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From the Author

REMARKS

ON THE EDITIO ALTERA

OF THE

Pharmacopœia Londinensis,

AND ON

Dr. POWELL's TRANSLATION

AND

ANNOTATIONS.

By RICHARD PHILLIPS.

LONDON:

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1816.

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IN 1809, after more than two years consideration, the College of Physicians published a revised edition of their Pharmacopœia: in the preface to this work they observe, "with "respect to ourselves, we have spared no pains "to render the present edition as perfect as "possible. Not that we are bold enough to "imagine that it will satisfy every body, or "that it is free from errors; but before any "person proceeds to criticise these with severity, we intreat him to reflect upon the diversity and difficulty which attach to a work "of this sort, and we trust he will not then "be disgusted with a few faults which may "occur."

The language of Dr. Powell in the preface to the translation, is in perfect unison with that of the College: referring to his execution of this undertaking, which was probably allotted to him on account of his numerous contributions to the original, he says, "perhaps

"I may err in judgment, I may be deficient "in ability, or sometimes in attention; and I "shall willingly and thankfully submit myself "to correction and instruction, especially if by "their means I shall be enabled hereafter to "render this translation more generally use-"ful."

Regarding it as certain that some processes were adopted by the College without submitting them to any examination, I cannot avoid concluding that the sentiments above quoted, arose both in the College and the translator, less from diffidence in their respective powers to effect the projected purpose, than from the consciousness of having feebly exerted them in the execution of it.

Painful as these forebodings appear to have been, they became immediately and amply realized; in several criticisms upon the original work of the College, not a "few faults," but many, and some even dangerous, were detected; and their exposure was followed by universal and well merited "disgust:" the mis-statements in the translation were also shown to be so numerous, glaring, and complicated, as to exhibit a striking example of the evils which may arise from being "deficient in attention;" allowing this to have been the sole cause of their production.

In 1811, I published an "Experimental "Examination of the last edition of the Phar- "macopœia Londinensis, with remarks on Dr. "Powell's translation and annotations;" and in the advertisement prefixed to it, I stated as my opinion, that the College would find it requisite speedily again to revise their Pharmacopœia. I do not revert to this prediction in order to claim any sagacity on account of its being verified; for no persons, except immediate contributors to the work, could peruse it without being convinced that it was destined to immediate and inevitable destruction: so certain was I of this event, that in almost every instance in which a process appeared to be objectionable, I ventured to propose a substitute; and mostly as the result of my own experiment.

The College have now published what they term "Editio altera" of the Pharmacopœia; and on examining it, the first circumstance to be remarked is, that the same order of Council, which enacted pains and penalties against those who contravened the directions of the Pharmacopœia of 1809, is prefixed to the present one; in which, according to Dr. Powell, the alterations refer to

1st, some important processes;

2dly, changes in the names of substances;

3dly, the introduction of new articles;

4thly, the restoration of some which had stood in the Pharmacopœia of 1787;

5thly, a very few omissions from the last edition; and he might have added

6thly, some changes in the arrangement.

Now I would ask, whether every change to which a Pharmacopœia can be subjected, is not referable to one of the preceding divisions? even if it is conceded that trivial alterations might be made in it without permission of the Council, the admission would be of no avail in the present instance; for of about 340 preparations which the Pharmacopœia contains, more than one sixth part, comprehending the most important medicines, has undergone a change in name, in mode of preparation, or in power.

It would be absurd to ask, how a work which was not completed until the present year, could be referred to and enforced by the Privy Council in 1809; but it is by no means frivolous to inquire, how far a proceeding is legal, to say nothing of its reasonableness, which by way of compelling uniformity of practice, adopts the same Order of Council, for directing the preparation of medicines by methods so different, as to leave them no resemblance but in name,—a proceeding which if persisted in, will

make the Pharmacopœia indefinitely subject to the alterations of reason or caprice, as either may chance to prevail; and truly render it, what Dr. Powell now indeed describes it to be, "in its very nature ephemeral."

Neither is it unreasonable to inquire, to which of these two conflicting authorities practitioners are now compelled to conform: whether to the cancelled Pharmacopœia of 1809; or to that to which the College of Physicians, in their assumed characters of Privy Counsellors, have affixed a royal mandate.

In the preface to the former translation Dr. Powell informs us, that the committee of fellows appointed to revise the Pharmacopœia "established, as had been done in a former "instance, a most important intercourse with "the society of Apothecaries, who appointed "a Committee for the purpose of co-operating "with the College, in the use of their exten-"sive laboratory, and in bringing to the test "of that sort of experiment on a large scale, "which could alone render the suggestions "of science practically useful, the several pro-"cesses which were communicated by the Col-"lege."

