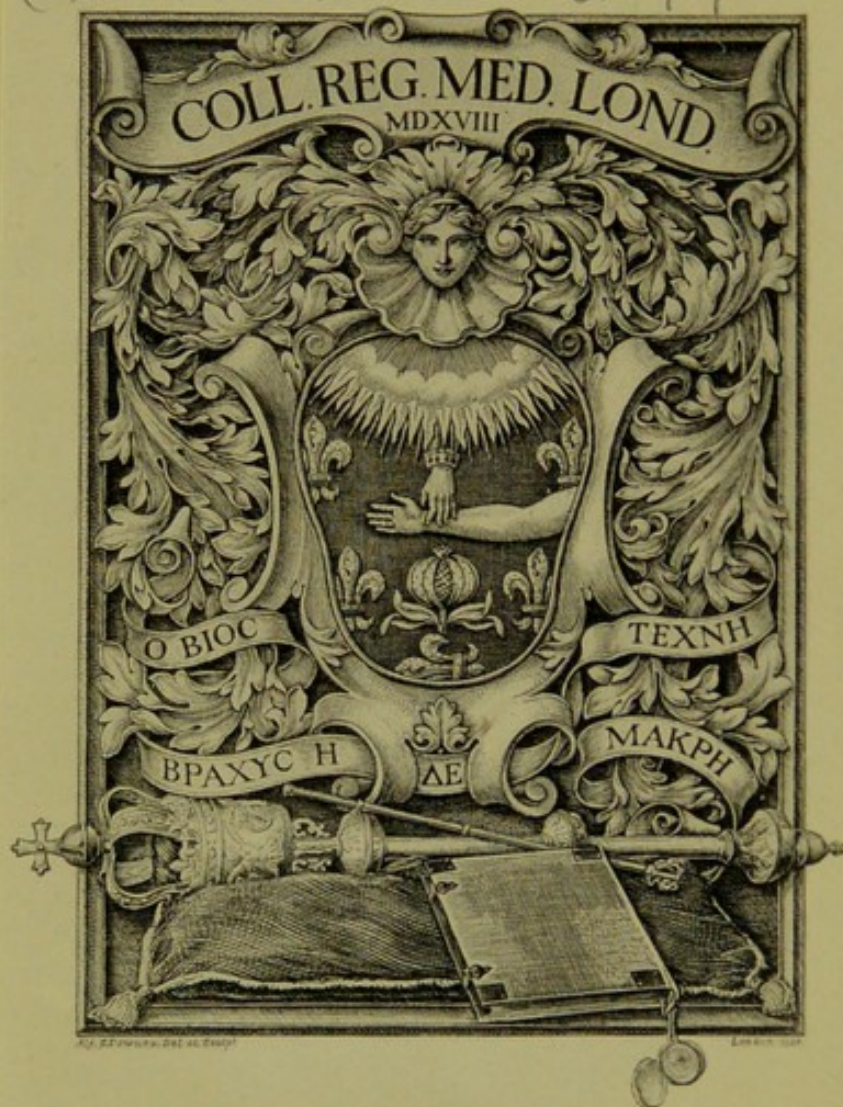


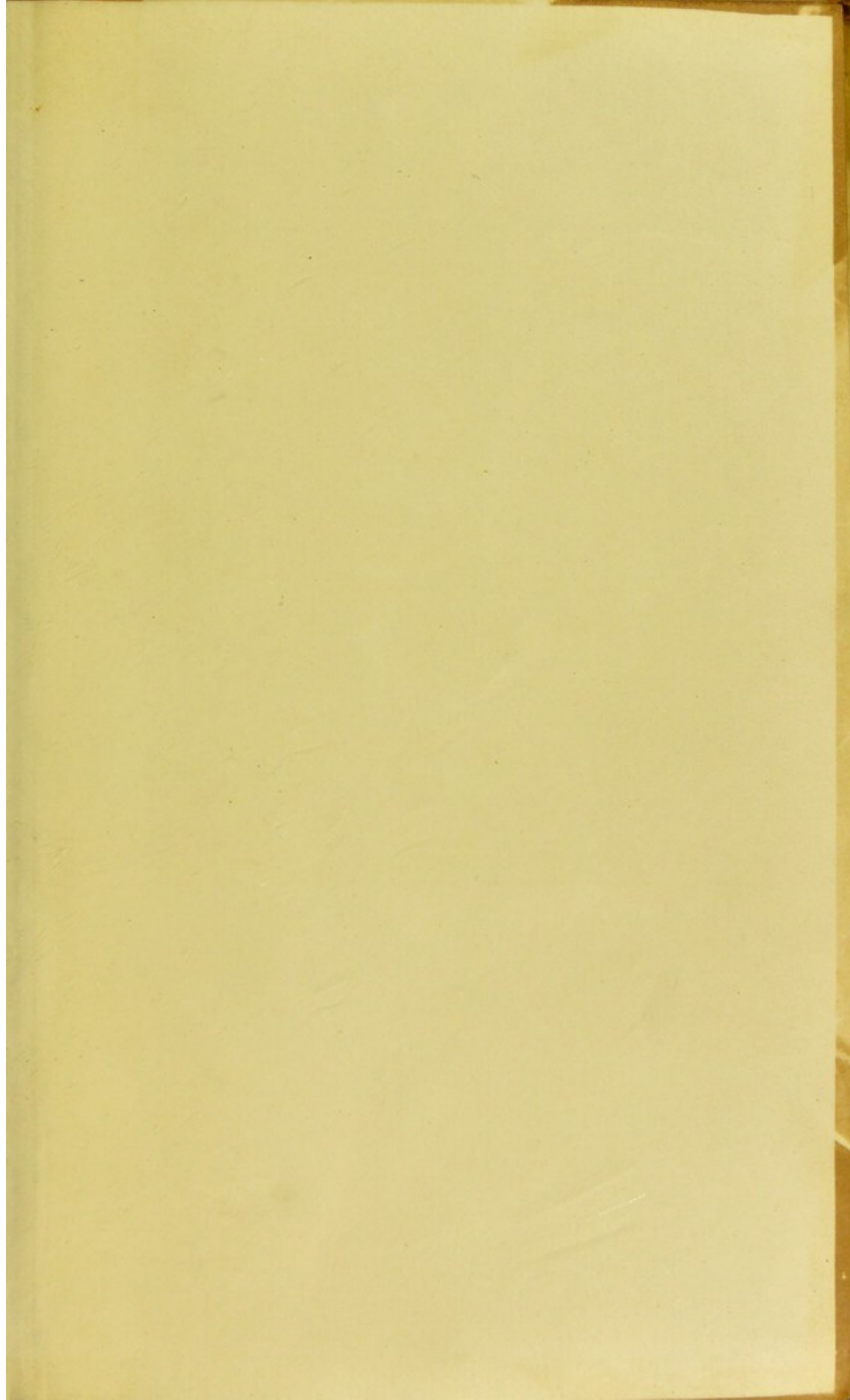
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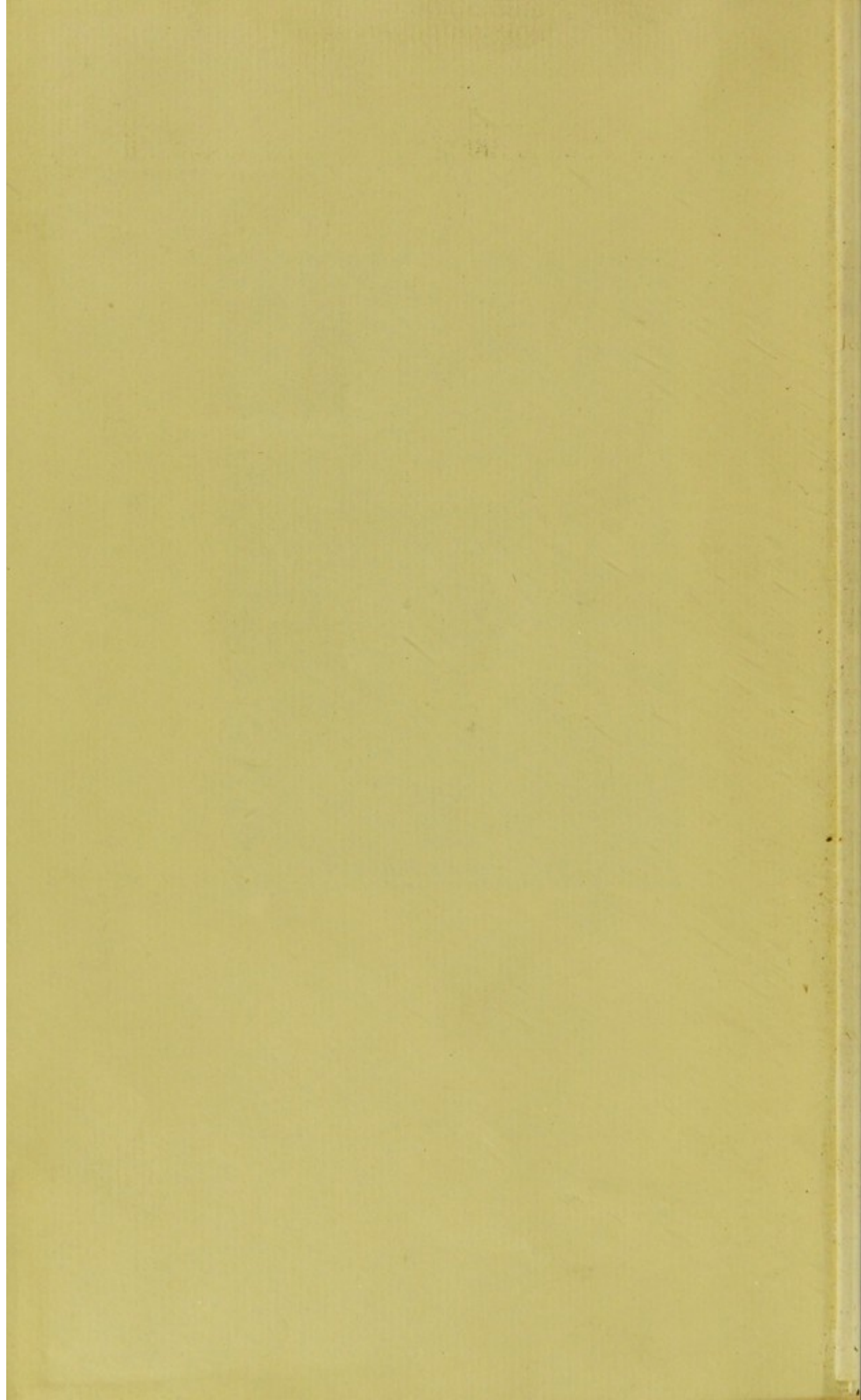


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From the author
to Dr. Baillie, with his
respectful compliments.

From the author
to the public, with his
respective comments.

REMARKS ON ARSENIC.

Printed by W. M'Dowall, Pemberton Row, Gough Square.

REMARKS ON ALGERINE.

REMARKS ON ARSENIC,

CONSIDERED AS

A POISON AND A MEDICINE;

TO WHICH ARE ADDED

FIVE CASES OF RECOVERY

FROM THE

POISONOUS EFFECTS OF ARSENIC.

Together with

THE TESTS SO SUCCESSFULLY EMPLOYED FOR DETECTING THE
WHITE METALLIC OXIDE;

in which

THOSE SATISFACTORY METHODS PECULIAR TO

MR. HUME,

WERE PRINCIPALLY ADOPTED, CONFIRMED, AND COMPARED
WITH OTHERS FORMERLY IN USE.

BY JOHN MARSHALL,

MEMBER OF THE ROYAL COLLEGE OF SURGEONS IN LONDON,
AND APOTHECARY TO HIS ROYAL HIGHNESS THE DUKE OF GLOUCESTER'S
HOUSEHOLD, &c. &c.

" Non doctis, sed discipulis,
" Non eruditis, sed erudiendis."

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ERRATUM.

Page 160, line 15 — For *arsenite* of copper, read
arsenate of copper.

PREFATORY INTRODUCTION.

THESE pages comprise practical and original observations, severally resulting from the effects of arsenic, as a poison, a medicine, and an external application; together with the chemical detection of that mineral substance, the retrospection of the symptoms, the treatment of the cases, and the various causes of recovery. As these subjects occurred, they have been subjoined and arranged under those distinct heads which form the present articles of the following work. Many additions are now made to my former publication on this subject,

which, in consequence of the flattering encouragement the last received from some professional men of the first celebrity, I am induced to reprint, the last edition being exhausted. As its reception far exceeded my most sanguine expectations, I have proceeded, thus supported with additional confidence, to prepare what is now offered to the public.

It has been my endeavour to render this little work useful to the faculty, and it is confidently anticipated, I hope without presumption, that the relation of the symptoms will be received with all the credit due to cases which rest upon the authority of an individual practitioner. All the circumstances, as they occurred, have been faithfully reported, and it has been my aim, in a practical point of view, to comprehend in one focus the various symptoms incidental

to the effects of arsenic upon the human frame, as far as five successful cases of recovery could afford proofs; together with some remarkable and novel indications, induced by the administration of the arsenical solution of Dr. Fowler.

THE circumstantial detail of the conduct of Eliza Fenning, both before and after commitment, have been omitted, considering those observations to be irrelevant to a work that is now principally designed for the perusal of medical men; and on this head those occurrences only are retained which are more immediately connected with medical reasoning, and the history of the cases.

THOUGH in these cases a hasty and simple experiment fully proved the presence of arsenic in the dumplings on the first night of the alarming effects produced by

their direful contents, yet it has been thought right to mention other methods, under a persuasion, that arsenic may frequently be present, in particles, too minute to be so easily detected. Mr. Hume's discoveries for the detection of the white metallic oxide, in the most diluted form, are therefore fully described; and they will be found infinitely to surpass, in beauty, rapidity, and accuracy, the crude methods that have been formerly had recourse to: these, however, are also enumerated, in compliance with those authors and lecturers on the science of chemistry who have recommended them; and in order more forcibly to exhibit the superiority and elegance of Mr. H.'s tests.

LEST the unpardonable vanity of attempting to appear arrayed in borrowed plumes should be sarcastically applied, I can neither dismiss my pen, nor conclude this pre-

fatory introduction, without thankfully acknowledging my obligations to Mr. Hume for the further able assistance which that excellent chemist has afforded me in the analytical department; and which it is hoped will be found to be studiously pointed out as frequently as opportunity has offered.

THESE observations are thus submitted to the candour of a liberal profession, and the author will be most amply recompensed should they recommend themselves to the smallest share of their notice and approbation. Throughout, the humble endeavour has been to substitute matter of fact for the splendour of diction, and artless relation for brilliancy of conception.

THE subject of these cases is comparatively new and unexplored, except from the short period of taking the poison, to the

more frequent cessation of its effects, which is too commonly and lamentably limited by the criteria of dissolution. The pleasure of preserving human life, every professional gentleman derives in the course of practice: the agreeable and enviable sensation of satisfaction arising from such successful instances, is, if possible, more especially augmented, in all those cases wherein the functions of the vital powers, in the plenitude of health, are so suddenly assailed and liable to be extinguished, as by the rapid and destructive operation of a deadly poison.

THE causes of recovery are fully explained; and that the measures which were speedily adopted and vigorously pursued, had a great share in the restoration of the patients, is most evident: for, had they been left to the sole operation and effects of the poison-

ous mineral, there can be no doubt, after an attentive perusal of the cases, that three at least out of five patients would have fallen a sacrifice.

THE public are fully acquainted with the dreadful catastrophe which suddenly befel Mr. Turner, law stationer, of Chancery-lane, and his family, on the 21st of March 1815, by the horrible attempt that was made to poison them. It was at that period considered a duty incumbent on me to publish my notes, on the progress of the symptoms in these interesting cases, with the mode of treatment that was pursued, and the chemical experiments. A faithful relation of facts has been strictly observed, which has frequently led to a repetition of the symptoms, as they occurred in each individual case; and as there were many variations, it would

have been impossible to have enumerated them all correctly under one head or case.

SHOULD the description attempted to be given of the various symptoms, the medicinal treatment, and the analytical experiments, &c. be found worthy the perusal of medical men, the most ample compensation will be derived by the author.

PREVIOUS to publishing my remarks, in the former edition, two reasons contributed to the delay. It was essential to wait the event of Mrs Turner's *accouchement*, in order to ascertain what influence the poison might possibly have on the mother and the infant. Mercy, too, at that time induced me to retard the publication, by dictating the propriety of withholding my sentiments until after the execution of the criminal.

Mrs Robert Turner was, at the time, advanced near seven months in her pregnancy, which critical period and situation rendered her case more alarming and interesting.— From the relation of all the remarkable circumstances, the bodily suffering and mental agitation, connected with this case, it will appear a matter of great surprise that abortion was not the result.

THE quantity of arsenic mixed in the dumplings must have been very considerable, for from the mere scrapings of the dish in which they were kneaded, when completely divested of the dough, and dried, I derived more than half a tea spoonful of the white mineral oxide. Another satisfactory mode of witnessing the free proportion which entered into their composition was, by cutting a piece of the remaining substance into thin slices; so that the white arsenious

particles became distinctly visible, being copiously distributed through the whole.


THE assistance of my much lamented friend and neighbour, Dr. Satterly, was strongly recommended by me, in these cases, but politely refused by Mr. Turner; in consideration of the late Mr. Ogilvy's co-operation during the first night, and two following days.

No. 12, *Half Moon-street, Piccadilly,*

May 1, 1817.

REMARKS ON ARSENIC.

&c. &c. &c.



ART. I.

*Five cases of recovery from the effects of arsenic;
with a full description of the symptoms, and
medical treatment.*

ON Tuesday evening, March 21, 1815, about half past eight, I received a very urgent message, brought by Mr. King, Mr. Turner's apprentice, to visit immediately Mr. Turner and his family, in consequence of their being poisoned. Mr. K. observed, the family were in the most deplorable state imaginable, and he feared that some of the sufferers might be dead ere I could arrive.

