PROVINCIAL MEDICAL JOURNAL

And Retrospect of the Medical Sciences.

No. 14.--VOL. II.]

LONDON, SATURDAY, JULY 9, 1842.

PRICE SIXPENCE.
[Stamped Edition Sevenpence.

ON POISONING BY THE FIXED ALKALIES.

By M. ORFILA.

I have thought it right to re-examine all the circumstances connected with medico-legal researches in cases of poisoning by fixed alkalies, because I have found many serious errors and lacunæ in the observations that have been hitherto made. Authors who have written on this subject have not sufficiently attended to the fact of the existence of potass, soda, and lime in many alimentary substances, and in the fluids and organs of man in their natural state. No one, as far as I am aware of, has yet been able to indicate in a precise and ready manner the means of ascertaining whether the fixed alkalies obtained from the analysis of suspected matters result from poisoning, or exist naturally in these matters. On the other hand, it seems to me to be important to discover whether the alkalies in question are absorbed under certain circumstances; and if so, by what means they can be discovered in the viscera to which they have been conveyed. I shall be very happy, if, in this communication, I am able, as I expect, to solve these important questions. The following facts I regard as indispensable to the completeness of this paper:—

Potass, Purified by Alcohol.

It is white, inodorous, of an exceedingly caustic taste, very soluble in water, and deliquescent. Its aqueous solution, either moderately strong, or very concentrated, turns the syrup of violets green, and turmeric paper blue when it has been reddened by an acid; carbonic acid does not cause a precipitation. It decomposes nitrate of silver, and separates the oxide, which presents a clear olive color, and is entirely soluble in pure nitric acid. The chloruret of platina causes a canary yellow, granulated, pulverulent precipitate, occupying the bottom of the vessel, and adhering to the sides of the glass, whilst soda is precipitated by this re-agent only when it is in a concentrated solution, and then the precipitate is of a reddish yellow, and less adherent to the glass than the preceding. The perchloric acid gives a white precipitate from potass, but does not disturb the aqueous solution of soda.

Diluted Aqueous Solution of Pure Potass.

It turns the syrup of violets green, and restores the blue color to turmeric paper previously reddened by an acid; carbonic acid and nitrate of silver act upon it as on the concentrated solution, provided, at least as far as regards the latter, it be not too diluted. The chloruret of platina and the perchloric acid do not disturb it even at the end of several hours; and as it is indispensable to prove these two qualities, in order to determine the existence of potass in the liquid, this latter must be evaporated, and brought to that degree

of concentration which will enable these two re-agents to act upon it. These proofs will be amply sufficient to demonstrate the existence of potass, and it would be useless to have recourse to the carbazotic acid, recommended by some authors. Nor is there any necessity to push the evaporation to dryness, and to calcine the product in a silver crucible, as M. Devergie advises, with the view, he says, of volatilising the ammonia and its compounds, if they exist, while, if the potass be pure, and he supposes it to be so, it cannot contain any ammoniacal compound.

Potass with Lime (Pierre à Caustère).

This contains, besides the pure potass, a certain quantity of lime, sulphate of potass, chloruret of potassium, silicic acid, alumine, and oxyde of iron and manganese. It differs from the potass purified by alcohol, first, because it gives with the nitrate of silver a precipitate of olive oxyde of silver mixed with the white chloruret of silver; in fact, if a few drops of pure nitric acid be added, the oxyde is dissolved, and the chloruret remains in the form of white, heavy grains; secondly, because the nitrate of barytes yields a white precipitate of sulphate of barytes, insoluble in water and in cold or boiling nitric acid; thirdly, because it gives a white precipitate of oxalate of lime with the oxalate of ammonia. I may add, that it is not uncommon to see the potass with lime of a brown, yellow, or reddish color.

Potassa of Commerce.

These contain a quantity of the carbonate of potass (the sub-carbonate), varying from 40 to 65 per cent., besides the other matters spoken of in the last article, with the exception of the lime. The potass of Germany rarely contains more than from 40 to 45 per cent. of the carbonate, whilst that of America has 65, and that of Russia from 55 to 60. They are like the potassa cum calce in their behaviour with the re-agents, excepting that they effervesce with the weak acid, with a disengaging of the carbonic acid gas, and that no precipitation takes place with the oxalate of ammonia.

Potass, purified with Alcohol, mixed with Red Wine.