Many besides myself have undoubtedly concluded, that Dr. Powell intended by the latter part of the above quotation, to identify "the

suggestions of science" with the speculations of the College. Without either denying their similarity, or giving that unqualified assent which the high station of the College might seem to demand, I confess I was surprized to find, after so much co-operation on "the large scale," that on one most important occasion at least, the committee relied solely upon the results of their own experimental research: for in a manner which sufficiently accounts for their former failure, Dr. Powell now observes, "It will be seen that the alterations adopted "refer, first to some important processes, to "which reasonable objections have certainly "been urged, on the score either of manipu-"lation or product, as, for instance in the pre-"paration of Antimonium tartarizatum, which "though it answered repeatedly according to "the former process, upon a small scale, be-"fore the committee, has certainly failed upon "a larger one, and under other circumstan-"ces."

If then the Society of Apothecaries was not consulted concerning a preparation of so great importance as Tartarized antimony, it is difficult to determine in what instances such assistance was deemed requisite; on some occasions of less consequence the College evidently decided, not only without any co-operation on

the large scale, but even without any small experiment of their own. Numerous instances might be cited in support of this assertion, but the Liquor ammoniæ carbonatis, and Syrupus sennæ will afford sufficient proof. In fact, it seems as if the acknowledgments which were so liberally bestowed upon the Society of Apothecaries, were given not only for what they did not perform, but for what they were not even invited to attempt; and by this proceeding they have probably incurred an unmerited degree of obloquy, on account of the imperfections of the late Pharmacopœia: this position is strengthened by the comparison which I made in the Experimental Examination, between some medicines procured from Apothecaries' Hall, and others prepared as directed by the College: and the Society of Apothecaries, benefiting either by my observations or others of similar import, and determining to remove all cause of future complaint, have subjected their institution to the controul of Mr. Brande; a gentleman whose eminence in chemical science, renders him unquestionably the most eligible person, that could have been selected for so important a trust.

Those who have not duly appreciated the powers exemplified by the College in reforming,

and by Dr. Powell in translating, the Pharmacopœia, may perhaps learn with surprize, that when the assistance of Mr. Brande might have been obtained, and the co-operation of the Society of Apothecaries rendered permanently useful, they have preferred, obtained, and acknowledged with particular and "unfeigned gratitude", "the aid of Mr. Hume, "chemist of Long Acre."

There are some parts of Dr. Powell's preface which I have read with great satisfaction; I allude to the hints thrown out respecting a National Pharmacopœia, and the probability that the College would not object to the weights and measures being reduced to one standard: and I sincerely concur in ascribing extreme importance to the Scale of Chemical Equivalents; one of the numerous and valuable acquisitions for which chemistry is indebted to Dr. Wollaston; but Dr. Powell will probably regret, that he was not so well convinced of the excellence of his own advice respecting this instrument, as to adopt it himself: little, if any use appears to have been made of it, either in the Pharmacopœia or the translation; and I have pointed out several instances, in which errors have arisen from the neglect of it.

With some observations on other parts of

Dr. Powell's preface to the present translation, I shall conclude these introductory remarks. He says "I hope I shall preserve as long as "I live the power as well as the will to resist "all personal attacks, and to defend my own "character, but I see no reason why I should "formally enter the lists with every one who "chooses to assail me from a dark corner as "I pass, or why like Erasmus, I should hold "myself compelled θηριομαχεῖν". That is, when the obscurity of a learned language is removed, Dr. Powell characterizes some of his opponents as wild beasts, with whom he disdains to combat. Having in the Experimental Examination noticed a great number of Dr. Powell's errors, he will probably be unwilling to except me from this contemptuous description: it is however requisite to his reputation, although immaterial to mine, that I should occupy a more respectable place in his opinion: he would hardly admit that the Pharmacopœia, or his translation of it, could be improved by adopting alterations proposed by persons of such mean intellect as those included in this general description of his critics; but I have shown in the present publication, that my suggestions have been freely transferred to the pages of the Pharmacopœia, and to the notes of the translation; and consequently so much

of Dr. Powell's promise as regards the "willingness" to receive "correction", is faithfully kept, whilst that part of it which relates to the "thankfulness" for it, is totally forgotten. I am far from complaining of this omission; for if Dr. Powell's explicit avowal of the utility of my advice could have established its worth, by adopting it without acknowledgment, he has stamped it with the value peculiar to the favourable evidence of an unwilling witness: but this forms no excuse for Dr. Powell, and should he honour these pages with as attentive a perusal as those of the Experimental Examination, which I sent to him by his own desire, he will probably expunge the following passage from the next edition of his translation; "I am not conscious that in any instance "I have purloined the observations of others, "or used them without due acknowledgment."