ON entering the house I first saw Eliza Fenning, the cook, lying on the stairs, apparently in great

agony, and complaining of a burning pain in the stomach, with violent reaching, head-ach, and great thirst. I directed her to drink some milk and water, and to be immediately conveyed to her bed; at the same time observing, that I would see her again as soon as possible, after having visited the rest of the family, who, I was then informed in the most anxious manner, by Mrs Turner senior, "were all four of them much worse than the cook." My attention was then directed to Mr. Robert Turner, who appeared to be nearly *in articulo mortis*; his face, which had been swollen, having assumed the appearance of the true *facies hippocratica*, my apprehensions were considerable for his preservation. On examining the contents of the utensils in which he had vomited, a fluid was perceived of a yellowish and greenish colour, and in two of them stercoraceous matter; the pulse was gone, his voice faint and tremulous; and he pointed to the abdomen in great agony. On examination I discovered a very remarkable irregularity of surface, occasioned by the spasmodic contractions of the muscles of the abdomen, and even of the viscera; this unevenness extended from the epigastric region to the pu-

bis, and to the right and left *hypochondrium*; and the excruciating pain was relieved for a short time by rubbing the abdomen with a piece of hot flannel and laudanum. From this state of the abdominal surface, there could be no doubt that the arsenic had gone far beyond the limits of the stomach, into the alimentary canal. He complained of extreme faintness, and dreadful sickness. Mr. R. T. had been violently purged; and on examining the alvine secretions, the singularity of their appearance excited great surprise; they were all of a bright homogeneous green colour, like paint, and strongly resembled the green colour produced from a solution of the arsenic by one of Mr. Hume's tests, the ammoniaco sulphate of copper, which will afterwards be more fully described. Each effort of vomiting and purging was preceded and followed by these painful gripings and spasmodic contractions of the abdominal muscles. Mr. R. T. complained of great heat in the stomach, which the patient compared to a furnace, or red hot irons, which sensation commenced at the tongue, and was felt throughout the course of the *æso-phagus* to the *cardia*, or upper orifice of the stomach; insatiable thirst, violent

head-ach, the eyes impatient of light, but the pupils sensible, and the extremities cold. The patient attempted, in this dreadful state, to get out of bed, to walk to the night table; he was directly seized with vertigo, dimness of sight, and palpitation of the heart; he fell down, and went off into an epileptic fit; he was assisted on the bed, and in a few minutes recovered from the fit.

Mrs Robert Turner had great pain and burning heat in the stomach, head-ach, immoderate thirst, vomiting and purging, with olive green alvine discharges, tension of the abdomen, the face swollen, cold chills alternating with flushings of heat; and light was painful to the eyes. Mrs. R. Turner's peculiar situation made me apprehensive of a miscarriage, in consequence of frequent bearing pains more or less constant in the loins; and, independently of these distressing symptoms, her mind was additionally agitated by the alarming state of her husband, who was lying by her side. If Mrs. R. T. had miscarried under these dreadful circumstances, there can be no hesitation in saying, she must have inevitably lost her life.

I NEXT saw, Mr. Turner senior with symptoms in many respects similar, though not quite so importunate as in the two foregoing cases: Mr. T. had the burning sensation in the stomach, vomiting, inordinate thirst, head-ach, the face swollen, tension of the abdomen; the purgative symptom had been more moderate. Mr. T. did not complain of light affecting the eyes; and the countenance was flushed, particularly on the upper part of the cheeks.

At this time, the late Mr. Ogilvy of Southampton-buildings, Chancery-lane, came, for whom I had sent, in consequence of his having been first called to the family, soon after dinner; and, as four hours had elapsed prior to my seeing the patients, it became desirable to know what methods that gentleman had pursued, lest I should interfere with his plan of treatment, and do harm in the critical situation of the patients. Mr. O. informed me he had given sugar and water plentifully, occasionally mixed with milk, and he had administered to each of them a full dose of castor oil. Mr. O. and myself then saw Mr. Gadsden, (Mr. Turner's ap-

prentice), who complained of a burning heat in the stomach, much nausea with vomiting, and severe gripings with purging, extreme faintness, palpitation of the heart, head-ach, and trembling of the right arm, and right lower extremity. Mr. O. and myself consulted on the best plan to pursue, to check the progress of these urgent and alarming symptoms. Finding Mr. O. had most judiciously and thoroughly emptied and washed their stomachs, and as we had every reason to suspect some portion of the arsenic had escaped into the alimentary canal, especially in the cases of Mr. and Mrs Robert Turner, and Mr. Gadsden, we resolved to persist in the purgative plan, and gave to each patient another full dose of castor oil, on two table spoonfuls of milk, and every four hours a solution of the *magnesiæ sulphas* with manna, in mint water; this dose to be alternated every two hours with the saline draught in the state of effervescence, letting the alkali predominate four grains to each dose, with the intention of neutralizing any possible remains of the arsenic, and relieving the disposition to vomit; and we further determined on persisting in the purgative system, until a more natural colour was

effected in the alvine secretions. The patients were allowed to drink frequently, and in small quantities, milk, soda water with or without milk, and mutton broth. Mr. T. and Mr. R. Turner, wished to have a draught of porter, but we strongly entreated them, also Mrs. R. T. and Mr. Gadsden, to abstain from beer, wine, and all fermented liquors, which they did for a fortnight afterwards, and likewise from animal food. Mr. R. T. once deviated from these directions, on Saturday the 25th, and the effects will be hereafter described, which will satisfactorily demonstrate the propriety of the plan of diet both here and subsequently recommended. Dr. Orfila, in his admirable treatise (vide English translation) on poisons, emphatically confirms this regimen, as in the following extract—"It must never be forgotten, that the success of the treatment depends in a great measure on the sort of regimen the patient observes during his convalescence, which is commonly long and painful. He ought to be principally nourished by milk, gruel, and rice creams, and he should be made to take nourishing broths." The thirst of each patient was so urgent, that they would readily have drank quarts, had they been permitted; and had we yielded to

their request, the vomiting would have been at this time unnecessarily excited, and Mr. O. and myself were apprehensive it might tend to increase the inflammation on the villous coat of the stomach, and augment the symptoms of debility. The thirst was somewhat allayed by frequently washing the mouth with cold water.

ON the following morning, March 22d, I visited the patients, who had all passed a restless night; the vomiting in each had greatly abated, the pain in the stomach was still violent, which they all compared to a furnace, or hot irons; the alvine discharges were changing to a proper colour, but intermixed with streaks of green, and highly offensive; the skin hot and dry, the pulse quick, varying in each case from 100 to 130, great thirst, and violent head-ach; their tongues white but moist; Mr. and Mrs. Robert Turner, and Mr Gadsden, could not endure a strong light.

THE supersaturated saline draught *in actu effervescentiæ*, with the addition of manna, was ordered to be continued, and the purgative mixture to be omitted.

Mrs. R. Turner's pulse was 130; this rapid circulation was accompanied with constant sensations of fainting; but the bearing pains, with the pain in the loins, had somewhat abated.

Mr. Gadsden appeared this morning to be the most afflicted; he had been seized with four epileptic fits in the course of the night, preceded by a violent palpitation of the heart, accompanied with a peculiar tremulous action of the right arm, and lower extremity; a considerable degree of symptomatic fever, insatiable thirst, a white but moist tongue, the face flushed, the respiration hurried, pulse 126, irregular and contracted, frequent gripings in the bowels, and spasmodic twitchings in the muscles of the chest and abdomen.

Mr. Robert Turner, in the early part of the morning had another attack of epilepsy; the symptomatic fever ran high, the pulse 120; he complained of spasmodic twitchings about the chest and abdomen, palpitation of the heart, great languor, accompanied with a constant sensation of fainting, tongue white but not dry, occasional chills, followed by an increase of heat, head-ach, and ver-

tigo. A dose of the purgative mixture was administered, and the same medicine as on the preceding day continued.

MR Turner senior appeared much better; the pulse 90, skin temperate, tongue moist and cleaner; the vomiting had subsided, but the stomach was in great pain; he complained of extreme lassitude; the face was flushed, and he had slept about four hours.

THE faces of all the four patients were swollen, with a fixed redness, more or less, under the eyes and on the cheek-bones; they had vomited two or three times in the course of the night, by drinking too copious a draught of the diluents recommended over night, and each complained of the tongue and lips being sore and swollen.

IN the evening the febrile symptoms had a little abated, the pain in the stomach was intense, occasionally remitting, and again returning with increased violence, with nausea, and vomiting, much pain in the head, considerable thirst, and the bowels were open in each of the patients.

MR Turner senior was better in many respects, and less oppressed by langour.

THE saline draught with manna was to be continued, and the addition of camphire mixture.

THURSDAY the 23d, Mr. Robert Turner had slept three hours during the night, the skin was moist and more temperate, the tongue less coated, not dry, but sore and swollen, the burning heat in the stomach rather less violent, and he expressed a degree of hunger; the pulse 98, spasmodic twitches in the arms and legs, with a cold sensation in the latter.

MR Gadsden had much fever, the respiration hurried, great thirst, violent and incessant palpitation of the heart, the fits had recurred twice in the night, he had had no sound sleep; if he went into a doze, he awoke suddenly, and much agitated; the pulse 120, spasmodic twitches, with tremor in the right arm and lower extremity, violent head-ach, and the eyes painfully affected by light; constant vertigo, which was increased if he attempted

to sit up in bed, or upon the slightest exertion. A wine glass full of camphire mixture was ordered to be taken frequently. The patient received so much relief from this, that he asked for it often with eagerness. The saline effervescing draught, with manna and camphire mixture, was repeated every four hours.

Mrs. Robert Turner had slept three hours in the course of the night; pain in the loins constant, with occasional bearing down of the womb; the thirst rather less urgent, the pulse 110, head-ach, vertigo, great intolerance to light, the tongue white and moist, the skin hot, frequent palpitations of the heart, and a constant sensation of fainting; a numbness extending from the right side down to the foot; the burning sensation of the stomach was excited and increased by the motion of the child *in utero*; the face was flushed and swollen, and the tongue and lips sore, which extended along the course of the *æsophagus*.

THE same medicine as yesterday was continued, and a wine glass full of camphire mixture taken frequently, when faint.

MR. Turner was considerably better, the pain in the stomach occasionally troublesome, the appetite returning, the face less swollen, but flushed and red under the eyes and on the cheek-bones, extending towards the ears.

FRIDAY the 24th, the febrile symptoms had considerably subsided in each of the patients, and they had passed a more tranquil night. They complained of a variety of singular nervous affections, tingling and burning sensations in the hands and feet, in Mr. R. Turner beginning at the extremity of the fingers, and gradually creeping to the shoulders; sometimes one foot, and at others both affected with a burning feel, commencing at the toes, and gradually rising above the ankle joint; palpitation of the heart, great depression of the spirits, with a perpetual sensation of swooning, and frequent twitchings of the muscles of the chest and abdomen, and of the upper and lower extremities.

MR. Gadsden had experienced in the night only one attack of the epileptic fit, and had slept three or four hours towards the morning; the

pulse 100, the breathing less hurried and more natural. The vomiting in each patient had wholly subsided, but they all endured the burning feel in the stomach.

Mrs. Robert Turner complained of violent head-ach, and to light she had still a great objection, as it, immediately on accession, increased the head-ach; at times the heart palpitated strongly, the thirst was considerable, the pulse 100, the tongue less charged and moist, the child *in utero* moved with vigour, and whenever this occurred the pain in the stomach was increased, with nausea.

Mr. Turner senior was nearly recovered.

The same medicine continued, with the camphire mixture.

In the evening they were all four evidently in a progressive state of convalescence; the febrile symptoms diminished, the pulse slower, less tremulous and contracted, more natural and open in the beat: the pulse in Mrs. R. Turner continued at or about 100 for a fortnight afterwards.

I now entertained confident expectations of their recovery, pronounced them out of danger, and began to be inspired with hopes of Mrs. R. Turner completing her full period of gestation, which prognostic, it affords me considerable pleasure to state, was realized, as Mrs. R. T. went her full time, and a very fine girl was born, after a safe but lingering labour.

EVERY experienced practitioner in the obstetric art, knows by what comparatively slight and trivial causes the process of parturition is occasionally delayed, or even suspended: and the reader cannot be surprised, that Mrs. R. T. should have had a lingering labour, after having undergone such severe and unusual sufferings and anxieties. But, during her labour, an unavoidable degree of solicitude prevailed respecting the child, and notwithstanding she made every effort to divest herself of apprehension, yet it was almost impossible for her to erase from her mind the persuasion that the effects of the arsenic had extended itself to the foetus.

THE child was entirely free from all arsenical

influence or affection. As experience in such a case is extremely rare, and Heaven grant it may continue so, neither time nor opportunity was lost to dispel the mother's fears, by examining the babe immediately after its birth, with more than ordinary scrutiny, and I could not detect the slightest variation from one born under the most natural and usual occurrences, and the several functions of the human body were in no way affected.

THE mother recovered from her lying-in much in the usual manner, without experiencing, at that time, any further ill effects from the symptoms produced by the white arsenic.

ON the next morning, Saturday the 25th, the symptomatic fever in each patient had wholly subsided, their tongues were cleaner, and the nervous symptoms much the same as on the preceding day; the appetite returning, and Mr. R. T. complained of hunger more than the rest. Well-boiled vegetables, puddings, eggs, and milk, were recommended, and he was enjoined most carefully to abstain from animal food and fermented liquors.

MR. Gadsden had a relapse of the fit shortly after I had left him over night, which had been preceded by palpitation of the heart and the tremulous agitation of the right arm and lower extremity; the fit lasted near two hours. They all still complained of the burning heat in the stomach: this symptom was constant and more severe in Mrs. R. Turner, who had it without intermission: this was attributed to her peculiar situation, the viscera pressing more constantly upon the tender state of the coats of the stomach; and Mrs. R. T. felt, for many days afterwards, an intolerance of light, accompanied with head-ach; she persevered in the recumbent position for a fortnight afterwards, which relieved the pain in the loins, and kept off, or lessened, the disposition to the bearing pains of the gravid uterus.

ON the following day, Sunday the 26th, they were all convalescent, except Mr. Robert Turner, who had gone contrary to my directions, by eating at dinner on the preceding day a free portion of animal food, and drinking a tumbler of porter, which caused a slight relapse of the fever; and he endured so much pain in the stomach, that he readily pro-

mised not to touch animal food or porter again, until fully permitted. Mr. R. T. had passed a restless night, with much thirst, and was again attacked with the spasmodic twitchings in the chest and upper and lower extremities; he took a dose of the cathartic mixture, and by afterwards living on a low diet and then strictly adhering to my directions, having suffered so severely by this transgression, this patient was soon relieved from the exacerbation of the symptoms.

THIS practical example of increase and recurrence of the sufferings, thoroughly confirmed the evident propriety of laying my injunctions more absolutely, in each case respectively, on the dietetic plan, as the prospect of recovery would have been materially endangered by the slightest deviation from such restriction. Those persons, who have survived six or eight days the first effects induced by the poison, it is not unlikely, might have caused their dissolution by some irregularity of this sort. The return of the appetite as soon as the symptomatic fever subsides is the more dangerous, as it is delusory and extremely liable to lead the patient and even the practitioner into an error. The weakened tone

of the digestive functions of the stomach cannot be too minutely regarded until at least a fortnight or more has elapsed.

MR. Gadsden experienced an epileptic fit at eight o'clock the preceding night, and it returned daily and periodically about the same hour every evening for a fortnight afterwards; the fit generally lasted near two hours, and he required, from the violence of his struggles, the assistance of several persons to hold him whilst the epilepsy continued. On recovering he looked wild, forgot where he was, and talked incoherently; and, as he gradually emerged from this state, complained of extreme langour, with great prostration of strength. Towards the latter end of the second week the fit became shorter, and less severe, and he sooner recovered when out of it; and at the expiration of a fortnight from the first effects of the poison, he enjoyed an interval of seven or eight days without a relapse; hopes were then entertained that he was recovered—"the fits becoming every day shorter, and the recovery from each more rapid and complete," agreeably to the observation of Dr. Roget, in his very interesting case of recovery from the effects of arsenic, publish-

ed in the Medico-Chirurgical Transactions, vol. ii. But they again returned, with the same or even greater degrees of violence, and it is necessary to state that Mr. G. has been afflicted with the fits up to the present time; he was then about seventeen years of age, appeared to have outgrown his strength, possesses very delicate stamina, and serious apprehensions are still entertained of the result, as the fits hitherto seem not in the least to yield to the remedies that have been employed. I attended Mr. G. about three weeks, but he was obliged to leave Mr. Turner's office, and return to his parents, in consequence of the frequency of the relapse of these fits.

ON the 30th Mr. R. Turner complained of a very singular affection in the upper and lower extremities; the arms were several times in the course of the day seized with a numbness and prickling feeling, accompanied with a sense of great weight, like what is commonly called, the part being *asleep*; and this symptom continued daily, more or less frequently, for six weeks, but, upon raising the arms in an upright position it immediately subsided. The same feeling almost as constantly attacked the legs,

but occasionally with, and sometimes without, the corresponding affection of the arms; the legs were some minutes longer affected, by reason of his not being able, as he himself observed, to place them in the same position as the arms.

WITH regard to the case of Eliza Fenning, it is indispensably requisite to make some remarks, otherwise it may appear singular not to have mentioned the succession of the symptoms which related to her. Those of the first night have been already described; the next morning she was much better, her face flushed and swollen, and she complained of burning pain in the stomach, head-ach, and dizziness. This patient most obstinately resisted all remedy; and as the manner in which she did it has already been stated and signed by me and the late Mr. Ogilvy, in the Observer, Aug. 6, 1815, it may be as well here to introduce this document in corroboration of what I have asserted.

“IN consequence of the late popular and tumultuous proceedings in Chancery-lane, against Mr. Turner and his family, Mr. Marshall and Mr. Ogilvy lament that they had not an opportunity

of stating, upon the trial of Eliza Fenning, what they consider as an additional proof of her guilt.

“ ON Tuesday night, the twenty-first of March 1815, and on the Wednesday morning following, Eliza Fenning most obstinately refused all remedy. After administering the medicine they deemed essentially necessary for the relief of the suffering patients, they lastly went to the garret, to give the same to Eliza Fenning: on recommending the identical remedy which Mr. Turner, Mr. and Mrs. R. Turner, and Mr. Gadsden, had most readily taken, Eliza F. said “she would not take any thing; she had much rather die than live, as life was of no consequence to her.” Mr. M. and Mr. O. said they must insist upon doing their duty, and urged her to take the medicine; the face was swollen, and her stomach in great pain, &c. By perseverance and much persuasion they at last induced her to comply with their request. Before she took it, she again repeated these words—“she had rather not, she would sooner die than live, life was of no consequence.”

PARTICULAR directions were given by Mr. M.

and Mr. O. for the repetition of the medicine through the night, to Mrs. Turner senior, who was present during this interview, together with Mr. Abbot her son-in-law. Mrs. Turner senior most humanely undertook to pursue their directions, in consequence of her sitting up all that night, and many subsequent ones, with the family. The next morning Mr. M. and Mr. O. saw Eliza Fenning, and to their surprise she had not taken a single dose during their absence: on again reasoning, and kindly remonstrating at the neglect, she repeated the same assurance of "preferring death to life, as the latter was of no consequence to her."