A few drops of this alkali are sufficient to impart a deep green tint to red wine; it is, therefore, impossible that such a mixture could be given as wine, but it might happen that the chemist should have to seek for potass purified with alcohol in a vomited liquid, or one found in the digestive apparatus, after the patient had drank some wine. It is, therefore, important to ascertain whether the processes recommended to discover the potass in these cases ought not to undergo some modifications. If two grains of this alkali are dissolved in 125 scruples of red wine, previously neutralised by three grains of the same alkali, and the liquid filtered, it will be found to be of a blueish green color, that it will turn blue turmeric paper, reddened by an acid, and that the

chloruret of platina and the perchloric acid will restore the red color of the wine, without causing any precipitate. At the end of a few hours the last-named of these re-agents induces a blackish deposit.

These characters, as may be seen, are not sufficient to demonstrate the presence of pure potass in this mixture. This may be attained by evaporating the liquid to dryness, and by slaking the dry and cold product for several minutes in concentrated alcohol, of 44° of the areometer; the liquid is then filtered, and evaporated to dryness, heat being applied continuously until the product is slightly carbonised; it is then treated with boiling distilled water; the filtered liquor, of a brownish yellow color, restores the blue color of reddened turmeric paper, and has a canary yellow and white precipitate, like potass from the chloruret of platina and the perchloric acid. If, instead of treating it with water, the chloruret of platina were added to the alcoholic solution, a mistake might happen, because concentrated alcohol alone will give a canary yellow precipitate with this chloruret, which might give rise to the belief in the existence of potass; the precipitate, in truth, is neither granulated nor adherent to the glass.

By a comparative experiment—that is, by treating in the same way 250 scruples of red wine (double the quantity used in the previous experiment), without the addition of any potass—we find that not an atom of potass can be obtained from the aqueous solution. This negative result is in perfect accordance with theory, because we know that the bitartrate and sulphate of potass, that may be contained in the wine, are not soluble in cold alcohol of 44°.

But, it may be observed, in adopting this process, the potass changes the bitartrate of potass of the wine into a neutral tartrate, soluble in alcohol of 44°; so that after the incineration of the alcoholic solution, we obtain not only the potass which rendered the wine alkaline, but also that which formed part of the bitartrate, and that which was added to change the latter into a neutral tartrate. This is, however, of no consequence, as it is not necessary to indicate the quantity of potass added to the wine, but to show that it has been added sometimes, and, with this object solely in view, the plan I have recommended is perfect.

Mixture of Pure Potass and the Alimentary Fluids, with the Matters Vomited, or with that found in the Digestive Apparatus, the Potass having disorganised the Tissues of the Canal.

It is well known that sugared water, tea, coffee, albumen, gelatine, bouillon, bile, and the blood, are not rendered turbid by this alkali, which, on the contrary, renders them more fluid; the tissues of the digestive canal are speedily softened, and changed into a liquid pulp.

Before describing the process which appears to me to be the best adapted to discover potass in these mixtures, I think it necessary to narrate a certain number of experiments instituted with the view of ascertaining its importance.

First Experiment.—I mixed equal parts of potass purified with alcohol, the neutral tartrate of potass, the sulphate of potass, and the chloruret of potassium, the mass weighing ten grains. I dissolved it in water, and evaporated to dryness. The product was divided

into two equal parts; one was shaken for ten minutes in cold alcohol, 44°; the other was treated for the same time with the same menstruum in a boiling state. The two solutions evaporated separately to dryness furnished products which I dissolved in a small quantity of boiling distilled water; the solution restored the blue of reddened turmeric paper, and contained free potass, as was shown by the perchloric acid and the chloruret of platina. They were not rendered turbid either by the salts of barytes or by the salts of silver, so that they did not contain an atom of the tartrate or sulphate, nor of the chloruret of potassium. These salts, therefore, remained entirely in the residuum of the treatment by alcohol.

I then poured pure cold acetic acid, diluted with three times its weight of water, on a mixture of equal parts of the nitrate and sulphate and of the chloruret of potassium, previously dissolved in distilled water, and evaporated to dryness; at the end of half an hour I filtered the acetic solution, and ascertained, by means of lime water, the chloruret of barium, and the nitrate of silver, that it contained the tartrate and sulphate, and the chloruret of potassium in solution.

Second Experiment.—After having saturated 100 scruples of milk, as many of broth, human bile, and coffee, with the purified potass, I added one grain of the same alkali. The liquor evaporated to dryness gave a brownish product, which I boiled for two or three minutes with alcohol at 44°; the alcoholic solution filtered, and evaporated one-fourth, was of a brown color, and restored the blue color of reddened paper; filtered again, and brought into contact with the chloruret of platina and the perchloric acid, it gave precipitate of potass so colored and mixed with organic matters, that it was impossible to decide whether there was or was not free potass in the liquid submitted to examination.