R. P.

London,

December, 1815.

REMARKS, &c.

THE arrangement of the different classes of medicines, which constitute the Pharmacopœia, has undergone but little change on the present occasion; so little, indeed, that had not the preparations been subjected to a much greater alteration, enough would hardly seem to have been done to gratify the perpetual and restless love of innovation, by which alone it appears to have been dictated.

The preparations of sulphur are now placed between those of metals and vegetables; instead of retaining their former situation between earths and metals: and as far as I can discover, with equal propriety, or with similar want of it, infusions now take precedence of mucilages and decoctions; whereas in the late Pharmacopœia decoctions were placed before infusions,

and these were followed by mucilages. The preparations constituting the classes are now arranged nearly alphabetically; instead of according to no discoverable plan, as before.

In the Experimental Examination I pointed out several errors and incongruities attendant upon the adoption of the terms newly devised to express measures of fluids: of the former I noticed about twelve, which are now rectified, both in the original and the translation. A fresh instance occurs in the directions for preparing the Extractum colocynthidis compositum. An error, which escaped my notice in the former edition of the translation, is now repeated in the directions for making Sodæ sulphas; and one now occurs in the process for Supersulphate of potash: in both these instances pounds of water are mentioned in the translation, instead of pints as directed in the original.

In assigning the quantity of mercury to be employed in some preparations of it, *librum*, which the College have expressly divested of the meaning of *pint*, is nevertheless preceded by *pondere*: but in several other preparations of this fluid metal, in which ounces or drachms are directed, and which alone are liable to ambiguity, neither *fluid* or *pondere* is expressed.

ACIDUM ACETICUM.

No alteration has been made in this process, and 1-12th of the product is still directed to be wasted, by rejecting the first pint which is distilled.

In the second edition of the translation it was stated by Dr. Powell, that a fluidounce of distilled vinegar decomposes about 10 grains of carbonate of lime. I have mentioned the quantity to be 13.8 grains: consistently with this, Dr. Powell now says that "one fluidounce ought to dissolve at least 13 grains of carbonate of lime."

ACIDUM CITRICUM.

In the note on this preparation, Dr. Powell observes, that "three ounces of chalk will commonly saturate $3\frac{1}{2}$ pints of juice, and 27 fluidounces of dilute sulphuric acid will be requisite for its decomposition." Now as 16 fluidounces of dilute sulphuric acid contain 1.5 fluidounce, or 21 drachms by weight, of the concentrated acid, 27 fluidounces contain nearly 35.5 drachms; which, it will appear by Dr. Wollaston's scale, are equivalent to about 36.25 of carbonate of lime; instead of 24, as stated by Dr. Powell.

ACIDUM MURIATICUM.

In the late edition of the Pharmacopœia, 24 ounces of common salt were directed to be decomposed by 18 of sulphuric acid, diluted with water. In my observations on that work I stated it as my opinion, after trying several experiments, that the quantity of acid was unnecessarily large. My conclusions, I now find, were erroneous; and that the proportion of sulphuric acid, so far from being redundant, is not even sufficient. The College have now directed 20 parts of it instead of 18; and if Dr. Powell had not stated that the alteration was the result of "further experiments," I should have concluded that use had actually, in this instance, been made of Dr. Wollaston's scale; these being nearly the proportions indicated by it.

Upon inspecting the results of the processes described in the Experimental Examination, and comparing them with those of the present Collegiate method, it will appear that the products obtained both by the College and by me are very deficient in solvent power, as indicated by the scale. It is indeed true that I did not employ a sufficient proportion of sulphuric acid to decompose the whole of the salt used

with it; but it will be also seen that the quantity of sulphuric acid did not produce its corresponding quantity of muriatic acid. In the last experiment mentioned in the Examination, "Process of 1787 modified," which is that productive of the greatest solvent power with the smallest proportion of sulphuric acid; only 16.42 of marble were decomposed, by the muriatic acid obtained by using 21 of sulphuric acid; whereas by the scale it appears that 21.57 parts ought to have been decomposed, making no allowance for loss in the operation. On comparing the solvent power of the acid now obtained by the College with that which it ought to possess, it will be observed that the deficiency is nearly in the same proportion as that of the product above alluded to.

The specific gravity of the Collegiate muriatic acid is stated to be 1.16: consequently, a fluidounce weighs 527.22 grains; dissolving, according to the Pharmacopœia, 220 grains of carbonate of lime.