It is necessary to observe, that, in the course of practice, I have met with various instances, as well as the rest of my brethren, of individuals who had rather part with life than take advice or medicine: but however obstinate in general these might be, in ordinary sickness, were they to be menaced with the dangerous effects of poison, by accident, they would all of them most eagerly submit to any directions offered, unless a pre-determination of self-murder was adopted.

ON Thursday morning, March 23d, about twelve o'clock, she was removed from Mr. Turner's house in Chancery-lane, in custody of a police officer (Thissleton), and that day committed to Clerkenwell new prison, on the serious charge of having poisoned the family; and for this horrible attempt she afterwards most deservedly suffered, and expiated her crime by the just sentence of the law.

ART. II.

Reflections on the natural and artificial causes which necessarily contributed to the recovery of the patients, with practical observations; and some remarks on the treatment of epilepsy.

THESE cases serve to illustrate the possibility of recovery after a considerable portion of arsenic has been taken, and in Mrs. R. Turner's case, under the most unfavourable of all circumstances, during utero-gestation, and at the more critical period of near seven months; and their recovery was attributed to the speedy and spontaneous operation of the arsenic, both as a powerful emetic and purgative; and no doubt to this joint operation the patients owed their immediate chance of escape from the imminent danger that awaited them; and by plentiful dilution, the stomach was wholly relieved and cleared from the deleterious particles;

and the portion which escaped into the alimentary canal must have been carried from its surface by the powerful cathartic action of the poison. The severe injury which the arsenic had effected upon the coats of the stomach, the nervous system, and the circulating fluids, could not immediately cease, although the exciting cause had been effectually and promptly removed.

THE happy recovery of the patients may be further and justly ascribed, independently of the above operation, and of the practice adopted, to the very peculiar *tough* and almost *horny* composition in which the white arsenic was fortunately incorporated; as it was with considerable difficulty the remainder of the heavy yeast dumplings could be dissolved in water, even after having been grated and almost pulverized. The solvent power of the gastric juice is too well known to need description, and no doubt its influence must have a very superior power to various external or artificial means of solution; yet there are many other forms or substances in which the poison might have been mixed, that would have had a much more serious and fatal tendency, by presenting a more increased surface

to the coats of the stomach, as there was unquestionably arsenic enough in the dumplings to have destroyed a dozen families.

THE poisonous mineral oxide, being enveloped in this tenacious aliment of heavy dough, it no sooner excited spontaneous reachings, than each of those early efforts dislodged from the stomach many grains of the arsenic that never came in contact, it is reasonable to suppose, with the villous coat of that vital organ, and which most likely were still embodied in undigested portions of the dumplings, notwithstanding the act of mastication must have greatly augmented the superficies of a given quantity, and thereby facilitated the process of solution, by the active powers of digestion. It is worthy of remark, that the yeast dumplings, which were five in number, proved to be extremely heavy, or dense, in their texture, a circumstance frequently arising, and always ascribable to some trifling neglect in the culinary process; this peculiar vicidity cannot be attributed to the poison which they contained, so irresistible is the force of fermentation, and the consequent extrication of the carbonic acid gas, it probably could not have checked

It suffices it to say, after the foregoing observations, it was a happy incident that the aliment in this case proved to be so glutinous, as it is fair to conjecture, the lighter and more porous the food, the greater the facility of digestion, and *vice versa*, the heavier the more difficult.

I AM fully aware that bleeding has been tried and recommended by practitioners in similar instances, and disposed to think almost every lady, with very few exceptions, during the nine months of utero-gestation, is more or less in a plethoric state. The propriety of adopting the use of the lancet was maturely considered in Mrs. R. T.'s case, but in consequence of the sudden symptoms of general debility and faintness, attended with so rapid and feeble a pulse, that if this remedy had been resorted to, probably under such circumstances it would have done an infinity of harm. The favourable result of all these cases fully bears me out in the several remedies applied; the principal of which I consider the purgative, which does not cause so great a prostration of strength, so necessary to guard against in these cases of extreme exhaustion, as the loss of blood;

and when the arsenic has gone beyond the limits of the stomach, after due attention has been paid to washing and clearing that organ, the most eligible mode of relief is by purging. The necessity of pursuing it appeared evident from the singularity of the alvine secretions; and was confirmed almost in proportion as these assumed a more natural colour, and the streaks of green, that were for several days intermixed, began to disappear, that the symptomatic fever gradually subsided, and the pain in the stomach became less constant and urgent. By attempting to withhold the purgative for twelve or eighteen hours, for many days after the first attack, the patients were not so well, from the increase of pain in the stomach, and so sensible were they of the relief derived from the use of the purgative medicine, they several times even asked for its repetition; which alleviation may be easily and satisfactorily accounted for on the following principle.

UPON a slight accumulation of fæces in the large arch of the colon, its contents pressed upon the tender coats of the stomach, the pylorus,

and the duodenum, and thereby excited an increase of suffering.

IN Mr. Gadsden's case there was a remarkable variation as to the time which elapsed prior to the serious attack of the symptoms that have been already described, and it is here deemed necessary to be noticed. The patient had previously dined at two o'clock on a beef steak pie; about an hour and a half after finishing his dinner, he ate about the size of a walnut only, of the remains of the yeast dumplings, in the kitchen; and would have taken more, but for the observation made to him whilst in the act of eating the dumpling, by the cook, Eliza Fenning—"Don't eat them, they are cold and heavy, and will do you no good;" and this caution being repeated in a very eager manner, he immediately desisted. (Mr. G. stated these words to me and to Mr. Turner's family repeatedly). About an hour after swallowing this small portion of the yeast dumpling, he became sick, and vomited twice, then felt quite well and was able to go to Belmont-place, Vauxhall, for Mrs. Turner senior, and not until he arrived there was he in the least aware of being poisoned.

Mr. G. became seriously ill, with an excruciating pain and a burning heat in the stomach, and then felt so much alarmed he thought he should have died. As soon as seated in the coach, to return with Mrs. T. to Chancery-lane, he began to vomit, and continued to do so almost without intermission the whole of the way. Probably there are two reasons to assign for his not suffering sooner: first, Mr. G. having so recently dined, prior to his partaking of the yeast dumpling, the coats of the stomach might be longer defended from contact. Secondly, the minute quantity eaten in proportion to the rest of the family. Hence it may probably appear that a small dose of arsenic would be longer in producing its effect, under the foregoing circumstances, than a much larger one, as the latter would have a more immediate action, both as an emetic and cathartic. And this case serves to illustrate, that equal mischief may ensue from either quantity. Mr. R. Turner had eaten a dumpling and half, and the arsenic appeared to be very accurately mixed in the dough, which was fully discovered by cutting into thin slices the remains of the dumplings, which I had an opportunity of examining and analysing

by a double test, viz. its effect on copper, and the alliaceous fumes.

THE very remarkably green colour of the faeces not having been generally noticed by authors, probably this may be the first time of its being thus particularly mentioned; and that it may consequently be considered in future, as one of the symptoms characteristic of the presence and effects of white arsenic, when accompanied with other corroborating and concomitant symptoms*. In the course of near twenty years practice, I never wit-

* Since writing the above, I have met with a work by Henry Baker, F. R. S. and M. S. A. entitled Employment for the Microscope, London, 1764, Part I. page 133, wherein is inserted the following letter from Dr. Blair, to Dr. Mead, on the effects of arsenic upon the human body; wherein this symptom is particularly mentioned. —“ A lady, who, on tasting (by mistake) only so small
“ a quantity of white arsenic as adhered to the tip of the finger,
“ found herself within two hours in great disorder, grew faint, fell
“ in a swoon, and lost her senses before she could be laid in bed. A
“ physician being called, prescribed an emetic, which made her
“ vomit a large quantity of greenish liquor; after which she voided
“ by stool several globules of *greenish coagulum* of the bigness, colour, and nearly the consistence of, *pickled Olives*.” —“ The Doctor

nessed any thing like it before: the alvine excretions of new-born infants, and during the irritation of dentition, are well known to be frequently green, but very different from those here described. The great and morbid irritation excited by arsenic, when it determines to the bowels, must have an effect upon the biliary secretion, and may be somewhat analogous. But this curious matter of fact is submitted for the further consideration of more able physiologists.

Mr. and Mrs. R. Turner compared the sensation of the stomach to a ball of red hot iron, with rays of heat emerging in every direction, as from a common centre, and producing a sense of dragging, as it were, from its great weight. Shortly after being taken ill, they became so extremely flushed and heated, that they opened the window for air, the current of which, instead of affording relief, increas-

further observes "That these greenish coagula are what arsenic
" usually produces when internally given; the knowledge of which
" may be of use to those who may have occasion to open bodies on
" suspicion of their having been poisoned thereby. See also Blair's
" Miscel. Observations, page 62."

ed the evil so insufferably, as if by fanning the flame, that they were obliged to shut it down. They lost the entire skin of their tongues a short time after they had taken the poison. In Mrs. R. Turner the whole surface of the cuticle of the body peeled off by degrees, in furfuraceous scales.

MR. R. Turner, in attempting to extend either arm to reach any thing, found the fore-arm suddenly contract, causing him frequently to miss the object he meant to embrace. The arms of Mrs. R. Turner and Mr. Gadsden were similarly affected for many weeks.

FOR some time afterwards Mr. Turner had frequent and daily attacks of burning heat in one or both feet.

IN the former edition, the enumeration of the following symptom, which is rather new and singular, was unintentionally omitted. During the first evening and three or four succeeding days, three of the patients who were most severely affected by the poison, complained of a considerable degree of strangury, not amounting to a suppression of urine, but

whilst passing through the urethra, it was accompanied with a great sensation of a scalding heat. This extraordinary symptom probably denotes the absorption of the arsenic into the circulating fluids, and may afford an additional proof of its presence; and it may possibly be an effect peculiar to this mineral in poisonous doses, and be somewhat analogous to the irritation of strangury, so commonly excited by the external application, and consequent absorption of cantharides. In the case here quoted from Baker, of Otto Tachenius, who by merely inhaling the sublimed fumes of arsenic "*made bloody urine with incredible heat, &c.*" seems to have rather exceeded the limits of mere nervous sympathy, and strongly to favour this hypothesis. In so truly ignorant and very unusual mode of taking the white oxide by this celebrated chemist of former times, peradventure a considerable portion of the inhaled fumes might have been imbibed into the system primarily and principally by the medium of the lungs, as well as secondarily by the organ of the stomach*.

* In Baker's edition of "Employment for the Microscope," in that part of the work which treats upon arsenic, I am glad to find mentioned a corroboration of this symptom, as in the following

MR. Turner has lately informed me, that, at the commencement of the arsenic's violent effect on his son he was struck with additional alarm at the wonderful alteration it produced in his appearance: the countenance was of a complete yellow cast, and his features were so much altered and contracted, that Mr. T. scarcely knew him. When Mr. R. T. re-entered the room from whence he had withdrawn for the purpose of vomiting, he appeared strongly to resemble an aged man, so much so,

case, extracted from page 133, in his own language.—“ The fumes
“ or steams of arsenic are exceedingly pernicious, and commonly
“ distinguish themselves by an abominable stinking smell like gar-
“ lic; though *Otto Tachenius* says in his *Hippocrates Chemicus*, that
“ after many sublimations of arsenic, on opening the vessel, he
“ sucked in so grateful and sweet a vapour that he greatly admired
“ it, having never experienced the like before: but in about half an
“ hour, his stomach began to ach and became contracted; a convul-
“ sion of all his limbs succeeded, *he made bloody urine with incredible*
“ *heat*, was seized with cholic pains and cramped all over for an
“ hour or two; when these ugly symptoms were taken away by his
“ drinking milk and oil, and he became indifferently well, they
“ were followed however by a slow fever, like an hectic, which stuck
“ by him the whole winter, and of which he recovered very slowly
“ by a proper regimen in diet.”

that it was like a sudden metamorphosis from youth to age.

SINCE giving the above description of the state of the constitution and symptoms of Mr. Gadsden, he has returned from Cheltenham, greatly improved in his general health, and was fully able to resume his situation in Mr. Turner's office; the epileptic fits had left him about three weeks; but I have to regret the necessity of stating, that he has experienced a relapse, with increased violence and frequency, as the fits now* return every twelve, or at least three or four times in forty-eight, hours. For some minutes his sensations and distress of countenance generally indicate their approach; and since the short time the epilepsy has returned, the patient's health and strength have suffered materially.

IN epilepsy, phlebotomy is almost generally recommended; perhaps it may be of use in some plethoric cases, wherein the blood is liable to de-

* About three months subsequent to the commencement of the attack.

termine towards the vessels of the head, and in those patients who are more advanced in years or verging upon a state of apoplexy, or when attributable to the sudden suppression of a customary discharge, especially the catamenia. But in the course of my practice I have never witnessed any material advantage derived from bleeding in this disease. After the second relapse of the epileptic fits, Mr. G. was bled by the advice of Dr. Babington, but without the slightest mitigation of the violence or frequency of the attack; he was therefore again recommended to change the air, from which he derived considerable benefit. Two years have now elapsed since Mr. G. became thus afflicted by the arsenic, and he is still subject to frequent and severe recurrences of this frightful disease.

My worthy friend, Dr. Plenderleath, informs me that he has administered in epilepsy the *oleum terebinthinæ* with the greatest possible success in many instances, in doses of thirty drops, *ter quotidie*, rubbed down with mucilage and mint water; should the fit recur twice a-day it will speedily reduce it to once, and in less than two or three days entirely cure the disease; but he has usually

continued the repetition of the dose for a fortnight or three weeks, to perfect the cure and prevent a relapse. Dr. P. has observed, that after the patients have taken this medicine three or four days, they have felt an unusual sensation of warmth all over the frame, accompanied with a degree of exhilaration of the spirits.

THIS communication is truly valuable, as every practitioner has no doubt more or less experienced the difficulty of subduing effectually this frightful disease, which too often proves the inefficacy of all other remedies formerly in use. It would have afforded me much pleasure in seconding this information by a recital of epileptic cases relieved within my own experience, in corroboration of that of Dr. Plenderleath.

Tænia is sometimes, and not unfrequently, the immediate or exciting cause of epilepsy; and as the *oleum terebinthinæ* is a well known specific for the destruction of the tape-worm, in which case I have frequently given it with the utmost success, in the full dose of one ounce or twelve drams, and

seldom have had occasion to repeat it, in the same subject, possibly some of the patients mentioned by Dr. P. have laboured under this disease; if so, it may be inferred, that a less formidable dose, repeated in the manner described, is likewise adequate to the cure of *tænia**.

* In vol. v. of the Medical Transactions, Dr. Latham, President of the College of Physicians, &c. &c. has written an admirable paper, wherein he forcibly recommends the *oleum terebinthinæ* as a cure for epilepsy. The Doctor's reasonings somewhat coincide with what is here advanced; of which I was not aware until pointed out by my learned friend and neighbour, Dr. S. Merriman. It is deemed necessary to insert the following quotation in corroboration of these reflections, (page 72). " My practice, it may have been observed, " has hitherto been confined to the exhibition of one large dose, and " I have afterwards waited until another paroxism; but I cannot " help saying, that after such an exhibition once or twice, in the " event of the recurrence of the fits, *it would seem much more rea-* " *sonable to pursue the plan of giving the same quantity daily in di-* " *vided doses, as practised by Dr. Percival*, who, in a letter just " received from him at Dublin, confirms to me his former " good account of its efficacy; and at the same time most " handsomely acknowledges that he first employed this remedy " from the recommendation which I had given of it in my book " on diabetes." In the same volume of the Medical Transactions,

ART. III.

Arsenic considered as a medicine; together with the relation of some extraordinary and novel effects produced by its administration, in the medicinal form of Dr. Fowler's solution.

IT appears that several attempts have been formerly, as well as recently, made to introduce this powerful mineral oxide into the *Materia Medica*, since various formulæ into which arsenic enters as an ingredient, are to be found in the *pharmacopeiæ* of medicine and surgery. Mr. Boyle mentions a balsam made of this substance, with nitre and spirit of wine, or vinegar, as efficacious in the cure

two cases of epilepsy, successfully treated with the *oleum terebinthinæ*, are mentioned by Dr. Young, F. R. S. &c. &c. wherein a preference is given to the full dose.

of venereal ulcers. Dr. Cheyne has also given a formula for pills made of arsenic, as used for the cure of obstinate quartans, which was in consequence of his recommendation adopted by many physicians for this particular purpose. It must however be acknowledged, that in the administration of so potent a medicine, by much the safest manner is in the modern form either of Dr. Fowler's or Macquer's arsenical salt in solution, the *aqua arsenici* of Bartholomew's hospital; in these elegant medicinal preparations, the dose being more accurately divided, can probably be regulated or restrained in its operative effects with greater precision; but even such formulæ, however improved, require a great degree of circumspection, as will be here fully and faithfully demonstrated. A French physician first prescribed arsenic in the soluble form, in water only.

It is supposed that this white oxide forms the basis of several empirical nostrums, which are employed internally as well as externally, and the latter more particularly in cancerous cases.

A NOBLE lord has informed me, that his son has

been severely afflicted with epileptic fits, in consequence of continuing the use of Dr. Fowler's solution of arsenic (*liquor arsenicalis*), which was prescribed in the usual doses, but persisted in for too long a time, in order to subdue an intermitting disease. Mention is made of this case, which is so highly and respectably authenticated, to prove the peculiar tendency which this mineral substance has to endanger one of the greatest calamities that can well befall the constitution, and to operate as a caution to the profession, and to induce them more narrowly to watch over the effects, during the administration of so powerful a medicine and reputed safe remedy in ague and chronic diseases.

MENTION has been made to me from good authority of the *solutio arsenicalis* of Dr. Fowler having been actually prescribed for the relief of epilepsy! This reminds me of an accident which befel a coachman of the late Sir Richard Jebb, who one day through excess of liquor fell from his box and broke three of his ribs, he was conveyed immediately into the shop of the nearest apothecary, who, in order to relieve the pain in the side, and the

difficulty of breathing, clapped a huge blister over the crepitating ends of the fractured bones!

I HAVE learnt from Dr. Johnson, an able and experienced physician at Weymouth, two very interesting cases of an intermitting type, wherein he administered Dr. Fowler's solution of arsenic in doses commonly prescribed, and after pursuing the use of this remedy for the short period only of *ten days*, a paralysis of the upper and lower extremities in each of the patients intervened, and ere they recovered they continued in this deplorable state nearly six weeks.

IN one of these patients the tongue first became so completely paralytic, as to destroy the power of distinct articulation.