Third Experiment.—The same experiment was repeated, but the alcohol was used cold. The brown alcoholic liquid, evaporated to dryness, gave a product, which was carbonised and incinerated in a silver crucible; the ashes, treated with cold alcohol at 44°, furnished a solution, which, having been filtered and concentrated by heat, restored the blue tint of reddened paper. It was evaporated to dryness; the product dissolved in a little water was precipitated white by the perchloric acid, and a canary yellow by the chloruret of platina. This last deposit was hard, granulated, and adherent to the glass.

Fourth Experiment.—The alimentary matters, exhausted by alcohol, as has just been said, were brought into contact for twelve hours with pure cold acetic acid, diluted with three parts of water, in order to affect that portion of potass which had passed to the state of carbonate or of soap, and which the alcohol had not dissolved. I then boiled the mixture for four or five minutes, and filtered; the solution of a brown color, evaporated to dryness, was incinerated in a silver crucible. The ash, treated for several minutes with boiling distilled water, gave a solution containing potassa, the carbonate of potass (this latter was formed during incineration), and some other salts. On concentrating the filtered liquid I became assured that it was alkaline. I then boiled it for a quarter of an hour with a few grains of a pure milk of lime made with distilled water, with the view of bringing

back to the state of potass the carbonate of potass that was in the liquor. I filtered this, and evaporated it to dryness; the product of the evaporation, shaken for twelve or fifteen minutes with cold alcohol at 44°, gave me a solution, which I filtered and evaporated; a few drops poured on this were sufficient to dissolve the pure potassa, and the liquid restored the blue of reddened paper, and gave with the chloruret of platina and the perchloric acid, when it was sufficiently concentrated, the clear and characteristic precipitates obtained from the purified potass.

This experiment repeated with the same quantity of alimentary matters, exhausted by alcohol, but without the addition of pure potass, gave at last an alkaline product containing soda, not potass; in fact, the aqueous solution of the residuum restored the blue of reddened paper, but was not rendered turbid by the chloruret of platina or by the perchloric acid.

Fifth Experiment.—I have often dried a mixture of a quart of broth, a pint of milk, as much coffee, and all the bile contained in a gall-bladder; the product, without the addition of potass, after having been macerated for a quarter of an hour in cold alcohol of 44°, was shaken in the liquid, and boiled for a few minutes, filtered, and the alcohol evaporated in a porcelain capsule, until carbonisation took place, and smoke was no longer disengaged. I then detached the carbon with a clean knife; this carbon brought into contact with reddened turmeric paper slightly moistened, did not turn it blue. I then incinerated it in a silver crucible, and boiled the ashes for several minutes with concentrated alcohol; the filtered solution had no action on the reddened paper; I then evaporated to dryness, and treated the residuum with a few drops of distilled water; the solution did not change the color of the paper; concentrated, and brought into contact with the chloruret of platina, it was not rendered turbid. The matter remaining in the crucible, not dissolved by the alcohol, was treated with a little boiling distilled water; it was filtered, and the liquid slowly restored the blue tint of the reddened paper; but it was not precipitated by the chloruret of platina, nor by the perchloric acid.

The alimentary mass dried and treated with alcohol, was left for twelve hours in pure acetic acid, diluted with three or four parts of distilled water, then boiled for several minutes; the filtered liquid, of a reddish brown color, was evaporated in a porcelain capsule until it was carbonised, and no longer disengaged smoke; the carbon, brought into contact with reddened turmeric paper slightly moistened, gave it a deep blue color; incinerated in a silver crucible, and the ash treated with boiling concentrated alcohol, gave a solution, which was filtered, and which was not alkaline by the turmeric test; the residuum obtained by evaporation to dryness of this solution was submitted to the action of boiling distilled water; the liquid did not restore the blue of reddened paper, and there was not any precipitate from the chloruret of platina or the perchloric acid. The portion of the ash not dissolved by the alcohol was treated with boiling distilled water, and the liquid filtered; this latter rendered the red paper blue, and was precipitated by the chloruret of platina and by the perchloric acid, as would be a solution of the carbonate of potass. Does this ash contain a certain quantity of soda, inde-

pendent of the potass? There is every reason to believe it does.

Sixth Experiment.—After having saturated with pure potass an alimentary mass, weighing a kilogramme and a half, and composed of milk, broth, coffee, bile, and 300 scruples of red wine, I added two grains of purified potass. This mixture was evaporated to dryness, and treated for two or three minutes with boiling alcohol of 44°; the residue not dissolved by the alcohol was submitted to the action of diluted acetic acid; the two liquors evaporated, carbonised, and incinerated separately, left ash, which, submitted to the action of concentrated alcohol, as has been said in the third and fifth experiments, gave pure potass, whilst a similar mixture, treated in the same way, without the addition of potass, did not yield any traces of it.