It is shown by Dr. Wollaston's scale that 24 parts of common salt yield 14.89 of muriatic gas; which, combined with the 24 fluidounces of water used by the College, weighing 22.72 ounces, give 37.61 ounces as the total weight of the muriatic acid obtainable from 24 ounces

of salt. If then 527.22 parts of the product dissolve 220 of marble; the whole of it, weighing 37.61 ounces, dissolves but 15.69; instead of 20.65, indicated by the scale as the equivalent of 24 of common salt: consequently, as in my experiment, only about three-fourths of the real quantity of muriatic acid are obtained.

In order to discover the cause of the deficiency, I put 24 parts of salt into a retort, to which a Woulfe's apparatus was adapted; and added to it 20.1 parts of sulphuric acid, the proportion indicated by the scale. The quantity of water employed instead of 22.72, as directed by the College, was from an accidental circumstance 23.62 parts; of this, one-third, as directed by the College, was put into the retort, and the remainder into the receiver; below the surface of which the orifice of the tubulated receiver dipped; in the next receiver also slight pressure was employed, but scarcely any acid passed into the water which it contained.

The muriatic acid produced weighed 35.11 parts, instead of 38.51, as should have resulted from the combination of 14.89 of muriatic gas with 23.62 of water; its specific gravity was 1.1645, its solvent power (including that of the small quantity condensed in the second receiver) 15.54; being 00.15 less than that of the

Collegiate product, and 5.11 less than indicated by the scale.

Having observed from previous experiment, that by the addition of water to the residuum, and submitting the retort again to a strong heat, a further product may be obtained; I thus procured in the present instance a weak acid, which dissolved 1.82 of carbonate of lime; reducing the deficiency of product from 5.11 to 3.29 parts: consequently either 3.82 of the salt partially or totally escaped decomposition, or the acid formed by it was dissipated. On examining the residuum I found that 1.86 of salt remained undecomposed, and that 1.74 of sulphuric acid were uncombined; and consequently, if all the salt had been decomposed, it will be seen by the scale that of the 1.74 of sulphuric acid 0.11 only would have been in excess.

It appears, by the experiment above stated, that the presence of a large portion of water is favourable to the decomposition of the salt; but its use is limited on account of its diluting the product. I am induced to believe that more muriatic acid would be produced if one half (instead of one-third) of the water were put into the retort; and that it would be advantageous to moisten the salt with a part of the water previously to the addition of any

acid; this would, probably, prevent the salt from running into lumps; round which, as it appears to me, an incrustation of sulphate of soda is formed, preventing the action of the sulphuric acid upon the enclosed common salt.

As the alteration now introduced by the College agrees nearly with the indications of Dr. Wollaston's scale, it may be deemed superfluous to remark that the propriety of it is also corroborated by the experiment which I have just described; it will however be seen that I find the specific gravity, and consequently the solvent power, of a given measure of the muriatic acid rather greater than it is stated to be by the College. In the Pharmacopœia it is said that the specific gravity is 1.16; and that a fluidounce, which consequently weighs 527.22 grains, decomposes 220 grains of carbonate of lime; I find the specific gravity to be 1.1645, the weight of a fluidounce 529.26 grs. and its solvent power 233.3 grs. of carbonate of lime.

ACIDUM NITRICUM.

I shall take this opportunity to correct some errors which I have committed respecting this acid; the mode of preparing which remains unchanged.

In my remarks on the Collegiate process, I stated that no advantages result from the present process compared with the former, whereas the contrary is evident even from the facts which I have advanced: I ought merely to have said, that if the College had depended upon the experiments quoted by Dr. Powell, the change effected was not so economical as it might have been. I have also proved by direct experiment the truth of the fact suggested to me, that nitric acid, when impregnated with nitrous gas, acquires additional specific gravity; and consequently I was in error, when I stated that nitric acid of greater density must necessarily possess greater power than that which is lighter.

It will be remembered that the College direct equal weights of sulphuric acid and nitre for the preparation of this acid; and it has been since shown by Dr. Wollaston, in his admirable paper on chemical equivalents, that if it is required to obtain the whole of the nitric acid from a given quantity of nitre, it is necessary to employ enough of sulphuric acid to convert the residuum into bisulphate of potash. This statement is unquestionably correct, if it is necessary that the nitric acid should be of the specific gravity of 1.5; because, as stated by Dr. Wollaston, the whole of the