THESE sad effects of the remedy employed for the cure of a milder disease, fully exemplify and prove, that the arsenical solution was the cause of inducing another, infinitely more formidable and alarming. It is not unlikely, that some constitutions may be more susceptible, or readily affected

by the injurious effects of arsenic than others, as is daily exemplified in the operation of mercury, whether administered internally or externally, and if so, it may also render the dangerous uncertainty of giving the *liquor arsenicalis* of greater consideration. It may not be extravagant to suppose, that arsenic can be retained in the system in a similar manner to mercury, and to obviate the deleterious effects during a course of this mineral solution, it may probably require the frequent use of an alterative or a purgative, to prevent such an accumulation and corresponding violence to the constitution.

DR. J. had a number of patients at the same period under a course of this medicine, who took it as frequently, and precisely in the same quantity, and none of the rest were in the slightest degree affected in the manner described; which clearly illustrates the theoretical or rather practical observations here suggested, which are submitted for the further serious and more able consideration of professional men. Dr. J. became greatly alarmed immediately as he recognised these violent symptoms arising from such a dreadful example of its

effects, and he directly ceased to continue the practical application of the remedy in all the other cases.

THESE interesting occurrences may be of use in practice, therefore I have thought it my duty to communicate them, but not with a view wholly to depreciate a valuable formula, that ranks most deservedly high in the estimation of the profession, and is also sanctioned by the recommendation of the Royal Colleges of Physicians of the united kingdoms. The great utility of this medicine in the army, the hospitals, and private practice, needs no comment, but it is necessary that it should maintain the high reputation it has acquired for safety and efficacy on a candid and a more substantial basis; it is presumed that the instances here enumerated and so respectably authenticated will shew, that it ought to be prescribed with more circumspection, and accompanied or guarded by the free administration either of purgatives, or by those methods if approved, which will be subsequently recommended, with the hope of restraining its deleterious action upon the animal œconomy.

I AM greatly obliged to my friend Mr. Gregg,

Surgeon to the second royal Surry regiment of militia, for the following valuable communication on this subject, and which will be found highly interesting in a practical point of view, by further corroborating and clearly illustrating, the deleterious effects of the *solutio arsenicalis*.

IN the month of January 1809, the above regiment was ordered from its quarters at Ramsgate, to make room for the troops who were then returning from Corunna, to Reading-street Barracks in Kent, which are situated on an eminence immediately over Romney Marsh. Very shortly after arriving at these quarters, intermittent fever of every different species made its appearance in the regiment, and so rapidly increased, that Mr. G. averaged sick of that disease alone, including women and children, 130 *per diem*, for near three months; which number afforded an extensive field for practice by ascertaining the value or good effects that were to be received from the use of the different medicines which are recommended for the cure of ague. Mr. G. being the only officer of the medical department with the regiment, had an opportunity of using his own discretion; and after having had re-

course to the usual plan of clearing the *primæ viæ* by emetics or purgatives, as the cases might require, he then administered the bark in sufficient doses; but in many cases where the stomach either entirely rejected it, or where it could not be given in adequate quantities, and in others though taken, it failed to produce the desired effect. Mr. G. then deemed it advisable to have recourse to other remedies, and the next that appeared to him as most likely to be attended with advantage, was the *oxydum arsenici*, in the form of Dr. Fowler's celebrated solution; and never having used it before, he was determined to give it a fair trial; the result of which was very far from satisfactory. In the commencement, a dose of five drops was administered three times a-day, and gradually increased until it amounted to sixteen; upon its producing nausea, pain in the stomach or head, Mr. G. immediately desisted and gave purgatives, which became necessary in many instances. Mr. G. was however compelled to abandon the use of this remedy in consequence of the patients complaining of dimness in the sight, œdematous swellings of the legs, and considerable debility. In one case the dimness nearly amounted to total blindness.

My friend here remarks, that these affections, if not originally produced, which he is inclined to think they indubitably were, by the use of the arsenical solution, were certainly increased by it, as he did not perceive, nor had occasion to observe, the like symptoms in any of the patients who had not recourse to it.

THE only instance in which Mr. G. ever perceived the use of arsenic attended with any decided advantage was when administered in intermittents to children; who, he has remarked, required and bore larger doses in proportion than adults. And from the result of all the observations on the use of this mineral as a medicine, during eight years practice in the army, he has no hesitation in saying, that, any good effects experienced from the use of it, were often more than counterbalanced by the symptoms which he has so frequently observed arising from it, an opinion which is likewise sustained from practical experience by many medical officers who have communicated to him the same remark.

WHENEVER the use of bark has been found by this gentleman to be inadmissible, the next best substitute, in his opinion and experience, is the *subphas ferri*, with *infusum quassiae*.

Observations.

THE singular variety of symptoms of diseased action occurring to the constitution, arising from, and also exemplifying the medicinal application of the *solutio arsenicalis*, is extraordinary, and fully merits observation, and more especially, as the cases here reported are derived from the most respectable and unquestionable authorities. Dr. Johnson and Mr. Gregg are both experienced and well educated gentleman, possessing medicinal discrimination and talents of superior order. Whether these diversities depend upon a certain peculiarity or predisposition in the habit is a difficult physiological question to explain, and may probably for

ever remain a desideratum. Mercury produces in almost every instance a uniform order of symptoms that are indicative of its progress and effect, by the breath, tender gums, ptyalism, swelling of the tongue and submaxillary glands, &c. but this poisonous mineral does not declare itself by such positive gradations as to enable the practitioner effectually to regulate the action. It is usual to direct the patient while under a course of this medicine, upon its producing nausea, pain in the stomach or head, to pause and take a cathartic; but these symptoms are not invariably the precursors of mischief upon the constitution, for in most of the cases here enumerated, they escaped the observation of the patients, and also of those who prescribed it. Whilst, therefore, under a course of the arsenical solution, the patient will be liable to be suddenly attacked either with epilepsy, paralysis, œdematous swellings, or dimness of sight, symptoms which are fully exemplified by the preceding cases. It does not at present appear that two of these diseases excited by arsenic are likely to assail the same subject, except œdematous swellings and dimness of sight, which, in all probability, are depending upon a general anasarcaous af-

fection operating upon the system, which though sufficiently evident upon the extremities, may also be accompanied with *hydrocephalus internus*, and by pressure upon the optic nerves cause the dimness of sight, a symptom usually attending that diseased action of the ventricles of the brain, but frequently amounting to total darkness.

THE liberty of obtruding a further practical suggestion during a course of this medicine, it is hoped, will be excused, viz. to administer it in the usual doses for seven or eight days, then to allow an interval of four or five ere it is resumed; and during the cessation of the arsenical solution, if, for example's sake, the disease under cure be an intermittent, after a purgative, let bark, or the *sulphas ferri*, with *infusum quassiae* be substituted; by such a method the risk of incurring mischief might possibly be obviated.

MR. G. observes, that children bear this solution much better than adults. This probably may be attributed or accounted for on the principle of a greater proportion of mucous contained in the stomach and alimentary canal, thereby defending the

lymphatic vessels, reducing their capability of absorption and the acrimony of the medicine upon the internal coat.

THERE scarcely can be a doubt remaining, that numerous adverse instances, similar to these now recorded, have already occurred to many practitioners in the army as well as private practice, and probably the nervous fear of censure may have been hitherto the cause of restraining their publication, which alone is a mistaken principle to act upon, since it must be acknowledged that frequently as much information and real benefit to society are derivable from them as from more successful cases.

AFTER such experience of frightful symptoms, it may possibly remain more or less a matter of doubt with the faculty, whether arsenic is not one of those productions of nature which is attended in its administration with too much risk to be implicitly and indiscriminately relied upon; and the real advantages are probably under these circumstances scarcely sufficient to compensate for its injurious effects. A patient rendered either paralytic, epileptic,

dropsical, or blind, through the medium of this medicine, independently of his sufferings, would no doubt become a subject of sincere and lasting regret to the mind of a practitioner. It may perhaps be remarked that such symptoms or cases are rarely to be met with in practice: be it so, nor is it in my power to establish the ratio in which they may happen; but facts are stubborn, and these hereafter may, if practicable, lead to substantiate such a discovery.

ART. IV.

Further practical observations on regulating and modifying the dose of the SOLUTIO ARSENICALIS, and other preparations of arsenic, in order to prevent the risk of their injurious effects upon the constitution.

ARSENIC possibly may be classed in the *Materia Medica* with other pure metallic tonics that are obtained from the mineral kingdom, such as iron, copper, zinc, &c. Probably the operative effects of this powerful medicine upon the human frame may be somewhat analogous to those substances, by communicating a degree of healthful tension to the nervous system, and thereby allaying or arresting that tremulous and inordinate action, which the late Dr. Cullen termed the mobility of the nervous system viewed as a diseased affection.— Thus, retrieving the healthy, and destroying the morbid action, when judiciously kept within the limited powers of the constitution.

THIS mineral, either in solution or substance, when discreetly regulated as a medicine, it must be acknowledged becomes a powerful auxiliary to the *Materia Medica*; but commonly it seldom admits in the free augmentation of the dose, or long continued repetition with perfect safety. In this respect it essentially differs, as a remedy, from the generality of medicinal articles derived from the mineral and vegetable kingdoms. I have occasionally administered the arsenical solution, with considerable advantage, in intermittents, and more especially in cases of inveterate cutaneous diseases; beginning with five drops, and gradually increasing the dose to *eight*, never exceeding that number; repeating it twice and rarely three times a-day, combined with other tonic medicines, also adapted to the cure of the case. After pursuing its use for a fortnight or three weeks, the solution has been uniformly discontinued for an interval of eight or ten days, and ere its resumption the medicines with which it was combined have been alone continued. By strictly observing these precautions, the adverse symptoms here described have never occurred. However obstinate a disease may prove in itself, during a course of this

potent remedy, the progressive increase of a variety of other poisonous productions of nature with impunity, does not apply, or even admit, a theoretical comparison. There can be but little hesitation in pronouncing, after these severe illustrations of cause and effect, that the regulated doses at present recommended in many of the pharmacopœiæ of medicine and surgery, from five to fifteen minims, being nearly equal to twenty drops, *bis vel ter quotidie*, require some modification, being too hazardous, and likely to produce mischief.

THE *liquor arsenicalis* of Dr. Fowler, contains four grains in each ounce by measure. The white oxide requires fifteen parts of boiling water, and eighty of cold, for its solution.

By a very interesting conversation, lately held on this subject with Dr. Brown, Member of the Royal College of Physicians, and senior Physician to the general sea-bathing infirmary at Margate*, I find

* This charitable institution, for the benefit of the diseased poor, is situated at Westbrook near Margate, under the patronage of H. R. H. the Prince Regent, &c. &c. &c. It was established in

that his mode of administering this medicine, nearly corresponds with my own. Dr. B. in cutaneous diseases, has uniformly limited the full dose to five drops twice, and but rarely three times a-day. This singular coincidence of cautionary limitation of the dose, adopted by so able and expe-

1796. The progressive increase of patients admitted from that period has risen from the small number of 16, to near 400 annually. Dr. Brown's indefatigable attention and successful treatment of the patients in scrofula, cancer, putrid fever, &c. that have been received into the Infirmary, surpasses all praise, and have been publicly acknowledged at a general meeting of the benevolent governors by the late Dr. Lettsom.

The advantages arising from such an admirable institution to objects of commiseration, doubly afflicted by poverty and disease, makes it a subject of regret, that marine hospitals are not generally adopted throughout the United Kingdom. Were the great and populous cities and manufacturing towns, in this respect, to pursue the excellent example of this vast metropolis, the diseased poor might then more generally partake of the same restorative aid of sea-air, and sea-bathing, hitherto experienced by the great and opulent. From the lamented prevalence of scrofula, and its lingering train of sufferings in this country, it may be deemed a national disease, and affords a cause worthy the general contemplation of the benevolent.

rienced a practitioner, affords me additional pleasure, and confirms my confidence in recommending these prudential measures.

Dr. B. further informs me, that in all the cutaneous diseases in which he has administered this medicine in solution, the dose has uniformly been commenced with three drops, and restricted to five, twice a-day; and his reasons for not exceeding that quantity have been the fear of doing mischief, in consequence of having witnessed its deleterious effects when pushed too far in these diseases. But although he has in no one instance further increased the dose in cutaneous affections, he has occasionally deviated from this rule, in intermitting fevers; but even then he never allowed the duration of the course to exceed three weeks, his mind being impressed with unavoidable apprehension of producing injurious effects upon the constitution. Dr. B. has been in the habit of prescribing arsenic during the last fourteen years, uniformly in conjunction with tonics. After the cautious manner in which he has prescribed this medicine, he has never experienced, even in a solitary instance, any adverse symptoms.

DURING the cessation of the arsenic for a week or ten days, either the same medicinal tonics alone, with which it was combined, or similar remedies, were pursued in that interval. Upon resuming the dose of the mineral oxide, whether in solution or substance, it has generally been found to impart a more palpable relief to the constitution, and to surpass the original administration. Dr. B. has had frequent occasion to remark, many months subsequent to the discontinuance of this remedy, its beneficial effects upon the general health, and casual disease.

THIS gentleman has also observed, that the patient, whilst under a course of the arsenical solution, has, by the addition of warm sea-bathing, evidently and invariably accelerated its salutary operation upon the system.

THE following singular occurrence happened to a patient of Dr. B.'s who was in the general sea-bathing infirmary. Having experienced considerable relief from arsenic, this patient particularly requested the apothecary of the institution to favour

him with the prescription by which he had been so greatly benefited. The following is an exact copy of the recipe—

℞ Extracti humuli, ʒ^{ss}.

Pulvis opii, gr. ij

Clei caryoph. gr^{ss}. iij.

Arsenici oxidi sublimati, gr. j.

Pulvis zingiberis q. s.

Misce ut fiant pilulæ x quarum sumatur unâ bis quotidie.

THIS dose was actually taken regularly for above *seven months* twice a-day, without the least injury resulting from its long continuance. The patient called upon Dr. B. in Sackville-street, after the expiration of that time, who was greatly surprised in finding the prescription had been continued for so long a period. The patient, however, was materially relieved in the symptoms of his disease, and observed, that he had never before found any other medicine afford him so much benefit, although he had been under the direction of several medical gentlemen in many of the London hospitals.

THIS remarkable instance of persisting for such

a length of time in so potent a medicine, with impunity to the constitution, strongly corroborates the theory I have already endeavoured to represent on this subject, wherein it is compared to the operation of mercury. For this remedy, it is well understood, will vary exceedingly in its effects upon different subjects, and surely arsenic must be liable to similar laws and physiological reasoning.

I AM informed by Dr. Macqueen, Licentiate of the Royal College of Physicians, that he administered arsenic in solution full thirty years ago, in numerous instances of intermitting fever, during the time he practised at Norwich, and in the county of Norfolk. It is curious to observe, that the cures performed at that period through the medium of solution of arsenic, were some years antecedent to its more general introduction and recommendation to the faculty by the celebrated Dr. Fowler. Dr. M.'s application of it originated from a hint taken from a quack medicine, well known by the appellation of *tasteless ague drops* which had been found to be highly beneficial by a practitioner in the county of Suffolk, without his being in the least aware of what it contained, who communicated to

Dr. M. his mode of curing intermitting fevers. Some time after this, it was communicated to Dr. M. by Dr. Hamilton of Ipswich, that the tasteless ague drops was discovered to be a solution of arsenic, and that he had himself made a solution which he found a most effectual remedy in intermittents. The solution was prepared in the following manner — A portion of white arsenic was levigated as fine as possible; of this two grains were added to two ounces of distilled water in a phial. This was suspended in a pan or kettle of boiling water for the space of six hours, when the solution appeared to be complete; yet, for further precaution, it was filtered through paper. The arsenical solution was generally administered in a two-ounce draught of brandy and water, by no means strong of the spirit. Dr. Macqueen then adopted the use of this arsenical solution in fevers purely intermittent, with a success almost infallible, having never failed with it except in one instance. Some short time after this, a regiment of dragoons was quartered in Norwich, and the season being very cold and damp, and the men being but indifferently lodged, they became so much affected with intermittent fever, that not a fourth part of them were able to muster

on parade. The bark was freely administered by Mr. Scott, the regimental surgeon, without permanent effect; for though the accession of the paroxysm was frequently suspended, it was sure to return after some days. On this occasion Dr. M. recommended to Mr. Scott a trial of the above arsenical solution, which proved effectual in every instance, without exception, and at the same time so safe a remedy, that Mr. Scott at last intrusted to the sergeants of companies a small phial of the mineral solution, of which they were to give fifteen or twenty drops three times a day to each patient, in a glass of weak brandy and water.

THIS highly valuable and interesting intelligence offered to the medical world on so important a subject, and derived from so experienced and honourable a physician, merits my unfeigned thanks.

SUFFICE it to remark, that the full dose of twenty drops of the above solution, being only one-fourth the strength of the *solutio arsenicalis*, as recommended by the royal college of physicians, no more than equalled five of that officinal preparation. Nevertheless it was found, by experience,

fully adequate to effect the cure of an intermittent fever that avowedly had resisted the medicinal properties and efficacy of the peruvian bark.

THESE practical observations, in conjunction with Dr. Brown's, materially serve to establish the principle I have endeavoured to recommend, with regard to the absolute necessity of limiting the dose of the *solutio arsenicalis*. Such illustrative evidence, independently of what I have observed in the course of my practice, proves the propriety of a due observance of such rules in its administration. This practical induction is now formed on a basis that may be deemed incontrovertible.

THAT essential benefit is derivable from arsenic, in a variety of diseases incidental to the human frame, is beyond all doubt; and while its application is restrained within bounds, I am satisfied no adverse symptoms will arise, or hazard the patient to the severe attacks it is capable of exhibiting.

ART. V.

Magnesia recommended as a remedy to counteract the deleterious effects of arsenic.

THE common carbonate of magnesia seems to be one of the best remedies to restrain, if possible, the action of arsenic. When the poisonous substance is administered either in the form of Dr. Fowler's, or Macquer's arsenical salt in solution, in gradually augmented doses, this alkaline earth may be taken at the same time, or, if preferred by the practitioner, shortly before or after, without interfering, it is presumed, with its medicinal or curable intention. It would form an arsenite of magnesia*, and may probably

* Which is fully confirmed by one of Mr. Hume's experiments published in the Philosophical Magazine for October 1812, which I shall here insert for the information of the reader. "Experiment 1st.—One grain of white oxide of arsenic was boiled in ten ounces (by measure) of distilled water, together with a few grains

be found fully adequate to check the baneful tendency of its effects upon the human frame, as has been variously exemplified. On conferring with Mr. Hume relative to this practical suggestion, he is decidedly of this opinion, and prefers it to any other of the earths, or even to the fixed alkalies. Mr. H. upon the same principle recommends in those cases, wherein a poisonous dose has been taken by accident or design, in the *first instance*, a free portion of magnesia, to be mixed in a copious quantity of warm water, and repeatedly given to the patient.