Seventh Experiment.—The preceding mixture, saturated with pure potass, with the addition of one grain of this alkali, was evaporated; the dry product was treated with boiling concentrated alcohol, the solution filtered and evaporated to dryness; the residue dissolved in distilled water, and the solution submitted to the action of a current of chlorine gas, as M. Devergie advises, when the liquid was deprived of its color, and filtered, to separate it from the numerous white flakes which had been formed during the action of the chlorine, and then concentrated by evaporation; it increased greatly the redness of the turmeric paper, instead of restoring its blue tint, and gave with the chloruret of platina a canary yellow precipitate, resembling that afforded by the salts of potass.

M. Devergie looks upon the presence of the salts of potass in certain vegetable and animal liquids as a difficulty inherent to this mode of operation; we cannot share his fears, as far as regards the salts most frequently present in these liquids, because, even if they were present in a notable quantity, they would not be soluble in alcohol of 44°, excepting always the acetate, which might perchance be present in the liquid, and which is soluble in alcohol. We shall examine hereafter the inconveniences resulting from the presence of this salt, contenting ourselves with stating at present, that we do not adopt the use of the chlorine, because it gives the potass as a salt, and that it is possible, by other means, to obtain it in the state of a pure caustic alkali.

Eighth Experiment.—I have several times given 2½ or 3 scruples of the purified potass, dissolved in 80 or 100 scruples of water, to dogs fasting, and to others who had eaten freely an hour or two previously, and have then tried the œsophagus, to prevent vomiting. The animals have died in from twenty to twenty-four hours. I then collected all the matters contained in the stomach, and washed it with distilled water; next mixing the water used in washing the stomach with the partly digested food, I ascertained that reddened turmeric paper quickly assumed its blue color when touched with the liquid. The mixture was next heated for twenty minutes, and filtered. The liquid I shall speak of as A, the solid matter as B. A, evaporated to dryness in a porcelain capsule, and treated with boiling alcohol of 44°, gave a solution, which, filtered while boiling, restored the blue of reddened turmeric paper; it was then evaporated until it became carbonised, and no longer gave out any smoke; the carbon, brought into contact with

reddened paper, slightly moistened, changed it to blue. A portion of potass had evidently been dissolved by means of the organic matters. I incinerated the carbon in a silver crucible; the ash, treated with concentrated boiling alcohol, gave a liquid which did not turn the reddened paper blue, because during incineration the potass had passed to the state of carbonate, insoluble in alcohol; the residue, not dissolved by this menstruum, was strongly alkaline; dissolved in water, it readily imparted the blue color to reddened paper, and gave abundant precipitates, with the chloruret of platina and the perchloric acid, similar to those obtained from the carbonate of potass; this residue also effervesced with acids.

That portion of A not dissolved by the boiling alcohol, having been left for an hour in pure acetic acid, diluted with three times its weight of water, was then heated to ebullition; the filtered liquid, of a reddish brown color, was evaporated in a porcelain capsule, until it was carbonised, and did not give out any smoke; the carbon was very alkaline in its action on paper. I easily detached it with the blade of a knife, in order to incinerate it in a silver crucible. The ash, treated with concentrated boiling alcohol, gave a solution, which did not turn reddened paper blue; the ash remaining after the action of the alcohol was exhausted by boiling distilled water, and the liquid filtered; the solution had a powerful alkaline influence on the reddened paper, and the chloruret of platina and perchloric acid afforded very slight precipitates, similar to those which a weak solution of carbonate of potass would give.

B—that is to say, the solid matters obtained after having boiled the contents of the stomach for twenty minutes—was treated with concentrated boiling alcohol; the filtered liquid was shown to be alkaline by its action on the paper; it was evaporated in a porcelain capsule until it became carbonised, and did not yield any smoke; the carbon gave a blue color to reddened paper; incinerated in a silver crucible, the ash, treated with boiling alcohol, gave a solution, which did not restore the blue to reddened paper, even when it had been concentrated by evaporation; the ash residue, on which the alcohol had acted, having been treated with boiling distilled water, gave a solution, which, when concentrated, rendered the paper blue, and gave abundant precipitates with the chloruret of platina and perchloric acid, similar to those from the carbonate of potass.

B, the residue exhausted by the alcohol, after having been macerated an hour in pure acetic acid, diluted with three times its weight of water, was boiled; the filtered liquid, of a brown color, was heated in a porcelain capsule, until it became dry and carbonised; the carbon rendered blue the reddened paper, previously slightly moistened; incinerated in a silver crucible, the ash, treated with boiling alcohol, did not yield up anything to that menstruum, whilst boiling distilled water dissolved all the alkali it contained; the solution powerfully affecting the reddened paper, concentrated, and brought in contact with the chloruret of platina and the perchloric acid, no precipitation ensued.