water contained in the sulphuric acid is requisite for the condensation of the nitric, when the salt and acid are employed nearly in the proportions directed by the College. As however part of the nitric acid to be procured can be employed more dilute than of sp. gr. 1.5, nearly the whole of the nitric acid may be obtained by using such proportions of sulphuric acid and nitre as are sufficient merely to convert the residuum into sulphate of potash. This is proved by the following experiment: I put 100 parts of nitre into a retort, and added 50.6 parts of sulphuric acid of sp. gr. 1.8435; which, according to Mr. Parkes, are equal to about 48.87 of sulphuric acid of sp. gr. 1.85. Now the equivalent of these quantities of salt and acid is nearly 50 of carbonate of lime, according to Dr. Wollaston's scale. Having heated the retort, towards the end of the process large quantities of gas were evolved, and were condensed by passing under slight pressure into water. The solvent power of the nitric acid produced, I found to be 46.2, instead of 50; and the residuum of sulphate of potash weighed 86.2, exceeding only by .2 the quantity mentioned on the scale: that it was entirely sulphate, and contained no bisulphate of potash, was proved by the solution of it being rendered alcaline by one part of

subcarbonate of potash. It is then evident that if the two or more receivers be employed in the distillation of this acid, nearly the whole of it may be obtained of different degrees of strength, by using a sufficient proportion of sulphuric acid to convert the residuum into common sulphate of potash.

In the late Pharmacopœia it was stated that a fluidounce of nitric acid of sp. gr. 1.5, was capable of dissolving seven drachms of limestone. This quantity is now altered to one ounce; exceeding by about 3.75 grains, the proportion indicated by Dr. Wollaston's scale; and by exactly four grains, that mentioned in the Experimental Examination.

As then the College admit that a fluidounce of this acid dissolves only 480 grains of carbonate of lime, it was surely worse than useless in Dr. Powell again to insert in his translation the experiments which are stated to have influenced the College in their selection of the present process; because it is therein stated that nitric acid of sp. gr. 1.5 dissolves .73 of marble, making the quantity soluble in a fluidounce to be above 497 grains.

In his remarks on this preparation, Dr. Powell has now adopted the hint which I gave him, that nitrate of barytes (and not

nitrate of silver, as he has heretofore stated,) is the test of the presence of sulphuric acid.

ACIDUM NITRICUM DILUTUM.

In the translation of the late edition of the Pharmacopœia, it was stated by Dr. Powell, in his remarks on this preparation, "that one ounce of nitric acid, by measure, is equal to about two ounces by weight:" that "one fluid-ounce of this dilute acid will dissolve 100. [grains] of white marble;" and that "the strength of the former diluted acid is to the present nearly as 16 to 10." These erroneous statements were noticed and rectified by me, and are now corrected by Dr. Powell.

ACIDUM SULPHURICUM DILUTUM.

In the former editions of the translation, Dr. Powell stated "that one ounce of sulphuric acid by measure is equal to 11 dr. 1 scr. by weight." I have shewn that the weight is a fraction of a grain more than 14 drachms; and Dr. Powell now says, "one ounce of sulphuric acid, by measure, is equal to about 14 drachms by weight:" according also to his

first determination, the strength of the present diluted acid is to that of the Pharmacopœia 1787, as 134 to 100. Dr. Powell has now made two representations of their comparative strength; differing from each other, and both at variance with his former opinion: at the commencement of his note on this subject, he says, the present diluted acid is stronger than the former in the proportion of 5 to 4; ten lines lower, in the same note, he says, it is as 3 to 2: the latter statement is the true one, as I have heretofore mentioned.

In my remarks on Dr. Powell's annotations, I did not notice under its proper head, his assertion, now repeated, that "one fluidounce of this diluted acid will saturate 107 grains of dried subcarbonate of soda;" but from some inadvertence I admitted, and even commended its correctness in the observations upon Supersulphate of potash. Previously to the appearance of Dr. Wollaston's scale I had ascertained its inaccuracy, and find my experiments confirmed by reference to that instrument: a fluidounce of dilute sulphuric acid contains 78.82 grains of concentrated acid, the equivalent to which is 85.6 grains of dried subcarbonate of soda, as appears by the scale.