It may appear almost superfluous to add, after this explanation of the tendency magnesia has to combine with, and consequently to restrain the inordinate action of the white metallic oxide, that its medicinal advantages may probably be equally applicable in future to those cases wherein epilepsy or paralysis, &c. may unfortunately be the

“ of carbonate of magnesia. This mixture being filtered and allowed to cool proved to be a solution of arsenite of magnesia, which was obedient to the silver test, either when applied in the form of simple nitrate or of ammoniaco nitrate of silver.”

result, either during, or immediately succeeding a course of the *liquor arsenicalis*.

SINCE writing the foregoing remarks on the anti-arsenical effect of the carbonate of magnesia, I observe that Dr. Thomas Percival has made the following recommendation of *calcined* magnesia. In vol. iii. of the Medical Transactions, No. ix. p. 88, Dr. P. evidently alludes to this absorbent earth as an antidote to arsenic, and p. 90, he says, "If the injury have been done by any metallic
" salt, which hath an acid for its basis, *calcined*
" magnesia will decompose it, and, at the same
" time, gently contribute to carry downwards the
" offending matter. This preparation also abates
" flatulence, corrects the putrefaction of the bile,
" and thus, in several ways, may prove an an-
" tidote to the operation of different mineral
" poisons."

THE common *carbonate* of magnesia is preferred by Mr. Hume, as well as myself, upon the following principles. This formula is more soluble in the stomach than the *calcined*, and as the chemical operation of calcination renders magnesia much

less susceptible of solution by the agency of the gastric fluids, it consequently becomes more inactive, and thereby, it is evident, a greater quantity of this would be found requisite to effect the same object. The carbonate of magnesia is also capable of being swallowed with less sensation of disgust to the patient, which alone is necessary to be regarded, in the high state of irritable excitement to which the organ of the stomach is reduced, after being assailed either by arsenic or any other of the mineral poisons.

DR. Orfila, on Poisons, recommends lime-water, when arsenic is given in a soluble state; "in this case there is formed an insoluble arsenite of lime, which acts very feebly*."

HENCE magnesia and lime-water appear to afford the best prospect of alleviating the injurious effects of the arsenical solution, by ope-

* This is contrary to Mr. Hume's experiments, for he has proved that *lime* will form a *soluble* salt, and may be employed in place of any alkali to detect arsenic.

rating as a safe antitode; and more especially, as the arsenite, either of magnesia or lime, would be equally feeble in their action on the human frame. These probably may be the means of superseding other preparations which have been recommended, less certain, or even injurious in their effects, wherein the white oxide itself has been taken.

ART. VI.

A variety of analytical experiments upon arsenic; including the very delicate and satisfactory tests peculiar to Mr. Hume, which will be found fully capable of detecting the minutest portion of that mineral substance, and highly useful in medical jurisprudence.

IT is expedient to subjoin some observations on the different methods that were employed to detect the arsenic forming the composition of the yeast dumplings, which was collected in so palpable a form, that it became wholly unnecessary to analyze the fluid ejected from the stomachs of these patients. Mr. Hume, of Long Acre, was so obliging as to assist me in this inquiry; and to that gentleman I am chiefly indebted for the analysis of the white oxide of arsenic, which was obtained from the scrapings of the dish in which the dumplings were kneaded.

DURING the night of the 21st of March I employed myself, when I could spare time, in investigating and searching after the cause of the serious symptoms that so much engaged my attention. On examining the remains of the yeast dumplings, a small portion was first cut into very thin slices; white opaque particles were perceived pretty thickly and uniformly distributed throughout the mass, which were conjectured to be white arsenic. Having at that time no other convenient apparatus, I proved it to be so incontrovertibly, by the following trite experiment; which, independently of the symptoms, afforded a double analytical test of the dumplings having contained a large proportion of the poisonous mineral. One of the slices of the yeast dumpling was put on a polished halfpenny, and held over the flame of a candle on the blade of a knife, and thus reduced to a cinder; it gave out most unequivocally the garlic smell, which Mr. Ogilvy and Mr. Abbot, who were also present, particularly observed. On allowing the coin to cool, the upper surface exhibited a bright silvery whiteness, occasioned by the condensed fumes of the arsenic. The knives were then examined which had been used at dinner;

they were so very deeply tarnished, that an inquiry was made if any vinegar had been used in the sauce, and it was answered in the negative. However, by the above crude experiment, a much more satisfactory and positive proof was already discovered. Here it may be necessary to caution people from relying on a knife being *blackened*, as a *complete* proof of the presence of arsenic; for yeast itself, gooseberries, and various kinds of fruits, may tinge iron black; any thing of an astringent nature will do it effectually.

ON the following morning I obtained from an earthen pan, in which the yeast dumplings had been kneaded, more than half a tea-spoonful of the white arsenic. The scrapings of this utensil were carefully suspended, and washed with a tea-kettle of luke-warm water, stirring it briskly as the water was poured in; the whole was allowed to settle about half a minute, and the fluid was cautiously decanted, until the vessel was nearly drained. The residuum was again submitted to the same operation, with a view to divest the white powder, which was distinctly to be seen through the water at the bottom of the pan, more completely from any admixture of the

dough or flour. The powder was then collected and dried.

SOME polished copper plates were then procured, about three inches long by two in width, and a few grains of this powder, previously moistened with water, were inserted between two of them, and bound together with wire, then placed between the bars of a fire-grate. On withdrawing the plates soon after they were properly heated, the alliaceous smell was highly perceptible; when red hot, they were again taken out of the fire, and, when cold, each plate beautifully displayed the white fumes of the arsenic, with a resplendent silvery whiteness. This circumstance, in point of demonstrative proof, must destroy the argument of the most fastidious critic.

WHEN white arsenic is mixed with carbonaceous or unctuous matter, and then exposed to a red heat in a glass tube closed at one end, it will be sublimed in the form of shining metallic scales; and these exposed to the air under the heat of ignition, burn with a blue flame, and revert to the common white oxide.

POLISHED *brass* plates will also exhibit arsenic in a silvery and metallic form, in combination with its surface, quite as perfectly as copper.

THESE two last mentioned experiments were not used by me, they are only here inserted with a view to complete the various analytical methods that have been formerly tried and recommended. These will most accurately answer the purpose as analytical tests, equally satisfactorily, in point of demonstrative proof, as those of Mr. Hume, and doubtless ought to be applied experimentally, provided, however, the white metallic oxide can be obtained in a quantity that is quite palpable and tangible. But in the generality of cases wherein a practitioner is called upon to decide on this important question, he has too frequently the difficulty of examining only a mere vestige, probably in solution, and so minute as to evade all the old methods of analysis; for the contents of the stomach alone seldom furnish any material portion of the poison.

IN all such cases, the polished plates of copper, or brass; the mode of reducing by distillation, the white oxide, to a reguline form; or the alliaceous

odour, produced by the operation of burning this substance, over a spirit lamp, becomes comparatively useless, or extremely difficult in the application, either practically, or analytically. Whereas the ammoniaco nitrate of silver, and the ammoniaco sulphate of copper, the discoveries of Mr. Hume, which I shall shortly describe, are capable of detecting the minutest portion, even the 100^{dth} part of a grain, *ad demonstrationem*, with the utmost facility, accuracy, and ease, by merely boiling the vomited contents of the stomach, then filtering, and, when cold, applying a glass rod, previously dipped in either of these preparations, to the suspected fluid.

It is impossible for me, under such circumstances, to exhibit in a stronger point of view, the superiority of these analytical tests of Mr. H. and throughout this little work, I have zealously upheld them, from the firm conviction of their real utility, and value, to the profession at large.

I BELIEVE that in almost every case wherein arsenic has been taken, either by mistake or imprudence, or given by the designing hand of wicked-

ness, the common white oxide of the shops, is the general species of this poisonous metal in use, being the only form popularly known as a deadly poison. From the lamented facility of obtaining this article, as well as its cheapness, some plausible excuse is always readily made by the purchaser, if interrogated, although intended for the horrid purpose, either of premeditated murder or suicide.

BUT, with a view to be still more satisfied, and to place the nature of this powder beyond the reach of doubt—feeling it, as I did, a duty of the highest importance to be fully prepared on the then approaching trial of Eliza Fenning, and having read of Mr. Hume's very accurate and infallible tests for the detection of this mineral substance, I waited upon that gentleman with the arsenic, who most obligingly and readily submitted it to his very superior tests and experiments, which Mr. H. found out many years ago.* He has published several treatises on the subject, in the monthly journals;

* I have since been informed by Mr. Hume, that he discovered the test by means of *silver* in the year 1789, although he did not at that time know its real value.

and the practicable excellence of these discoveries are now admitted and acknowledged by the first chemists of the age, and preferred to all other tests. Indeed the accuracy, the elegance, and the certainty, with which they serve to detect the minutest portion of the white metallic oxide, infinitely surpass all other modes hitherto known or discovered, and deserve to be every way recorded: they are highly beneficial to the medical world, by enabling practitioners to clear up any doubtful point on this important subject, and more especially to those gentlemen who may be called upon to give evidence in courts of judicature on such criminal cases.

It is proper to enumerate some of the experiments which he has contrived; for Mr. Hume does not always find it necessary to employ others, such as the decomposition of nitrate of pot-ash by the arsenic, to form Macquer's arsenical salt, a solution of which produces a *red* or *brick-coloured* precipitate with nitrate of silver. This is, however, one of the processes in which he places very great dependance, since in many cases he employs and recommeuds it to corrobo-

rate others; especially where there may be strong reason to doubt, and when there is not a sufficient quantity of the poison to give out the garlic smell.

A WEAK solution of the powder was made, by boiling it in a sand bath, in the proportion of one grain to about four ounces of distilled water. About half an ounce of this solution was put into a phial, and a glass rod, previously dipped in the ammoniaco nitrate of silver, was applied to the surface. It instantly produced a fine yellow cloud, descending in an undulating form to the bottom of the phial, and gradually converted the transparent solution to an opaque or turbid yellow colour, and a copious precipitate was thus thrown down, which in the course of a few hours turned to a dark brown. This beautiful and highly satisfactory experiment infallibly proved the powder which had been previously so well washed, to be white arsenic.

THE ammoniaco sulphate of copper was next applied, in the same manner, to another portion of the above solution of arsenic; and this was instantly changed into a flocculent and copious precipitate, which retained its bright green colour, forming the pigment so well known as Scheele's green.

THE delicacy of this test was further elucidated by diluting the above solution, viz. about a dram measure of the above described solution, of one grain of arsenic to four ounces of distilled water, was diluted with three ounces more of distilled water, i. e. about a thirty-second part of a grain. When thus copiously diluted, on applying the ammoniaco nitrate of silver, the same brilliant yellow colour was obtained, and, after standing a little while, the test threw down a yellow precipitate, which in twelve hours changed to a dirty brown, proving it to be arsenite of silver.

A GRAIN or two of the same white arsenic was put into a platina spoon, and heated over a spirit lamp. Here the effect was likewise very conspicuous, and the alliaceous odour from the white fumes sensibly affected the olfactories.

It has been lately asserted, that the nitrate of silver is subject to act ambiguously, in *one* instance, and consequently it will be requisite to guard against any fallacious conclusion, should such a case occur. This is said to happen when any soluble *phosphate* is present; for silver combined with phosphoric acid, forms also a yellow precipitate. It

must however be acknowledged, that none of the soluble salts, with phosphoric acid and the alkalies, will cause such direful effects, and derangement of the system, as arsenic; and there is no phosphate to be found, as a peculiar secretion of the stomach. There is another distinction, which Mr. Hume has pointed out as a valuable fact; it is this, that nitrate of silver *alone*, will not detect uncombined white oxide of arsenic in solution; it will not produce the *yellow* precipitate, whereas it effects an immediate change in a solution of the alkaline phosphates.

ANOTHER method of distinguishing arsenic, from a soluble phosphate, is, by the ammoniaco sulphate of copper; for this makes the Scheele's green with the arsenic, and no such change in the phosphate.

NITRATE of silver alone, was never recommended as a test for arsenic by Mr. Hume; the poison must be either combined, or rather saturated with one of the alkalies; or, if ammonia be chosen, joined to the metallic salt of the test, whether it be that of silver or copper. As his experiments, which have been published, admit also of the *earths*, and that ba-

rytes, lime, magnesia, &c. have been employed by that gentleman for the same important object, it must be evident to every chemist, that when any phosphate is present, and even in the same mixture with the arsenic, no error can arise if proper precautions are taken. It is well known that *lime*, which is one of his tests, will decompose all the soluble phosphates; of course the arsenic in this way, can be separated most readily, and then it will become obedient to the proper tests.

WITH a view to detect the arsenic, in Fowler's solution, the nitrate of silver alone is sufficient, as that medicinal preparation is already combined with the vegetable fixed alkali; this remark also equally applies to a solution of Macquer's arsenical salt*. This will be illustrated by the enumeration of the following experiment—

LET eight or ten drops of this *liquor arsenicalis*, of Fowler, be shaken up with an ounce and a half of distilled water, then, by immersing with a pair of forceps, or any convenient instrument, for a few seconds, a

* See description of this medicinal preparation, page 88.

fragment, of the nitrate of silver, commonly called lunar caustic, and then withdrawing the substance, as it is not requisite to allow the caustic to remain longer, it produces a copious yellow and cloudy precipitate, forming a case of double elective attraction. Mr. Hume, with his usual urbanity, exhibited this experiment in my presence; and it fully proves that nitrate of silver does not require the addition of *ammonia* to detect arsenic, when this is in combination with any other *alkali*.

THE ammoniaco nitrate of silver, will likewise detect the presence of arsenic, even in a more crude form. By agitating about three grains of the white oxide with one ounce and a half of cold distilled water, for a few minutes, and then allowing it to settle, a solution was obtained in that short period, sufficiently strong to shew indubitable signs of arsenic, on the application of the ammoniaco nitrate of silver. Here the change is slower, and not so strikingly satisfactory and brilliant; it is, in the end, however, quite confirmatory.

MR. H. by no means advises this mode alone of ascertaining the presence of arsenic, but the expe-

riment is mentioned merely to shew the further power of this valuable discovery.

ANOTHER very commodious and ready way of detecting arsenic, was exhibited by Mr. H. A small portion, hardly perceptible to the sight, of the powdered arsenic, was placed upon a peice of glass, and on this a single drop of the ammoniaco nitrate of silver was let fall; these were permitted to remain untouched for a few minutes, when the whole became yellow, of the same hue as the usual precipitate. This appeared more obvious when the glass was held over a piece of white paper, and still more so, when it was removed and received upon the same paper.

THE ammoniaco nitrate of silver, is fully capable of detecting even the 1000th. part of a grain of the white oxide of arsenic in a state of solution; and cases accompanied with suspicious circumstances may possibly occur, wherein no portion of this substance could be otherwise detected. With a view to demonstrate this position, it may not be deemed extravagant to suppose the following case—

SHORTLY, or even sometime after the death of a person, a legal investigation into the causes thereof, might be considered necessary; and facts may arise out of collateral evidence, directly or indirectly, proving the death to have taken place through the medium of poison. Thus, a piece of paper, in which the arsenic had been purchased or found, will probably still retain enough in its pores, to yield ample proof of guilt, and satisfy the most scrupulous conscience. "Let such paper, (says Mr. Hume), be boiled with a small quantity of distilled water in a Florence oil flask. The fluid is then to be filtered off, and when quite cold, divided into two portions. To one of these present the end of a piece of dry nitrate of silver, or lunar caustic, for a few seconds; to the other portion add a drop or two of the *ammoniaco* nitrate of silver: if a decided yellow colour appear in the last case, and not in the former, there cannot be a doubt of the presence of arsenic; and the most skeptical chemist must acknowledge these experiments to be infallible."

It will most probably be found highly useful to the medical reader, by here inserting the two following further simply elegant methods of detect-

ing the presence of the arsenious mineral, which were invented and communicated by Mr. Hume, in a letter to the editors of the Medical and Physical Journal, dated July 13, 1810.

“ ANOTHER very accurate and ready test for arsenic, which being easily performed, requiring neither expense, apparatus, nor a nice acquaintance with operative chemistry, may deserve the attention of the reader and the profession at large. It is, however, more suitable to detect the *dry* oxide itself, than when in solution; and therefore, as this poison is generally administered in powder, when some fatal purpose is to be effected, the method I shall now suggest will consequently be found more practicable, though not more certain than the former; but at all events one will serve to corroborate the other; for when we can avail ourselves of an extended evidence in criminal conviction, nothing should be lost, nothing neglected.

“ FROM the difficult solubility of the white oxide, especially in cold fluids, we may in most cases obtain from one source or other, a sufficient quantity for examination. For it is astonishing

“ how very delicate these tests are, particularly
“ the first, which will render the effect obvious,
“ when water is even slightly impregnated with
“ the poison, so that a mere fractional part of a
“ grain could not escape notice.”

“ As an instance of this first process, let us take
“ about a grain of the white powder, or suspected
“ arsenic; mix this very intimately with two or
“ three grains of nitrate of potash; introduce this
“ mixture by the point of a penknife, into a small
“ phial, in such a way, by inclining the phial ho-
“ rizontally, that the powder may remain undis-
“ turbed, on the side or thinner part of the glass;
“ now apply the flame of a small lamp, just under
“ the powder, and presently, if there be arsenic, the
“ nitrate will be decomposed, nitrous gas, and ni-
“ trous acid evolved, and arseniate of potash, will
“ remain as the result.

“ I WOULD prefer spirit of wine to oil for the
“ lamp, as it produces no smoke, that can tinge
“ the phial, and intercept our seeing distinctly the
“ yellow fumes peculiar to nitrous gas, when in
“ contact with the atmosphere.

“ THE acid vapour is thus easily recognised, either
“ by its smell; by presenting the point of a feather
“ imbued with solution of ammonia; or even by pla-
“ cing a morsel of moistened litmus paper within the
“ phial, and over the materials, during this short
“ operation.”

Mr. Hume's second test for arsenic.

“ AS a further support of this test, proceed thus
“ with the new product, the *arsenate of potash*.
“ Fill the phial with warm rain water, that some
“ of the salt may be dissolved; then to the mere
“ surface of the solution, present a piece of dry
“ nitrate of silver, (lunar caustic), and the peculiar
“ dark brick-coloured precipitate will fully evince
“ the fact, that arsenic had been administered.”