Ninth Experiment.—All the preceding experiments were repeated, substituting the potassa cum calce for the purified potass, and with the same results.

Tenth Experiment.—I gave a dog fasting 4 scruples of potassa cum calce, dissolved in 130 scruples of water, and I tied the œsophagus. The animal died six hours afterwards, and was immediately opened. The liver, spleen, and kidneys were immediately removed (the alimentary canal remaining intact), cut into pieces, and placed in a porcelain capsule with distilled water; the liquid was boiled for an hour, and then filtered; the solution did not appear to have any action on reddened paper; it was evaporated to dryness, and as soon as it was rather concentrated, it showed a slight influence on the test paper. The solid product thus obtained, after having been shaken for ten minutes with cold alcohol of 44°, was boiled for six or seven minutes, the boiling liquid filtered, and evaporated in a porcelain capsule, until it was carbonised, and no longer gave out any vapour; the carbon, touched with reddened and slightly moistened paper, restored its blue color; it was then removed from the capsule, and incinerated in a silver crucible; the ash, treated with boiling water, gave a solution, which, having been filtered and concentrated by evaporation, acted strongly on the test-paper, and gave a precipitate with the chloruret of platina and the perchloric acid, like the carbonate of potass.

The liver, spleen, and kidneys of a healthy dog, treated with boiling water, alcohol, &c., as has just been stated, gave an alkaline ash, in which it was impossible to discover the slightest trace of potass by the chloruret of platina or the perchloric acid.

Eleventh Experiment.—Being desirous of ascertaining whether the alcohol and the acetic acid would act on the carbonate of potass as on the caustic potass, I instituted another series of experiments. I mixed two grains of solid carbonate of potass with as much neutral tartrate of potass, sulphate, and chloruret of potassium; this mixture having been dissolved in water, and evaporated to dryness, I poured diluted acetic acid on the product, until effervescence ceased, and then filtered it, and evaporated to dryness; the acetate of potass obtained was dissolved in cold alcohol of 44°. At the end of half an hour I filtered again, and evaporated to dryness; the product was heated in a silver crucible for several minutes, until it was well carbonised; the carbon was frequently treated with cold concentrated alcohol, which was filtered, and evaporated to dryness; the residue contained pure, caustic potass; the carbon, exhausted by the alcohol, and submitted to the action of cold water, gave a colorless alkaline liquid, in which the chloruret of platina and the perchloric acids gave precipitates similar to those from the carbonate of potass. This salt, then, had evidently been produced during the carbonisation of the acetate.

Twelfth Experiment.—I mixed four grains of solid carbonate of potass with a quart of milk, bouillon, bile, and coffee, previously saturated with the same salt. After having evaporated to dryness, I shook the solid product for a quarter of an hour in cold alcohol of 44°, and then boiled it for two or three minutes; the liquid filtered, and treated as has been said of the third experiment, gave caustic potass; the carbonate of potass had then been partly dissolved. The part not dissolved by the boiling alcohol was left for twelve hours in contact with diluted acetic acid, which slightly effervesced with it; it was then filtered,

and the brown liquid was submitted to the same process as in the fifth experiment, and furnished a notable quantity of pure potass; the chloruret of barium did not produce any precipitate, but the nitrate of silver gave a slight white precipitate of the chloruret of silver.

A mixture similar to the preceding, but without the carbonate of potass, did not yield potass to the alcoholic treatment, and gave to the acetic acid an alkaline residue of potass, and probably soda, analogous to that which I had from the fifth experiment after the acetic treatment.

The following results are drawn from the preceding facts:—

1. That very concentrated boiling alcohol dissolves a notable portion of the purified potass, or potassa cum calce, which may be found in a solid organic mixture, either in its caustic condition, or as soap, or in any other combination with vegeto-animal matter, and that it does not sensibly dissolve the salts of potass naturally contained in this mixture, nor those which may have been accidentally introduced into the stomach as medicines, except the acetate.

2. That it equally dissolves a certain quantity of the carbonate of potass, which may have been added to the mass with the view of poisoning, or which may have been formed as the result of the action of the carbonic acid of the air on the caustic potass, or of the decomposition of organic matters by this alkali (*vide* twelfth experiment). Nevertheless, the carbonate of potass is completely insoluble in concentrated alcohol, so that we must conclude the solution in question to have taken place, aided by the combination of the salt with a portion of fat or other organic matter.