In the former editions of the translation, Dr. Powell says, "sulphuric acid diluted with

one third its weight of water, ceases to give out heat on its further addition." I have shown the total inaccuracy of this assertion, and mentioned the increase of temperature which was occasioned by repeated additions of certain portions of water to sulphuric acid. Dr. Powell has now omitted the former statement, and supplied its place with the following: "If sulphuric acid be diluted with an equal measure of water, and cooled to the temperature [of the atmosphere] another equal measure of water raised [raises] it about 21°, and a third added in the same manner, about 7°." In order to try this experiment, I mixed two fluidounces of sulphuric acid, previously diluted with an equal bulk of water, at 65°, with two fluidounces of water at the same temperature; the thermometer immediately rose to 93°: when the mixture had become cool, I added two more fluidounces of water, which raised it to 75°. It being very evident that the degree of heat excited must depend upon the absolute, as well as the relative quantities of the acid and water employed; I mixed half a fluidounce of acid with an equal measure of water; when cooled to the temperature of the atmosphere, I added another similar quantity of water; the thermometer rose only 16°, instead of 28° as in my former experiment, and

21° as in Dr. Powell's; and the next addition of water raised the temperature only $6\frac{1}{2}$°, instead of 10° as in my trial, and 7° as mentioned by Dr. Powell.

These experiments, although differing materially in their result from those mentioned by Dr. Powell, rather confirm than impeach the probability of his correctness, but they demonstrate at the same time the uselessness of the accuracy: because, unless the quantities of the acid and water employed, as well as the temperature of the atmosphere, are mentioned, the same apparent causes produce different effects

AMMONIÆ SUBCARBONAS.

Dr. Powell observes, "The proportions of the mixture are now altered, and that of the prepared chalk is reduced from two pounds to one pound and a half; which is still more than is absolutely necessary for the decomposition of the muriate." I have shown that 100 parts of muriate of ammonia may be decomposed by about 94 of carbonate of lime: a determination confirmed by Dr. Wollaston's scale, which indicates 94.5 of the carbonate.

Dr. Powell is content again to copy Bergman's inaccurate analysis of this salt; viz. car-

bonic acid 45, ammonia 43, water 12: by the scale it appears that the acid unites to the alcali in the proportion of 45 to 35.1.

I find that this salt, as usually prepared, contains about half its weight of carbonic acid: consequently, 100 parts consist of about

50 carbonic acid
39 ammonia
11 water;

and it will be about 55 on Dr. Wollaston's scale.

Dr. Powell still retains his former statement, that "two parts of cold water dissolve one of this salt;" although in his remarks on the Liquor ammoniæ subcarbonatis, he says, when four ounces of it are added to a pint of water, there is "certainly sufficient to supply a saturated solution."

LIQUOR AMMONIÆ.

I have shown that the method devised by the College, and adopted in the late Pharmacopœia, contained every quality which a process should not possess; unaccompanied with a single circumstance which could diminish the evils attendant upon directions in which inconvenience, extravagance and uncertainty seemed to vie for preponderance.

"This process," observes Dr. Powell, "is altered from that of the last edition, which was inconvenient from its strength, and certainly less applicable therefore to internal administration." I readily agree with the Doctor, that the former process was inconvenient on account of its strength; for the escape of the ammonia was so constant, and so considerable, as to produce intolerable effects both upon the olfactory and optic nerves of the operator; and Dr. Powell would also have commanded my assent, if he had stated that the product, as well as the "process," is inapplicable "to internal administration."

To remedy the defects of this method, I proposed a modification of the process of 1787; and the College have now adopted one which is much more like it than I had any reason to expect. The proportions of the ingredients which I recommended were

12 oz. of muriate of ammonia,
9 oz. of lime,
4 pints of water;

from which I distilled 20 fluidounces of liquor ammoniæ, having a specific gravity of .954; agreeing precisely with that of the aqua ammoniæ puræ of the Pharmacopœia of 1787.

The College have now directed the following proportions to be made use of:

12 oz. of muriate of ammonia,
9 oz. of lime,
6 pints of water;

from which 18 fluidounces of solution are to be distilled, possessing, as stated, a specific gravity of .960. It will be seen that these preparations agree as to the quantity of muriate of ammonia and lime employed; but the College use one half more water than I advise, the consequences of which are

1st, That larger vessels and more fuel must be employed;

2dly, That the specific gravity of the product does not resemble that of the Pharmacopœia of 1787;

3dly, That as only 18 fluidounces of solution of sp. gr. .960 are obtained by the Collegiate process, instead of 20 fluidounces as by mine, the total product is weaker in the proportion of about 9.5 to 13; as will be evident on inspecting Davy's table of the quantities of ammonia contained in solutions of different specific gravities, inserted in the translation.

Dr. Powell advises that "the lime should be free from carbonic acid, so that the liberated ammonia may be pure." The recommendation ought certainly to be attended to, but not for

the reason which induced the translator to give it; because, as he has stated when treating of the decomposition of muriate of ammonia by carbonate of lime, "to effect this a high temperature becomes requisite:" this refers to a red heat, but in the preparation of the liquor ammoniæ a boiling heat only is made use of; consequently no carbonate of ammonia will be formed, even should the lime be mixed with carbonate.