THE methods by which Mr. Hume recommends
the ammoniaco nitrate of silver, and the ammoniaco
sulphate of copper to be prepared, may be rendered
further beneficial to society by introducing them here;

and I am greatly obliged to that gentleman for having indulged me with the proportions.

Ammoniaco nitrate of silver.

DISSOLVE a few grains, say ten, of the nitrate of silver, commonly called lunar caustic, in about nine or ten times its weight of distilled water; to this add, by a drop at a time, some liquid ammonia, till a precipitate is formed. Continue cautiously to add the ammonia, now and then shaking the bottle, till the precipitate shall be nearly taken up, and the solution again become transparent, or nearly so, as the ammonia need not be in great excess, if in any; for solution of ammonia being lighter than water, the superfluous portion would be likely to remain on the surface of the fluid, to which this test-liquor is to be applied—a circumstance not noticed by other analysts.

“Here,” Mr. H. observes, “we have one neat and simple liquid, which, if kept in a phial with a glass stopper, will not easily spoil, and therefore may be always at hand. Its application is also equally simple; for nothing more is required than to dip a piece of glass into this liquor, and apply it to the surface of the solution containing arsenic. Should the material suspected to contain the poison be of a dry nature, such as a mixture of sugar, meal, bread, meat, or any other kind of food, let some boiling water be poured upon the suspected substance, and filtrate the solution through paper; then, having allowed this to become cold, apply the test-liquor with a piece of glass in the way I have just described.” And Mr. H. further remarks—
“The strip of glass can be readily procured at any glazier’s shop; or, if not at hand, a few drops of the test from the phial may be put in, as there is not so much uncertainty from a slight excess of alkali, nor even of the test liquor itself, as to require very great caution.”

Ammoniaco sulphate of copper.

“LET a little liquid ammonia be dropped into a saturated solution of sulphate of copper, or common blue vitriol, until a precipitate be formed; then continue to add the ammonia by degrees, when presently the precipitate will be perfectly dissolved, and the solution will become of a rich elegant deep blue colour, and perfectly transparent.”

THE flour which remained in the tub, from whence the dough had been made, was submitted to a careful examination. I adopted a process similar to the investigation of the scrapings of that dish in which the dough had been kneaded, by washing and decantation, and could not detect the presence of the smallest particle of arsenic.

THE yeast was carefully examined, and subjected to Mr. Hume's tests, which clearly proved it to be entirely void of the white metallic oxide.

ART. VII.

Treatment.

THE stomach of each patient was first cleared as much as possible, (an imperative duty upon a practitioner), with very copious libations of warm sugar and water, occasionally mixed with milk, which favoured the expulsion of the arsenic. In the course of these observations, free portions of the carbonate of magnesia, in full draughts of warm water, have been recommended in the first instance, as being the best medicine, or antidote, to restrain the violent action of arsenic, by going into chemical affinity, and thereby forming an arsenite of magnesia. After the stomachs had been thus thoroughly drenched, for upwards of half an hour, a full dose of castor oil, on two table spoonfuls of milk, was administered to each patient, and this was repeated four hours afterwards; then every four hours a solution of the *magnesiæ sulphas*, with manna in mint water. This formula was pre-

ferred as being less liable than any other to be rejected by vomiting, and in consideration of the painful symptoms of cholic, it was deemed likely to operate without griping. A dose of this purgative mixture was alternated, every four hours, with a supersaturated saline draught, *in actu effervescente*, allowing the alkali to predominate four grains to each dose, with the intention of neutralizing any probable remains of the white oxide, by forming an arsenite of potash, and relieving the disposition to vomit.

THE patients were allowed to drink frequently, but in small quantities, of milk, soda water with or without milk, and mutton broth.

THE thirst of each patient was so urgent that they would have drank quarts of these fluids most readily, but they were advised to abstain as much as possible from too copious a draught, and to swallow gradually, lest at that time the stomach should have been unnecessarily harrassed by vomiting, and thereby endangering an increase of the pain and inflammation upon that *viscus*. And it was observed for three or four days afterwards,

that, whenever they deviated from this injunction, reaching was immediately induced. The insatiable thirst was somewhat allayed by washing the mouth frequently with cold water.

THEY were strongly interdicted from beer, wine, and all fermented liquors, and animal food; which they complied with for a fortnight after the period of the first attack of the symptoms. This plan was once deviated from by one of the patients, and the effects are fully described.

ON the second day, the saline purgative was omitted, except in Mr. R. T. who required its assistance. Manna was added to each dose of the supersaturated saline draught.

ON the third day, the same draught was continued every four hours, but with the addition of camphire mixture. A wine glassful of camphire mixture was administered frequently; which was extremely grateful to them, as it afforded considerable relief to the faintness, palpitations of the heart, and other nervous symptoms, so much so that they frequently took it with a degree of eagerness.

THIS plan of medicine, with the occasional and rather frequent use of the purgative, was persisted in for some time after the symptomatic fever had subsided. As their appetites returned, well boiled vegetables, puddings, eggs, and milk, were recommended. Mrs. R. T. notwithstanding the peculiarity of her situation, was treated precisely in the same way as the rest of the patients.

IN all cases wherein a poisonous dose of arsenic has been administered, emetics are imminently dangerous, and must be cautiously avoided. From high authority the sulphate of zinc* in such in-

* It is by no means my intention otherwise to aim at depreciating this medicine, which is undoubtedly an active and valuable emetic in ordinary sickness or disease, but only in those cases more especially wherein *gastritis* has been excited by arsenic, corrosive sublimate, or similar acrimonious substances. The *zincum vitriolatum*, now called *sulphas zinci*, has been frequently employed by me in several instances after deleterious fluids have been administered through accident, ignorance, or design. By way of illustration, it may be as well briefly to describe two cases that were successfully treated by the operation of this active remedy.

Mr. R. in consequence of a mistake of his servant, swallowed the

stances has been recommended in a dose containing twenty or thirty grains, and thrice to be repeated, amounting to a dram and half, than which to ex-

whole contents of a two-ounce phial full of the extract of lead, nearly equal in weight to four. The accident no sooner happened than it was detected by a peculiar sweet and astringent taste or sensation in the mouth and *fauces*. I almost immediately detected the nature of the poison my patient had taken, by tasting and smelling a small portion remaining in the phial which had previously contained it. Before either warm water or the *sulphas zinci* in doses of twenty-five grains could be procured, Mr. R. was directed to tickle the throat with a feather, which succeeded in bringing up a portion of the lead; he then took the emetic powder dissolved, and after copious draughts of tepid water, by their repetition the stomach was wholly cleared from its noxious contents. A hundred grains in four equally divided portions at stated intervals of ten or twelve minutes were taken in less than forty-five: then castor oil and other laxatives were administered. The principal inconvenience subsequently experienced by Mr. R. was an attack of cholic, accompanied with constipation of the bowels, which required the frequent repetition of active purgatives to overcome, and the digestive power of the stomach was for some weeks much impaired.

Another instance of relief by this remedy, was that of a young lady who had been disappointed by her amoroso. She intentionally drank at one effort nearly half a pint of laudanum, after previously being at the trouble of driving in a hackney coach and deliberately

press my abhorrence and repugnance, or to say the least of it, nothing can be more highly injudicious. It would have the most cruel and painful effect upon the already irritable and inflammatory state of that vital organ. It is well known that a weak solution of this salt when applied either to the eye, or the urethra, in a state of inflammatory diathesis, in the proportion of a single grain to an ounce of water, is capable of producing acute pain. Whereas an emetic dose usually consists of twenty grains or upwards dissolved in a vehicle most probably of

purchasing it at different shops in small quantities in various parts of the metropolis. Before I could get to her, a considerable portion had been fortunately and spontaneously regurgitated from the stomach. This active emetic in solution was thrice repeated in the usual quantity, administered at intervals, and followed by copious libations of warm water, and by this method she was restored. The narcotic property of the tincture had acted so powerfully upon the nervous system, as to render it indispensably necessary, for many hours afterwards, to exert the utmost vigilance in preventing her going to sleep; and it was with extreme difficulty that effect could be obviated. The system remained more than three weeks in a state of considerable exhaustion, attended with a violent head-ach, which was greatly increased upon the sudden approach either of light or sound.

two ounces: such an application to the stomach thrice repeated, under these circumstances, doubtless would excite unnecessary suffering, and materially augment the danger. Should a case occur even without spontaneous vomiting, after drenching the stomach with a copious libation of warm water and magnesia, then, by tickling the *fauces*, either with a feather, or the finger, vomiting could be excited with ease and without hazard, and be repeated alternately with diluents, at the discretion of the practitioner, as long and as frequently as the urgent necessity of the case would require.

THE particles of the arsenical powder being a caustic of the most active kind, are consequently the more liable, perhaps, even to be imbedded, or at least to adhere to the *rugæ* of the villous coat of the stomach. The more effectually to dislodge them, and to obviate such threatening mischief, it is expedient that this organ should be almost distended repeatedly with warm aqueous fluids, in which magnesia, sugar, honey, treacle, milk, or mucilaginous substances, have been mixed or dissolved, at discretion. A child generally could be more easily induced to drink a quantity when

combined with either of these saccharine materials, which are designed to lessen the corrosiveness of the metallic particles, and thereby defend the stomach. The successful issue of the foregoing cases, may probably in a great measure be ascribed to the strict attention that was at first devoted to this most essential period of the treatment, so promptly and judiciously employed by the late Mr. Ogilvy.

ART. VIII.

An abstract of the Symptoms.

ALL the patients having received the poison nearly at the same period, or in the course of the afternoon, I have endeavoured to frame the following summary retrospection of the symptoms, marking the time of recovery, with the various coincidences.— This epitome of the several indications may probably be found useful in a practical point of view.

THE following symptoms were common, or applicable, to each of the patients, and which rapidly developed themselves nearly in this order of succession.

THEY were all attacked about half an hour after partaking of the poisonous aliment, with vomiting and purging, a burning heat in the stomach, head-

ach, vertigo, swelling of the abdomen, insatiable thirst, face swollen, cholic or painful gripings which increased before and after vomiting and purging. The countenance flushed, particularly on the upper part of the cheeks, extending towards the ears, the tongue white but moist, extreme faintness, great prostration of strength, a rapid pulse, exceeding a hundred, the vomited fluid of a greenish and yellowish colour, and symptomatic fever.

MRS. R. T. was advanced near seven months in her pregnancy, which critical period and situation rendered her case more alarming and interesting. The poison produced a violent and long-continued pain in the loins, accompanied with frequent bearing pains, threatening abortion.

MR. R. T.'s countenance, at the commencement of his sufferings, was completely yellow, and the features were so altered and contracted, he appeared strongly to resemble an aged man, so much so that it was like a sudden metamorphosis from youth to age.

MR. Gadsden's case affords a singular variation:

half an hour after taking the poison, he vomited twice, then felt quite well, and was able to walk a distance of at least three if not four miles, before he was seriously attacked with the succession of the above symptoms.

MR. and Mrs. R. T. and Mr. G. passed olive green fæces resembling paint. This symptom probably was common to all of them, but for want of opportunity, it was not observed the first night in Mr. T. senior or the cook. It is however reasonable to suppose, -that it equally occurred to them; as, on the following day, I had an opportunity of observing streaks of green, in the alvine secretions of Mr. Turner, and which that day coincided with the appearance of those excretions, which had passed from the other three patients.

IN Mr. and Mrs. R. T. and Mr. G. the light was intolerably painful to the eyes, and this was greatly increased on a sudden accession of it, such as the approach of a candle, drawing up a sun-blind in the room, or dividing the bed curtains. These three patients were affected with strangury which

continued three or four days, and violent palpitations of the heart.

MR. R. T. and Mr. G. had the whole surface of the abdomen very irregularly contorted by the spasmodic action of the abdominal muscles, and seemingly of the viscera.

MR. G. had considerable spasmodic agitation of the right arm, and lower extremity on the right side.

Two of the utensils, in which Mr. R. T. had vomited, contained stercoraceous matter; his extremities were cold, the pulse was gone, and he had one attack of an epileptic fit.

Second Day.

THE vomiting in each of the patients had greatly abated, and the fæces changing to a more natural colour, but intermixed with streaks of an olive green.

MR. G. suffered exceedingly from the repeated attacks of epileptic fits, in the course of the night, which remained two years afterwards, more or less severe and frequent, and he still continues to be severely afflicted by them.

MR. R. T. complained of spasmodic twitchings about the chest and abdomen; and a second relapse of the epileptic fit, which was happily the last he experienced.

MR. T. senior much better, the pulse ninety.

IN each of the other three patients the skin was hot and dry, the pulse rapid, varying in each case from a hundred to a hundred and thirty. Mrs. R. T.'s pulse a hundred and thirty, with constant sensations of fainting. The countenances of all the four patients appeared swollen, and each complained of the tongue and lips being sore and enlarged.

IN the evening, the febrile symptoms had a little abated; the pain in the stomach was intense, occasionally remitting and again returning with increased violence, with nausea and vomiting, and much pain in the head.

Third Day.

THE febrile symptoms were further abated, and each patient complained of many singular nervous affections, with frequent twitchings of the muscles of the chest and abdomen. The vomiting in each patient had wholly subsided, although they still endured the burning feel in the stomach, which they all repeatedly and throughout compared to a furnace, or red hot irons.

MR. R. T. had passed a better night, skin moist and more temperate, tongue less coated, but sore and swollen, the burning heat in the stomach diminished, he expressed a degree of hunger, the pulse ninety-eight, spasmodic twitches in the arms and legs, with a cold sensation of the latter.

MR. G. much fever, breathing hurried, incessant palpitation of the heart;—two fits, pulse one hundred and twenty, the eyes affected by light, constant vertigo.

MRS. R. T. had passed a better night, pain in

the loins constant, with occasional bearing down of the womb, pulse a hundred and ten, head-ach, vertigo, great intolerance to light. The tongue moist, the skin hot and dry, palpitations of the heart, sensations of fainting, a numbness extending from the right side down to the foot, burning sensation of the stomach much increased by the movements of the foetus *in utero*, and the tongue and lips sore, which extended along the course of the œsophagus.

MR. T. senior was considerably recovered; the pain in the stomach occasionally troublesome, the appetite improved.

Fourth Day.

THE febrile symptoms in each case had considerably subsided; all the patients complained of a variety of nervous affections, such as tingling and burning sensations in the hands and feet, palpitation of the heart, great depression of the spirits, a perpetual sensation of swooning, with frequent twitchings of the muscles of the chest and abdomen.

THE vomiting in each patient had wholly subsided; but they still complained of the burning feel in the stomach. Mr. G.'s breathing more natural, the pulse a hundred.

MRS. R. T. had violent head-ach, and still great objection to light, the pain in the head was increased by its sudden approach. Whenever the foetus *in utero* moved strongly it augmented the pain in the stomach.

MR. T. senior nearly well.

IN the evening all the patients were in a progressive state of convalescence, and were pronounced out of danger.

Fifth Day.

THE symptomatic fever wholly gone, the nervous symptoms were much the same as yesterday.— The burning feel in the stomach was constant and more severe in Mrs. R. T. which was attributed to

her peculiar situation, she had for many days afterwards an intolerance of light.

Sixth Day.

MR. R. T. had a slight relapse of fever, with great increase of pain in the stomach, by eating animal food, and drinking a tumbler of porter; which induced a restless night, much thirst, with a recurrence of the spasmodic twitchings of the muscles of the chest, and both extremities. These symptoms were soon relieved by a cathartic, and low regimen.

MR. G. had a relapse of the epileptic fit, every evening about eight o'clock for a fortnight; after a week's interval, the fits returned with increased violence.

Conclusion.

MR. R. T. had a sensation in both extremities like the parts being asleep, and this symptom recurred daily for six weeks.

MR. and Mrs. R. T. and Mr. G. for many weeks afterwards, in attempting to reach an object by extending either arm, found the fore-arm suddenly contract towards the chest, causing them frequently to miss their aim. This may be considered as a very peculiar and uncommon symptom.

MR. T. senior for some time afterwards had daily attacks of a burning sensation in one or both feet.

THEY all lost the entire cuticle of their tongues a short time after they had been poisoned. In Mrs. R. T. the whole surface of the cuticle of the body peeled off by degrees in furfuraceous scales.

It is curious to remark, that none of the patients complained or had the slightest sensation of the itching of the skin, a symptom particularly observed by Dr. Orfila, in his general system of Toxicology, and also by Dr. Roget in his case of recovery from the effects of arsenic. Mrs. R. T. did not even complain of such a sensation, although she experienced an entire change of the cuticle.

Mrs. R. T. at her full period, underwent a safe but lingering labour, that is about two months subsequently to these alarming and trying symptoms to the constitution during utero-gestation. Neither the mother nor the infant, was at that time in any way constitutionally affected, by the poisonous mineral.

SUCH is the extraordinary train and variety of symptoms, arising from the effects of this powerful production of nature, upon the human frame, and when medicinally administered, it is also capable of producing, as already has been shewn, a still further diversity of action upon the animal œconomy.

ART. IX.

Experiments with arsenic upon human bile.

IN consequence of the singular appearance of the colour displayed in the fæces here described, and which was particularly remarked in three or four of the cases, a series of experiments have been adopted, with a view to ascertain what possible effect this most potent substance might have upon human bile. After mature reflection upon this extraordinary change, it became desirable to attempt an explanation of this problem, by artificial means, and the result of these trials proves the difficulty of effecting the purpose by the simple admixture of these substances, and after exposure to the influence of heat, &c. The digestive powers of the chylopœetic visceral secretions are so much beyond the reach of imitation, it is feared it may be deemed presumptuous in me, to have expected a fully adequate conclusion. By the following experiment the object in view was in some measure effected. It

may be necessary however, first to premise the difficulty there is in hitting off an exact tint of colour, and more especially as it is well known, that a variety of given materials produce infinite changes, according to the proportions chosen, either from the design of the chemist or the caprice of the artist; so perhaps by varying the quantities of the arsenious oxide* and bile, still greater transitions of colour probably might be produced.

ABOUT half a dram of the white oxide of arsenic, was levigated with double the quantity of human bile, collected as soon as possible *post mortem*, and then one ounce of distilled water was added.— These ingredients were immediately exposed nearly twenty minutes, to a moderate heat in a glass vessel, over a spirit lamp, and frequently agitated; during this process the liquor assumed the colour of an olive green. After allowing it to cool and the

* By Fourcroy and others denominated arsenious *acid*; for when this mineral substance is in a state of solution, it then becomes an acid, and is proved by its then acting upon or changing the colour of litmus paper.

undissolved portion of arsenic to subside, then by gently decanting the fluid, this powder was afterwards collected, then directly spread and dried, on a piece of white paper. It resembled a yellowish green approaching the olive, but not exactly of the same hue, observed in the alvine excretions.