3. That the solid organic mixtures to which neither potass nor its carbonate has been added, even when they are abundant, and naturally contain salts of potass, such as the lactate, acetate, tartrate, sulphate, phosphate, or chloruret of potassium, treated with boiling concentrated alcohol, do not yield to this menstruum sufficiently evident portions of these salts, that their presence in the alcoholic solution could be demonstrated by the chloruret of platina or the perchloric acid, re-agents which readily discover traces of free potass or its carbonate in the alcoholic solution, whenever this alkali has been mixed with the food. That if the normal alcoholic liquids in question, treated in the manner adopted in the fifth experiment, give at last a slightly alkaline residue, which, after a certain time, restores the blue of reddened paper, it is doubtless owing to their containing a small quantity of soda, or else so small a proportion of potass as to avoid the action of the chloruret of platina and the perchloric acid.

4. That if pure acetic acid, diluted with three times its weight of water, be heated with a solid organic mass, to which potass or its carbonate has been added, and which has been already exhausted by boiling concentrated alcohol, can dissolve, in certain cases, a portion of the potass or carbonate left unacted on by the alcohol, it equally dissolves many salts of potass naturally contained in the organic mass, so that it becomes difficult, if not impossible, to decide, when the operations are terminated, whether the alkali obtained has been added, or is procured from some of the salts of potass found in organic matters in their

natural condition, and which the acetic acid may have dissolved or decomposed (*vide* twelfth experiment).

5. That it is right to reject the use of chlorine, proposed by M. Devergie to destroy the animal matter, which might mask the potass, because, if this gas be passed into an alcoholic solution, resulting from an organic liquid, with the addition of potass, evaporated to dryness, and treated with concentrated alcohol, or to a solid matter exhausted by alcohol, as Devergie advises, the potass is never obtained in its caustic state, but either as a salt, or in a solution which, instead of being alkaline, is strongly acid; and besides, when the solid matter is treated with chlorine, by means of the chlorine and of the hydrochloric acid which are formed, a notable quantity of some of the salts of potass naturally contained in the solid mass is dissolved. In the latter case, the objection made to acetic acid at once applies. Devergie, it is true, does not place his entire confidence in this process; for he says, at page 310 of the third volume of his work on Forensic Medicine, "We must, however, acknowledge many difficulties inherent to this mode of analysis, and to the conclusions drawn from it. First, Certain vegetable and animal liquids contain salts of potass; but, then, these salts being neutral, the liquid does not show any alkaline re-action. Secondly, The potass that has been added may pass to the state of a carbonate; it is, then, impossible to state from analysis whether the potass was originally the caustic potass or a carbonate; some animal liquids are entirely alkaline, but as they owe their alkalinescence to soda, they are not precipitated by the chloruret of platina, unless they contain the sulphate of potass besides, and then the chemist must form his opinion from the quantity and abundance of the precipitates he obtains from the re-agents." The reasons thus alleged to show the difficulties inherent in this mode of analysis require to be examined with care, in order to place them in the clearest light. M. Devergie fears the salts of potass, which are naturally found in certain vegetable and animal liquids. There he is in error; for he has advised, as we have done before him, to treat these liquids, evaporated to dryness, with alcohol. Now, we know from the fifth experiment, that if this agent is concentrated to 44°, it will not take up enough of these salts for a precipitate by the chloruret of platina and the perchloric acid; however, to avoid confusion, he adds, these salts being neutral, the liquid will not give any alkaline re-action. In order to show M. Devergie how much he is in error, we will admit that some atoms of soda have been added to the vegetable and animal liquids containing the salts of potass, as he supposes; and we will admit also, although it is not the case, that these liquids, evaporated to dryness, and treated at first with concentrated alcohol, afterwards with chlorine, contain a sufficient quantity of the salts of potass to precipitate with the chloruret of platina and the perchloric acid. It is evident the liquid will have an alkaline re-action, and will give the potass precipitate with the salt of platina and the perchloric acid. According to M. Devergie, we might credit the existence of free potass; and yet in these is only a little soda and salts of potass in the suspected liquid. Devergie says also, against the use of chlorine, that the potass may have passed to the state of carbonate,

and then it will be impossible to discover by analysis whether the alkali was added in its caustic form, or as a carbonate. Although this remark is correct, it has very little bearing, as I shall show lower down, when examining whether it is really possible to determine, in an analysis of this kind, in what state the potass was administered. As far as regards the natural existence of an alkali in certain animal liquids, as stated by Devergie, we do not acknowledge there is a serious difficulty, when these liquids contain sulphate of potass, besides the free soda; nor that it is requisite in such a case to decide according to the abundance of the precipitates obtained from the re-agents. In forensic medicine, we must avoid as much as possible solving the problem of a case of poisoning by the abundance or the traces of a precipitate, because that which might appear abundant to one chemist might be trifling to another. We must obtain an incontestable result; we must draw from a given matter a poisonous substance, which will not be furnished when the same matter has not been previously mixed with it; then there is proof the poison has been added. Besides, we repeat, that in the present instance the sulphate of potass cannot be a cause of difficulty, because it is insoluble in concentrated alcohol; and that the examination in question has reference to liquids evaporated to dryness, and treated with concentrated alcohol, before being submitted to the action of chlorine.