LIQUOR AMMONIÆ SUBCARBONATIS.

The proportion of subcarbonate of ammonia is reduced to half the former quantity, which is an improvement, coinciding with my advice.

LIQUOR POTASSÆ.

This process also has been altered, and Dr. Powell now says "the proportion of lime is diminished to one half from the former." This I consider an improvement; having stated in the Experimental Examination, "that half the proportion of lime now used is capable of rendering potash sufficiently caustic for medicinal purposes."

LIQUOR POTASSÆ SUBCARBONATIS.

No alteration has been made in this preparation; nor did it require any; the process being like that for making Liquor calcis, as described by Dr. Powell, "simple, efficacious, and convenient." He adds, that when a pound of salt is dissolved in 3-4ths of a pint of water, as directed in the Pharmacopœia, that the solution "amounts to nearly 18 ounces in bulk." I find its sp. gr. to be 1.446; consequently the above quantities measure rather less than 17.1 fluidounces.

POTASSÆ ACETAS.

The process for preparing this salt remains unchanged; it remains therefore subject to the objections which I before urged against it.

POTASSÆ CARBONAS.

In the Experimental Examination I mentioned the extravagance of the method adopted by the College from Berthollet, for the preparation of this salt; as well as the absurdity

of directing the use of subcarbonate of potash prepared from tartar, instead of that usually employed.

No alteration has been made in this process. On examining Dr. Wollaston's scale, and noticing what I have mentioned with respect to subcarbonate of ammonia, it will be seen that the method is more extravagant even than I supposed; the carbonate of ammonia ordered not being in sufficient quantity to supply carbonic acid to convert the carbonate of potash into bicarbonate. In my remarks on the next preparation, it will be shown that the number representing subcarbonate of potash in the state prepared by the College is usually 102; the equivalent to which is 55 of subcarbonate of ammonia: consequently 12 parts of subcarbonate of potash require the carbonic acid of nearly 6.5 parts of subcarbonate of ammonia, instead of 3 as ordered by the College.

POTASSÆ SUBCARBONAS.

No alteration has been made in this process; indeed no change was requisite.

In employing Dr. Wollaston's scale it is requisite to notice that the preparation directed

by the College differs in power from that employed by Dr. Wollaston; the latter having been submitted to a red heat, and thus rendered free from water. I find that the former usually contains about 16 per cent. of water; making the number on the scale for this preparation about 102, instead of 86.5. It will be seen by referring to p. 38 of the Experimental Examination, that this statement is corroborated by direct experiment; it being there mentioned that 12 parts of sulphuric acid require about 20 of subcarbonate of potash for their saturation, which agrees very exactly with the above determination: but it should be remembered that the quantity of water contained in this salt, and consequently its saturating power, is subject to vary, according to the degree of heat employed in preparing it.

POTASSÆ SULPHAS.

The process for preparing this salt remains unchanged; consequently it is subject to the objections heretofore mentioned.

In my observations on the late Pharmacopœia, I ventured to state that the quantity of sulphate of barytes which 100 parts of this salt yield, is erroneously said by Dr. Thomson

to be 128 instead of 136.7 parts: the latter proportion agrees within about 1.5 with the quantity mentioned by Kirwan, and the scale indicates 134.7. In consequence of adopting a wrong estimate of the quantity of sulphuric acid contained in sulphate of barytes, I gave an erroneous analysis of sulphate of potash. Dr. Powell re-states the former inaccurate analysis; instead of referring to the scale for a correct one.

POTASSÆ SUPERSULPHAS.

The process which I recommended for the preparation of this useless salt, has been nearly adopted by the College; and more nearly by the translator. The College direct two pounds of the salt to be dissolved in four pints of water, and the solution to be evaporated to half: Dr. Powell says four pounds of water, and evaporate to half.

The translator still retains his singular and incorrect description of the mode in which this salt crystallizes, viz. that "on crystallizing it chiefly fixes itself to the sides of the vessel, from which bed slender needles sometimes shoot." By admitting Dr. Powell's erroneous statement, with respect to the saturating power of acidum sulphuricum dilu-

tum, to be correct, I rated that of this salt too low when comparing it with the dilute acid.

Dr. Powell fixes the dose of dilute sulphuric acid at 40 minims; the saturating power of which, according to the proportion mentioned in my remarks on this acid, is 7.4 grains of dried subcarbonate of soda; the dose of supersulphate of potash, according to the Doctor's authority, is 120 grains, saturating 30 grains of the dry subsalt: so that the dose of acid in the supersulphate, is four times as great as that in the diluted acid; instead of three times, as I before mentioned.