THIS experiment, though not quite satisfactory, came the nearest to my object, and as many others were tried, without a similar result, it would be superfluous to enumerate them. But as this subject is new, future experimentalists may improve upon these hints, and peradventure enable them to add something more deservedly interesting, to the annals of physiological and chemical inquiry.

UPON briskly and merely agitating about forty grains of the poisonous mineral oxide, with three drams of recent bile obtained from an ox, it exactly resembled the olive colour, and thereby approached as near as possible to that which I was in search of. But this must be in a great measure attributed to the previous dark green colour the bile of that animal naturally possesses.

THE true homogeneous paint-like olive colour, produced by arsenic upon *fel humanum*, I am inclined to think, that such a variation from its natural appearance cannot be exactly artificially imitated, and can only be accounted for through the *modus operandi* of the chylopœetic digestive organs.

It is curious to observe, that the arsenic first employed in these experiments upon the human and ox bile, had been kept in a corked phial upwards of sixteen years; its operation was more rapid and complete in effecting the change to a bright olive green colour upon the bile of the ox, by simple agitation, than that which was produced by a more recent specimen of the white arsenious oxide obtained from Mr. Hume. This circumstance is worthy of observation, as it possibly may have an influence even upon the bile in the alvine excretions; at least it is but reasonable to make such an inference, since colour with its various transitions, is so readily influenced or acted upon by many apparently trivial causes.

SUFFICE it to say, that in the larger specimens of this poison as imported, the upper and lower strata

are usually of an opaque white, the middle stratum is commonly more compact, and often completely vitrified. Upon separating this portion and then exposing its glassy and semi-transparent surface to the action of the common atmospheric air, it undergoes a partial change by imbibing the oxygenous gas, and thereby losing its transparency and becomes more readily pulverized.

ART. X.

A safe and radical cure of Cancer, by the application of the white oxide of arsenic, in the form of an ointment.

HAVING experienced the satisfaction of curing a cancer, with the external application of the oxide of arsenic, by relating the particulars of this case, it probably may not be thought uninteresting; and more especially, as it further tends to illustrate the effects of this substance, upon one of the most terrible and untractable diseases incidental to the human frame.

BUT before entering upon the full description of the following case of cancer, which was radically, and safely cured by the metallic oxide, in the form of an ointment; it probably may be necessary to premise, that, Dr. Orfila in his elaborate treatise on mineral, vegetable, and animal poisons, or ge-

neral system of Toxicology, has mentioned some instances of alarming and fatal effects, arising from the external application of this poisonous mineral, in the form of white oxide, under the article *arsenious acid*. The formula therein described is denominated *pate arsenicale*. Now whether this paste is formed of honey or farinaceous matter with water, is not defined; but this mineral oxide enveloped in either of these substances, would with much more dangerous facility undergo decomposition or solution, by the assistance of animal heat, than when applied in an *unctuous* form; and to this circumstance is principally attributed the success, as well as prevention consequent upon such direful effects upon the constitution. The *unguentum arsenicale* is a very old remedy, and used by surgeons formerly, as well as of the present time, and also by empirics for the cure of this dreadful malady; and surely no regular practitioner would persist in the use of an application that could in the remotest degree endanger such untoward symptoms upon the human system. Nor could the boldness and ignorance of a quack, however hardy such a combination might render his nerves, be found capable of persevering in a remedy, that had produced even

in a solitary instance, effects so strongly and palpably marked, as arising from the absorption of the arsenious mineral. Such empirical practice, could it be supposed possible to give rise to so frightful a train of symptoms, would soon disclose itself by a legal investigation into the causes of dissolution.

Mr. W——e, about twenty-five years of age, and apparently healthy, had been afflicted about fourteen months by a cancer in the right inferior order of the inguinal glands. When first observed in the form of a schirrous, it was not much larger than a pea, which rapidly increased to the size of a pigeon's egg, accompanied with lancinating pains, troublesome itching, and unremitting pain in the loins. About five weeks afterwards, the tumour broke spontaneously, and the opening was dilated by a practitioner in the country, who advised poultices. A hæmorrhage frequently occurred without any exciting cause, the tumour then assumed a disposition to spread very fast. In consequence of this increase of morbid action continuing for many months, and which could not then be restrained by topical applications, however varied, the patient came to town, and was placed under my care.

ON examination, I perceived a great degree of tumefaction and induration, attended with inflammation, about the surrounding parts of the cancer, which was spreading with rapidity, appearing to threaten the circumjacent thickening with the same diseased action; the edges were jagged, and the fætor which issued from the surface was highly unpleasant to the patient. In order to reduce the inflammatory action, fomentations, linseed meal, and carrot poultices, were well applied, with the occasional use of leeches. Purgatives, the *extractum conii* in full doses, with an opiate at night, were administered. This plan of treatment in about ten days considerably reduced the swelling and inflammation. It became evident, that no effectual relief could be obtained without wholly destroying the diseased glands, and with this view the following arsenical ointment was applied, thickly spread upon lint, and adapted to the size of the cancerous surface—

℞ Unguenti cetacei, ʒj.

Arsenici oxidi albi,

Sulphuris loti, ana ʒj.

Misce fiat unguentum, pars affecta pro re natâ applicandum.

THIS escharotic ointment was gradually augmented in strength, by twice subsequently adding a scruple of the arsenic and sulphur until they each became in the proportion of a dram to one ounce of the ointment. The sulphur was used in order chemically to restrain the too violent action, as well as mechanically to divide the particles of the white oxide, and give to the ointment a stiffer consistence. This was applied three successive days, then discontinued and not again renewed, until by the aid of fomentations and cataplasms, the eschar could be taken off: and after proceeding in this cautious manner, a series of eschars, near a quarter of an inch in thickness, were removed, and each time of their separation the schirrous glands appeared sensibly and proportionably reduced. In a month from the commencement of this application, the diseased glands were entirely destroyed. The divided edges of the part were then brought together with straps of adhesive plaster, and a moderately tight bandage. The cicatrix was found to heal in the usual manner of an ordinary wound.

DURING the repeated applications of this arsenical ointment, and which was allowed to remain

each time twenty-four hours in contact with the part affected, neither symptoms of absorption nor deleterious effects upon the constitution were in the least perceptible, which tends to prove the groundless apprehension of such injurious effects. Immediately as it is applied, it destroys the living fibre, and thereby is somewhat similar in the principle of its action to the actual cautery, but with this advantage over the latter, by remaining many hours upon the surface, perhaps it thereby produced a much thicker slough, and did not offend the tender irritable state of the surrounding parts. The white oxide of arsenic applied in this form is much superior to the caustic potass, as the latter probably acts by entering into chemical combination with the animal substance, which renders it constantly liable, even with the utmost care, to extend beyond the exact boundaries of the part destined for destruction; and, considering the high state of inflammatory diathesis, or disposition thereto, in the approximate parts of this case, it would indubitably have caused, under such an event, an infinity of mischief.

Dr. Brown, of Sackville-street, kindly informs

me, that in numerous instances of cancerous affection, and fungous excrescence, he has prescribed the application of the white oxide of arsenic, incorporated with basilicon ointment. He varies the proportion, or degree of strength, agreeably to its effect and the circumstances of the case.

THIS gentleman has witnessed the application of such an arsenical cerate in many cases, and invariably accompanied with the most satisfactory and salutary results. In no single instance of its local use, however frequent the repetition to the diseased surface, has he ever had occasion to remark, either symptoms of absorption, or injurious effects upon the constitution. Dr. B. considers the arsenious oxide, when thus applied, as one of the most effectual of the class of escharotics. All apparent risk of danger is most effectually obviated by the very principle of its action, and the topical application being perfectly governable, it possesses a decided advantage over many other caustics.

THIS additional practical elucidation with regard to so powerful an escharotic, is highly important, inasmuch as it is derived from undoubted autho-

rity, and from a practitioner whose honour, veracity, and discernment, are equally unimpeachable.

NOTWITHSTANDING the complete success which throughout accompanied the case of cancer, here faithfully described, yet it was almost impossible to divest myself of the idea, that the medical reader might still entertain a doubt upon single evidence, as to the propriety of adopting the use of arsenic in similar cases, without further sanction and corroborative proofs of its real utility, perfect safety, and superior advantage.

Cancer uteri, is perhaps the most deplorable and lamentably frequent occurrence of this dreadful disease. It has for ever been the ardent desire and pursuit of the faculty to discover a specific, but this hopeless case we well know offers defiance to consummate skill, and scientific research. Under full persuasion of the remorseless fate awaiting the unhappy sufferer, I have been almost induced in certain stages of this disease, to have recourse to the arsenical ointment. But I have been appalled, by the full persuasion of meeting with those insurmountable objections which would doubtless be

suggested by the patient, under the impression of indelicacy, together with the great difficulty of adapting and retaining the ointment to the precise surface of the disease, independently of the risk that might possibly arise from the effect of moisture combined with animal heat, producing solution and consequent absorption; as well as the chance of piercing the vagina, and thereby endangering a communication either with the bladder, the *rectum*, or both.

A PUBLIC hospital, however, is the only situation from which even a trial of such an application could conveniently take its rise. This suggestion I have already communicated to my worthy friend and neighbour, Dr. S. Merriman, Physician accoucheur to the Middlesex Hospital, who has done me the honour of communicating this subject to the medical officers of that excellent institution; but at present no case has been admitted into the cancer ward suitable for the application.

ART. XI.

*Some practical remarks on the dangerous effects of
arsenious oxide in form of a Lotion.*

THIS mineral substance, when in solution, and used as an external application, is extremely liable to enter the system by absorption, and thereby produce paralytic affections, and even death. I remember an instance wherein a gentleman used it too freely, for the purpose of hastily dispatching some well known vermin, the *pediculus*, that are liable to assail and adhere to the pubes, and was shortly afterwards greatly alarmed, with symptoms of vomiting, swelling of the abdomen, and a complete paralysis of the lower extremities.

THIS metallic oxide, when dissolved and designed for the purpose of a wash, even in the most di-

luted form, is probably more imminently dangerous when applied to a *diseased* surface. The quantity so used must be ambiguous, as some patients apply outward remedies with more assiduity than others; therefore the larger the surface, the greater the hazard. Hence it may be very difficult to define the exact quantity or proportion that really might be used with impunity, and that perhaps may be found too weak to effect a cure; therefore it is reasonable to incline to the supposition, that it would become perfectly nugatory when so reduced. Indeed I am disposed to think that it cannot readily be extended in this shape, with unbounded safety and efficacy, to surgical practice.

THE degree of susceptibility of absorption, is well known to be more or less precarious; for it deviates considerably in different habits from some peculiarity of the constitution, and sometimes even in the same individual, being at various periods influenced perhaps either by healthy or diseased action. This is also frequently exemplified in the exhibition of mercury, externally as well as internally; the same natural laws, however difficult they may be

to be adequately explained upon physiological principles, are most probably equally applicable to solutions of arsenic, either when medicinally or surgically employed.

THIS theory I have before endeavoured to establish, by a somewhat similar practical inference and illustration, in Dr. Johnson's cases of paralysis.

ART. XII.

Practical application of the chemical analysis, whether antecedent or posterior to dissolution.

AN imperious duty here devolves upon the practitioner, forthwith to investigate the exciting cause of the dangerous and fatal symptoms arising from poison, as it behoves him to exert his utmost endeavours, by every possible inquiry that may enable him to arrive at the clearest and most satisfactory testimony on this important branch, which so necessarily tends to the elucidation of medical jurisprudence. With a view to facilitate such an investigation, it is with considerable deference the following practical suggestions are enumerated, since the full propriety of such an undertaking would no doubt spontaneously present itself to the mind of every practitioner.

IF no solid particles of the white metallic oxide can be readily discovered, the fluids early rejected from the stomach may then be collected, and, after boiling and filtering, submitted to the tests that have been here particularly recommended, viz. the ammoniaco-nitrate of silver, or the ammoniaco-sulphate of copper; the first will exhibit a fine yellow cloud, and the second a bright green colour; these will satisfactorily demonstrate, by chemical analysis, that arsenic had been therein contained.

SHOULD a remaining portion of the fluid or aliment be found, suspected of being similar to that which had been swallowed, both ought to be carefully examined. If the fluid form be of a thick gelatinous or opaque colour or consistence, such as flummery, sago, gruel, treacle, honey, arrow-root, milk, &c. by free dilutions with cold water, quickly agitated by a spoon, the white metallic particles will be disengaged and precipitated; then, by gradually decanting the fluid, these can with ease be collected and dried. The aliment, being of a more solid texture, such as cake, biscuit, gingerbread, puddings dumplings, &c. these must be carefully

suspended in cold water, and if from these substances, the suspicious white particles can be obtained, they must be exposed to a similar analytical process. But if from these, or such like articles of diet, only a fractional portion of a grain be obtained of the arsenious mineral oxide, after solution in three or four ounces of rain or distilled water, by means of a sand bath, then, having tested this solution through the agency of the foregoing chemical affinities, and thereby producing the yellow and green precipitates, they will amount to a positive and accurate confirmation of the presence of the arsenical poison. Should the suspected white powder, however, be obtained in a larger quantity, it will afford the means (if deemed requisite) to be further illustrated, by undergoing all the other chemical tests which have been fully explained in the foregoing pages, and also in the appendix, each corroborating the other.

IF the practitioner be called in *post mortem*, such minute inquiries are more or less necessary, whether it be to determine a case of suicide or murder, from the connected chain of evidence

that may fortuitously and eventually transpire. The exact state of the villous coat of the stomach, together with the *cardia* and *pylorus*, must be minutely inspected upon dissection; and, should this organ contain either a fluid or substance, it must be then cautiously submitted to the same process of chemical analysis. It is not improbable but some of the deleterious particles may be discovered adhering to its velvet lining. The alimentary canal may also furnish, after this manner of examination and close inspection, a decided and irrefragable testimony of the presence of the arsenious oxide.

SHOULD a failure of success be the result of these means of inquiry, a divided portion of the stomach itself must be boiled, without loss of time, ere putrefaction begin, in rain or distilled water, and the fluid, when filtered, submitted to chemical examination.

THE investigation of the alimentary canal, and the alvine secretions, may possibly afford some important evidence. Should the matter therein

contained be discovered intermixed with an olive green colour, it would directly imply a strong presumptive inference or suspicion, that death had been caused by the administration of this poisonous mineral: more especially if such an appearance could be otherwise corroborated by a reference to the exact history of the symptoms immediately preceding and foreboding the approach of that awful event.

SHOULD the abdomen appear swollen, upon a superficial view, previous to dissection, it will afford an auxiliary symptom of the effects of arsenic, provided only that a very few hours had elapsed from the period of dissolution, and the patient had been cut off in the plenitude of health.

SHOULD the white metallic particles not be discoverable in the stomach, having possibly escaped or gone beyond that organ of life, they may still perhaps be detected in the course of the alimentary canal.

IN very doubtful and difficult cases, when no

decided proof of the existence of arsenic can be discovered among the contents of the stomach or bowels, it will be requisite carefully to inspect other surfaces, especially the mouth, the tongue and œsophagus even to the cardia; for, it is not improbable that these sources would yield some satisfactory and valuable evidence.

APPENDIX.

A MOST important and highly interesting trial for murder, took place before Mr. Justice Abbot, at the Lent Assizes for 1817, held at Launceston in Cornwall. The accusation was founded upon a strong suspicion, supported by presumptive evidence, that the death was effected by poison, and that this was arsenic. The conflicting evidence of the medical men respecting the methods of detecting arsenic, and the mode of reasoning adduced at this trial, compel me to offer to my readers a very few comments upon some of the assertions made on that occasion.

THE only source from which I draw the allegations uttered by some of the witnesses, is the detail of that trial, published in all the respectable newspapers, early in the month of April. As these authorities seem unanimous, or nearly so, I shall not consider myself amenable for any incorrectness or omissions they may have committed.

It appears, on a cursory view, that these tests, of which they employed only *two*, underwent some deterioration, from their detail of experiments upon a decoction of onions producing the yellow and green *precipitates*. Indeed the learned judge emphatically observed in his charge, that the onion *liquor* was always thrown away, and the vegetable itself only used. In consequence of the sophistical reasonings produced in the course of the medical evidence, this publication has been retarded until every satisfactory information could be derived from experiment to shew the fallacy of the inductions.

THIS chemical investigation was instituted principally with a view to substantiate scientific facts

and to uphold the validity and accuracy of the ammoniaco-nitrate of silver particularly, as well as the ammoniaco-sulphate of copper, as re-agents; for until this part of the evidence be refuted, the general confidence of the faculty in them may probably be lessened. However, let any one thus biassed by such erroneous conclusions, or still entertaining a doubt, go through the same ordinal investigation about to be submitted for consideration, and he must immediately derive perfect satisfaction, by the palpable variation arising from the experiments.

IN short, these tests for the detection of arsenic, are of too much importance to the professional world to be hastily abandoned, more especially as hitherto the science of chemistry is principally limited to them and their various modifications, until superior criteria are discovered. They must still remain the foremost in efficacy as already stationed and fully admitted in the scale of chemical affinities, for detecting the presence of this poison when in a state of *solution*.

It appears in the course of the evidence, that no *solid* particles of arsenic could be discovered, either in the fluids or aliment *rejected from the stomach*, (perhaps they were never examined), or in the immediate contents of that organ found upon dissection. Hence it may be inferred, that instances of murder actually committed by *solution* of arsenic may eventually occur comparatively with impunity, because the poison in that form cannot be displayed in the resplendent metallic state upon plates of copper or brass, or by reduction and sublimation, through the aid of carbonaceous matter. The chemical operation of evaporating the contents of the stomach or rejected fluids to dryness, on a sand bath, in cases wherein the arsenious oxide had been taken in the form of solution, might not always afford the practical means of furnishing a sufficient quantity for such an exhibition.

It may be remarked, that arsenic has been rarely if ever administered, with a murderous intention, in any other form than that of the white oxide; and this fact will be readily admitted. However,

in the trial here mentioned, it appears from a part of the testimony, to have "indicated its presence in a *fluid* and not in a soluble state." In this enlightened era, such a circumstance may actually furnish a hint to the depraved, by tempting them to evade the views of justice and condign punishment, by giving the poison in this equally active though less easy form to be detected, even supposing the utility and accuracy of these and other analytical tests, to be wholly disqualified and inadequate.