6. That potass dissolved in water, and introduced into the stomach, is absorbed, and carried into the different organs, where it can be found.

Process of Analysis.

We may now turn our attention to the process to be adopted to discover the potass in a case of poisoning by it. It must first be ascertained whether the suspected matter restores the blue color of paper reddened by an acid, and whether it gives forth an ammoniacal odor; this character is very important, for if the liquid is strongly alkaline, and does not contain any free ammonia or its carbonate, we may conclude that it contains either potass, soda, barytes, strontian, or lime. The liquid and solid mass, or the tissues of the alimentary canal, are to be introduced into a glass retort, after having been diluted with a certain quantity of distilled water; a receiver, containing a little water and covered with cold rags, is next to be adapted to the retort, to which heat is to be applied until the liquid contained is reduced to one third its volume; the liquid thus concentrated is next to be tested with the reddened paper; it may be that, after distillation, this fluid will not be any longer alkaline, if its alkaline essence depended on a certain quantity of ammonia, or its carbonate, which would be volatilised into the receiver; the alkaline essence of the distilled liquid must next be tested, and if it prove so it must be preserved, to ascertain if it contain free ammonia or the carbonate. The third of the matter remaining in the retort, which we will suppose to be alkaline, must be evaporated to dryness at a gentle heat in a porcelain capsule; when the product is cold, it is to be shaken for eight or ten minutes in pure concentrated alcohol of 44°, and caused to boil for five or six minutes, alcohol being added as it evaporates; the liquid is to be decanted and filtered into another porcelain capsule. The mass is to be

again treated with boiling alcohol, in order to exhaust it, and extract all that this menstruum can dissolve; the alcoholic solution filtered and mixed together, must be evaporated to dryness in the capsule. The alcohol, in this operation, dissolves the free caustic potash, that which has been changed into soap, a part of that which has combined with the organic matters besides the fat, and finally a notable portion of the carbonate of potash contained in the mass—either because this salt has been mixed with it, or because the caustic potash may have passed to the state of carbonate, as a result of its action on the carbonic acid in the air, or on that which may have formed during the act of evaporation. The solubility of carbonate of potass in concentrated alcohol, aided by organic matter, cannot be denied after the twelfth experiment, previously narrated. If the alcoholic liquids were allowed to get cold before they were filtered, or if they were collected in a test-glass and allowed to cool in it, there would be deposited on the sides of the capsule or glass, a fat, soapy matter, containing a portion of potash, and it would be requisite, in order not to lose this, to detach this matter carefully, in order to mix it with the liquid; it is better, therefore, to proceed as I have indicated; it is of equal advantage to wash the funnel through which the liquids are filtered. The alcoholic solution evaporated to dryness, must still be heated in the porcelain capsule, until it is carbonised, and no longer emits any vapors; in this state it will be readily separated from the capsule with the blade of a clean knife, which could not have been done if the heat had not been carried to carbonisation. The carbonised product must be incinerated in a covered silver crucible; from half an hour to three quarters, at a red heat, will be generally sufficient to produce incineration. Platina, or earthy crucibles, must not be used, as the potash would act on them. The crucible having cooled, the ash must be brought into contact with cold alcohol at 44°, stirred with a glass rod for several minutes, and then boiled in the crucible; this liquid, when cold, to be decanted, filtered, and evaporated to dryness at a gentle heat; during the evaporation, it is to be tested by the reddened paper. This solution in general is not alkaline, because the potash has been changed into the carbonate by the process of incineration, and scarcely any sensible residuum is obtained. There are, however, circumstances where the proportion of potash dissolved by the alcohol is considerable, with respect to that of the organic matters found in the alcoholic solution; then a portion only of the potash was passed to the state of carbonate during incineration, and the alcohol readily dissolves that part of the alkali which remains caustic. Let us admit that it is so, and that a residue has been obtained on evaporating the alcoholic solution; it must be dissolved in a little distilled water, the alkalinescence of the liquid must be proved by the test-paper, the solution concentrated by heat, and the fact ascertained by trying it in test-tubes, that it yields the potash precipitates with the chloruret of platina and the perchloric acid. However this may be, the ash remaining in the crucible after the alcoholic treatment must be boiled in a little distilled water, in order to dissolve the carbonate of potash formed during incineration, and the liquid filtered and

evaporated until it is sufficiently concentrated; in this state it will easily restore the blue color of reddened paper, and will give abundant precipitates with the chloruret of platina and the perchloric acid, as would a concentrated solution of the carbonate of potash. The use of these re-agents would be accompanied even with a well-marked effervescence.