*A few of the Experiments on Decoction of
Onions.*

A DECOCTION of this vegetable was prepared after this manner. Four moderately sized onions were sliced after being divested of their external coat and first lamina, in the usual manner for culinary purposes, and boiled in a pint of water three quarters of an hour. The liquor, when strained from the vegetable through a close sieve, is of itself decided-

ly yellow, and when cold was submitted to the following experimental tests.

The Ammoniaco-nitrate of Silver.

Experiment 1.—AN ounce of this decoction, filtered, was touched with the ammoniaco-nitrate of silver, which produced neither cloudy precipitate, nor any perceptible change. Then three drops, and afterwards nine more of the test-liquor were added, which in a few seconds heightened the previous yellowish colour of the fluid, and after a few minutes it inclined to a reddish yellow, and gradually changed to a *deep red* colour resembling tawny port wine, which it retained several days, and never returned to that decided yellow colour, indicative of arsenite of silver, nor any thing whatever in the form of *precipitate*.

Experiment 2 —SOME decoction of onions was mixed with an equal quantity of distilled water,

then treated precisely as in the foregoing essay; the result was exactly similar, only the liquor in consequence of dilution was less coloured, nor did it ever exhibit the slightest disposition to form a yellow precipitate or even a cloud.

Experiment 3.—Two drams of the onion liquor with one ounce of distilled water. This fluid was also tested with the ammoniaco-nitrate of silver, which caused an increase of yellow colour. This changed slowly to a reddish brown tinge; and continued unaltered for many days.

Experiment 4.—HALF an ounce of the decoction was diluted with double the quantity of distilled water. By holding a piece of the nitrate of silver (lunar caustic) for a few seconds, in the liquor, by means of a small pair of forceps, it produced a dingy red, very much resembling the colour resulting from twelve drops of the ammoniaco-nitrate of silver, in number 1 and 2.

The Ammoniaco-sulphate of Copper.

Experiment 5.—AN ounce of the filtered onion liquor, was tested by the ammoniaco-sulphate of copper, which effected a very slight hue of green; then three, and afterwards nine drops were added, which quickly yielded a permanent and *transparent grass green* colour, and no cloud or precipitate could be perceived.

Experiment 6.—AN equal part of decoction (not filtered) and distilled water were tested after the manner of the last essay, which occasioned the identical tint of grass green, but of less density of colour.

Experiment 7.—Two drams of the onion decoction diluted with one ounce of distilled water, being tested by a glass rod previously dipped in the ammoniaco-sulphate of copper, produced no visible alteration. This was satisfactorily confirmed by comparing it, necessarily, with a similar specimen

or proportion of distilled water, and the vegetable decoction placed by its side in another glass vessel. Some days afterwards no deviation could be perceived; it was impossible to distinguish one from the other.

Experiment 8.—ONE part of onion liquor and two of distilled water, by adding three drops of ammonia, caused a light grass green colour equally pellucid.

THE same order of experiments, tested in a similar manner, were tried on a decoction of onions made with *distilled* water, prepared after the same culinary method, in the exact proportions either of the liquor itself, or further combined with distilled water. These afforded in every instance a similar result, with the exception of the colours deep red and transparent green being respectively fainter in their tints.

THE conclusion of all these experiments differs so remarkably from the analytical effect produced by these celebrated tests upon solution of *arsenic*, even in its most diluted form, that it is utterly impossible for the colours to be confounded. Those arising from arsenical solution are perfectly dense and opaque, whereas, from the onion decoction they are quite transparent by these tests. The fine undulating cloud, forming a brilliant king's or vivid yellow, and that peculiar green precipitate of Scheele (so well known to artists) instantaneously descending as the glass rod moistened with either touches the surface of the arsenical fluid, are strikingly beautiful and convincing: whereas, in no single instance of these experiments, just reported, could the slightest vestige of a cloudy precipitate be perceived from these analytical tests, neither at the time, nor for many subsequent days. The mere *change of colour* in a fluid preserving its clearness, does not constitute or me-

at the appellation of *precipitate*. This essential difference of transparency with onions, and opacity with arsenic, must be particularly regarded, as it is one of the distinguishing marks confirming the presence of the arsenious oxide.

THE changes of colour arising from the 'onion, are undoubtedly curious and somewhat interesting; the *grass green* is at once effected by adding a sufficient quantity of the copper test, and the yellow occasioned by the triple silver test gradually degenerates to a *dark red*.

THESE experiments were again tried by me, in the presence of Dr. Plenderleath and Mr. Hume, who equally bear testimony to the satisfactory result, and expressed their entire conviction of the fallacy of decoction of onions, as interfering with and injuring the chemical reputation of these arsenical tests.

It became however, equally necessary to go through the experiments on decoction of onions precisely after the manner described in that part of the medical evidence adduced at the trial, which

differed very materially in some respects from the foregoing; nevertheless, these varied so remarkably from solution of arsenic, that it is impossible even to admit a similitude in their operation.

AFTER holding a fragment of the nitrate of silver two minutes, by means of a convenient instrument, in a decoction of onions equal in strength to the antecedent essays, and with an equal proportion of distilled water, a light tinge of yellow appeared. On withdrawing the lunar caustic, and then adding five grains of the phosphate of soda, a turbid red colour was produced, which formed into an opaque white precipitate, which in two hours became a dark muddy red.—Two grains and a half of the phosphate of soda, was dissolved in one ounce of the plain decoction of the vegetable; on suspending a piece of the nitrate of silver, for two minutes, it yielded a thick opaque white precipitate, not the least inclining to the yellow tinge.—Then a similar portion of the onion liquor and phosphate of soda

by merely touching its surface a few seconds with the nitrate of silver, formed a yellowish precipitate gradually changing to a dark cloudy red.—In another instance, with an equal proportion of decoction and distilled water, with two grains and a half of the phosphate of soda, by suspending a fragment of the sulphate of copper, exhibited a grass green precipitate, which retained the colour.

THESE were the proportions severally adopted, and such were the results in these experiments. The quantities of ingredients not having been described in the evidence, or before the jury, on that occasion, we necessarily can only guess at them. But I am disposed to think, however diversified, in given proportions, no very material deviation in the chemical effect could be demonstrated.

THE nitrate of silver, separately applied to an uncombined solution of arsenic in distilled water, has no other power in detecting its presence than pro-

ducing a slight degree of opacity; it becomes, however, a negative proof that the suspected fluid does not contain an alkaline phosphate. Hence the application of this substance alone is strongly recommended by Mr. Hume, previous to the commencement of the chemical analysis by *ammoniaco-nitrate* of silver, which acts only by double elective attraction, as has been previously remarked. The stomach, it is well known, does not secrete a phosphate peculiar to itself; hence, should the yellow precipitate be displayed, upon the simple contact of the lunar caustic to its contents, when filtered, it would form a more doubtful case to determine the existence or combination of the arsenious oxide, as Fowler's solution would also yield the same. But, fortunately, phosphate of soda is perfectly harmless in its effects upon the stomach and constitution, even in the full dose; such a possible case, however unlikely to happen, must be determined medically by the succession of symptoms, as well as collateral evidence by the further application of Mr. Hume's means, particularly by that of nitrate of potass, which has been unaccountably overlooked by some of the most eminent chemists.

MR. Hume has, in one of his letters, described a process for the detection of arsenic, which seems to have quite escaped the notice of some of the most intelligent chemists of the age. It is that by which either arsenic or its combinations can be submitted to the action of *nitrate of potass*. I have witnessed the perfection of this method to my complete satisfaction, and have his permission to give a short detail of it in this place, by stating a single example only.

LET the yellow precipitate be mixed with a little finely pulverized nitrate of potass, and then exposed in a glass tube, hermetically sealed at one end, to the flame of a spirit lamp. Let a piece of moistened blue litmus paper be suspended within the tube over the compound.—As the operation proceeds, nitrous acid will be disengaged, and change the colour of the paper to red, if any arsenic be in the precipitate, and this may be depended upon as one test; the tube and its contents are then to be allowed to cool. Now, let a narrow slip of paper dipped in a solution of caustic ammonia, be held in the tube over the

residuum, and a dense white cloud appearing will confirm the first indication, and thus produce a second test, fully establishing the former. The tube is now to be nearly filled with hot distilled water, again held over the lamp, and occasionally shaken. The solution being filtered, will give *two more* indubitable and correlative proofs of the presence of arsenic. Thus, divide the filtered liquor into two equal portions; to one present a piece of dry *nitrate of silver*, and the usual brick red coloured precipitate will ensue. Let the other part of the solution be now treated precisely in the same manner, only substituting a piece of dry *sulphate of copper* for the nitrate of silver, this will produce the *arsenite* of copper, being a *blue* precipitate, and very distinct from Scheele's green or the *arsenite* of this metal; and this change is so apparent, that no person can confound the two products with each other, or assert that any *phosphate* could be present in either of the above solutions.

INSTEAD of a glass tube, the operation can be performed in a shallow glass vessel such as a watch glass; and a few drops of concentrated solution of

nitrate of potass in place of the dry powder. The moistened blue litmus paper need not be suspended over the mixture until the aqueous vapour be dissipated, when the nitrous acid fumes will soon follow, and shew themselves by the usual indications of colour, smell, &c.

THE profession at large are earnestly exhorted to render themselves perfectly acquainted with every information appertaining to the more distinct and unanimous elucidation of this important subject of medical jurisprudence. Cases of poison are unfortunately too frequently occurring, while the knowledge that is requisite to enable practitioners to adduce demonstrative evidence, devoid of ambiguity, is most essentially wanted; therefore it becomes a serious part of medical education to be thoroughly conversant with this exclusive department of chemistry.

It is humbly hoped the foregoing articles may contribute in some degree to establish the basis of this momentous inquiry, by furnishing hints and practical data. These observations on the various

and remarkable effects of this powerful production of nature upon the human system, may possibly be the means of stimulating an abler hand to pursue this needful subject, and thereby contribute more permanent benefit to the community, by further facilitating the scientific and highly useful researches of medical men.

WERE the awful symptoms and horrid sufferings, arising from the action of this poison more generally contemplated, either by the audacious assassin, or the unhappy individual who aims at self destruction, it possibly might have a tendency to appal such irreligious and execrable projectors, who presumptuously attempt to put a period to the inestimable blessing of human existence. Instant death is their object, not torture or lengthened pain, since the human mind, fully possessing the free exercise of its right faculties, however depraved, can scarcely be deemed in the remotest degree so callous as to seek or require such additional pangs to the immediate approach of premature and hurried dissolution. The certainty of detecting the minutest portion of this poisonous oxide, whether in a state of

powder or chemical solution, being commonly known, would doubtless materially prevent the commission of this crime, and lessen the frequency of clandestine murder. It would indeed become a pleasing reward, but too presumptuous to be expected by me, should these reflections be the means of diminishing the frequent perpetration of such cruel attempts, or otherwise of compelling the guilty mind, barbarously bent on the destruction either of himself or of another, to forego his wicked intentions, by reflecting on the painful consequences attending dissolution under such circumstances.

THE END.

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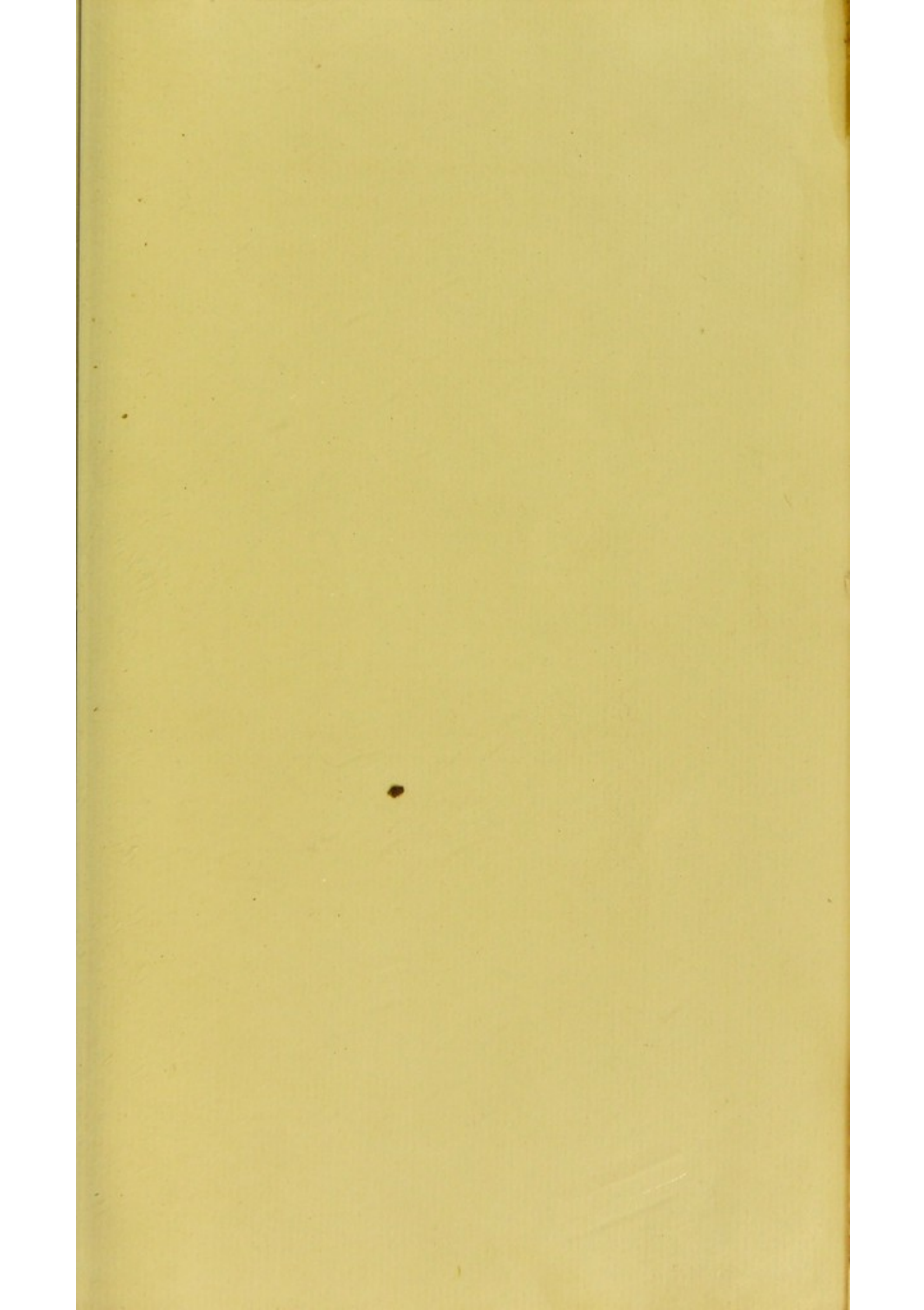
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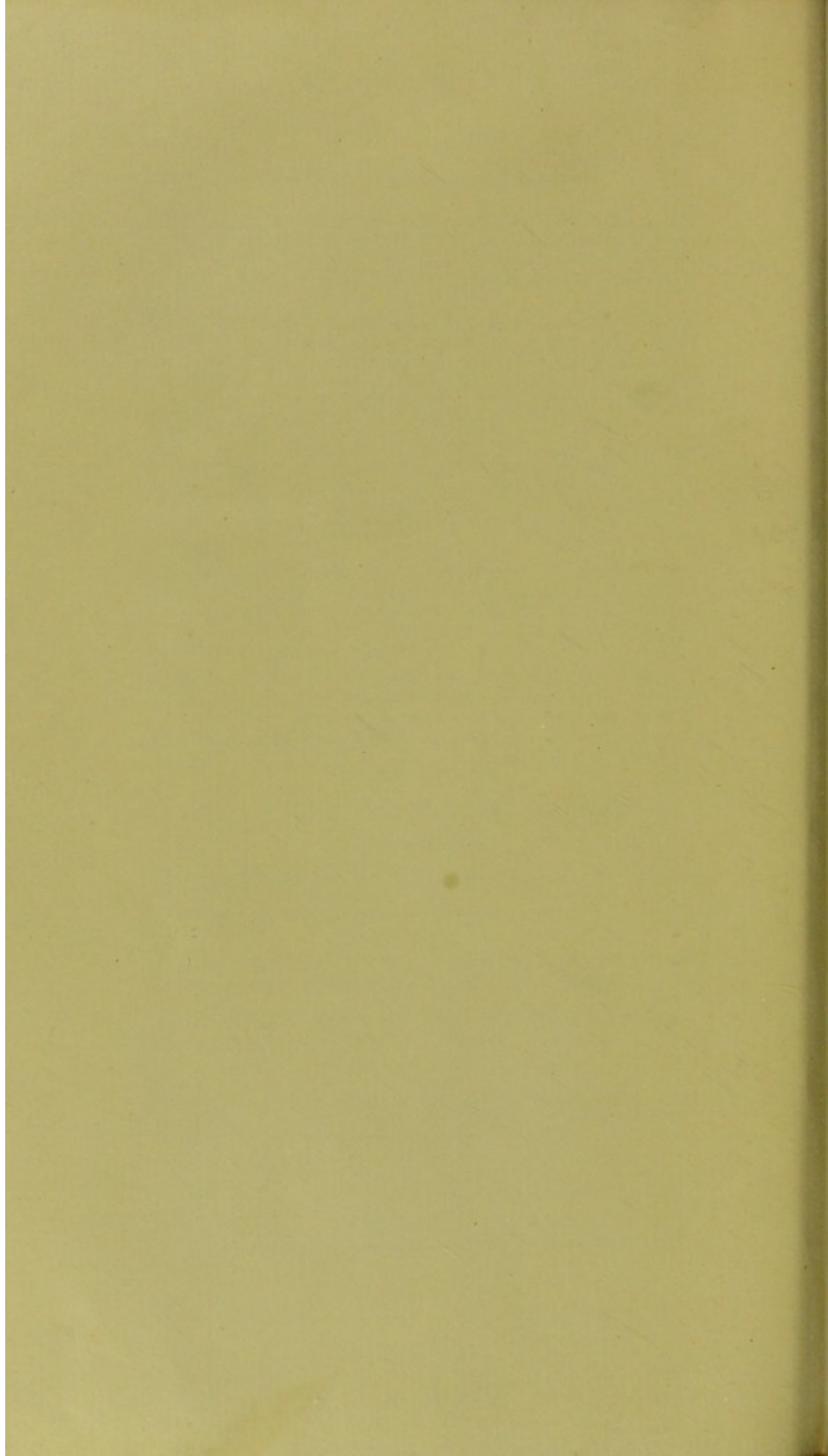
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