I should not recommend pushing the experiment further, and treating, for example, the mass already exhausted by alcohol with water or acetic acid, because, while acknowledging that by their means we might dissolve a certain quantity of potash, which had been used as a poison, it is certain that we should also dissolve a considerable quantity of the salts of potash naturally contained in the animal liquids and in food, so that we should run the risk of committing serious errors, in attributing to potash taken as a poison, re-actions due to the salts of potash naturally in the system. It were a hundred times better not to seek to separate the entire of the potash which has acted as a poison.—*Journ. de Chimie Médicale.*

CASE OF MONSTROSITY.

TO THE EDITORS OF THE PROVINCIAL MEDICAL JOURNAL.

GENTLEMEN, — If you think the following case worthy of record in your valuable Journal, I shall be gratified by its insertion.

I am, Gentlemen,
Your obedient servant,
W. B. SANDERSON.

Ipswich, June 27, 1842.

November 29, 1841. I was called to Mrs. L., aged thirty-six, who has been married fourteen years, and was in labour of her first child. I found the os uteri well dilated, and the membranes protruding largely, through the volume of which I was unable to ascertain the presentation. I, therefore, ruptured them, and a large quantity of the liquor amnii escaped; when, on several further examination, with much puzzling and difficulty, I diagnosed an acephalous fœtus, by feeling the craggy edges of the base of the cranium, surrounding a soft, pulpy mass, which occupied the site of the brain. This proved a correct opinion on delivery, when I received a complete monstrosity, presenting the extraordinary aspect of two distinct and perfect faces, united to one cranial base, and possessing four perfect and lucid eyes, two noses, two mouths, each divided by a septum, with a separate tongue and gums, and two chins; the rest of the body normal, well formed, and of good average size; one ear only on each side of the cranial base.

On viewing the posterior part of the trunk, I observe (for I possess the curiosity) the spinal column deficient in the spinous processes of the vertebræ, the chord and its membranes exposed superficially, and the transverse processes widely separated throughout their whole length, until they unite at the sacrum.

On opening the thorax and abdomen, I found their contents perfectly normal. I did not trace the faucial, œsophageal, or bronchial formations, being unwilling to disfigure my preparation so much as such an investigation would involve.

I may add, it is a female child, and the mother felt its powerful movement a short time prior to delivery. Respiration never occurred.

ON SPONTANEOUS FRACTURE OF THE THIGH-BONE.

By JONATHAN TOOGOOD, Esq.

Senior Surgeon to the Bridgwater Infirmary.

In the course of my practice, two cases have occurred in which the thigh has been fractured without any external violence. The first was that of a man who had for many years been in a weak, nervous, and half paralytic state. In attempting to turn in bed, the bone broke. The case was considered an extraordinary one; it was treated in the usual way, and united after a considerable time, and he lived many years after. The next case was that of James Pople's wife, of Bawdrip, aged fifty-five, who had been long in an infirm state of health, which terminated ultimately in paralysis of the lower extremities. She had suffered very severe pain in her right thigh for some months, which was considered by those about her to be rheumatic; and being a poor woman without friends, little was done for her relief. One evening, on being lifted up in the bed, the bone suddenly snapped; she was aware of it immediately, and cried out that her thigh was broken, but no one believed her, and she lay all that night in dreadful agony, but when, on the following morning, her neighbours saw the limb almost doubled by the violent spasmodic action of the muscles which drew the ends of the bones forcibly against each other, I was requested to see her. Her condition was indeed truly deplorable, and the grating of the bones against each other was distinctly heard.

The limb was placed in splints, and united after a longer period than usual. I mentioned this case to Sir Astley Cooper, who considered it to be cancer of the bone, and directed my attention to the state of the breasts, in both of which I discovered on examination several hard, knotty tumors, of a carcinomatous character.

The following interesting account of a similar accident will be found in the life of Archbishop Secker:—

"About a year and a half before he died, after a fit of the gout, he was attacked with a pain in the arm, near the shoulder, which, having continued about a twelvemonth, a similar pain seized the upper and outer part of the opposite thigh, and the arm soon became easier. This was much more grievous than the former, as it quickly disabled him from walking, and kept him in almost continual torment except when he was in a reclined position. During this time he had two or three fits of the gout, but neither the gout nor medicines alleviated these pains, which, with the want of exercise, brought him into a general bad habit of body.

On Saturday, the 30th of July, 1768, he was seized, as he sat at dinner with a sickness at his stomach. He recovered himself before night, but the next evening, whilst his physicians were attending, and his servants raising him on his couch, he suddenly cried out that his thigh-bone was broken. The shock was so violent that the servants perceived the couch to shake under him, and the pain so acute and unexpected,