Dr. Powell says that this salt "consists of 37 parts of sulphate of potash, with 33 excess of acid:" if he had consulted Dr. Wollaston's scale, he would have found that 37 of sulphate of potash contain 17 of sulphuric acid; and consequently, to be converted into bisulphate, it requires only 17, instead of 33, as he states.

Dr. Powell observes, "It has been affirmed that this salt contains a large proportion of nitrate of potash, almost 10 to 33, that a true supersulphate is attainable with great difficulty; and that the superabundant acid is attached, and not chemically united." I apprehend that Dr. Powell here alludes to what I have stated respecting the salt procured from Apothecaries' Hall, before that institution was

subjected to its present inspection; not indeed that the representation of what I said is correct; but the error is such as may be easily made by, and readily forgiven to Dr. Powell: it would seem from his statement, that it had been asserted that nitrate of potash actually enters into the composition of the supersulphate; a circumstance which I will venture to assert could never have been affirmed by any one but Dr. Powell, and he may possibly believe it. In the London Medical Review, I mentioned it as my opinion, that a true supersulphate of potash was not attainable; but Dr. Powell must have known that I corrected this erroneous opinion, in the Experimental Examination; he having actually adopted in his translation, the proportions of salt and water which I advised for obtaining the true supersulphate.

POTASSÆ TARTRAS.

The quantity of subcarbonate of potash directed to be employed for the saturation of 36 parts of supertartrate of potash, is now increased from 12 to 16 parts. On referring to p. 46 of the Experimental Examination, it will be seen that I recommend 15.7 parts; with which the present directions nearly agree:

supposing this determination to be correct, the number for supertartrate of potash on the scale will be about 234.

Although the College direct one pound four ounces of subcarbonate of potash for the saturation of three pounds of the supertartrate of potash; Dr. Powell, in his remarks on this preparation, says, "three pounds of the supertartrate require three pounds four ounces of the ordinary subcarbonate." It is generally difficult to decide to which authority preference ought to be given, but on the present occasion the advantage appears to me to be on the side of the College.

SODA TARTARIZATA.

No alteration has been made in this process; but the proportions of the salts might have been improved by adopting those mentioned by me.

I have stated that 24 parts of supertartrate of potash require only 13 of subcarbonate of soda for their saturation, instead of 20 as ordered by the College: if these proportions be correct, the number on Dr. Wollaston's scale for supertartrate of potash will be about 240; instead of 234, as just mentioned. These determinations, deduced from experiments made

with salts which are subject to variation, one from deliquescence, and the other from efflorescence, coincide as nearly as could be reasonably expected; and no great error can arise from adopting either 234, or 240, as the number for the supertartrate.

SODÆ CARBONAS.

The process for making this salt remains unchanged. By admitting the accuracy of Klaproth's analysis, as quoted by Dr. Powell, I was led into error with regard to the quantity of subcarbonate of ammonia required, to supply the subcarbonate of soda with sufficient carbonic acid to convert it into bicarbonate.

Taking, as already mentioned, 180 as the number for crystallized subcarbonate of soda, it will appear that the equivalent of subcarbonate of ammonia is about 55: consequently 12 ounces of these crystals require for their conversion into bicarbonate of soda, rather more than $3\frac{1}{2}$ ounces of the ammoniacal salt; instead of 3 ounces, as ordered by the College. In the translation, Dr. Powell says 2 instead of 3 ounces; and in his remarks, he states correctly, that this salt "contains double the quantity of carbonic acid" which the carbonate does: being aware of this, he must

also have seen that one of the two analyses of these salts, which he has quoted, must be erroneous. In Kirwan's analysis of the carbonate, the proportion of the acid to the base is nearly as 2 to 3; and in that of the bicarbonate, quoted from Klaproth, they are nearly in equal proportions. The analysis of Kirwan is nearly correct, as shown by Dr. Wollaston's scale; consequently Klaproth's must be erroneous. From this instrument, Dr. Powell might also have learned that there is no excess of carbonate of ammonia ordered, either in this preparation, or that of the bicarbonate of potash; and consequently his assertion is inaccurate, which attributes excess to both.

CALCIS MURIAS.

This preparation is now introduced into the Pharmacopœia; and the College have directed the use of the salt which remains after the "distillation" of subcarbonate of ammonia. The word *sublimation* ought to have been employed instead of "distillation"; for the salt is not directed to be distilled, but sublimed.

The translator, as usual, neglecting Dr. Wollaston's scale, the use of which would have insured accuracy, quotes Bergman's very incorrect analysis of this salt: it will be seen

by the scale, that 44 of lime combine with about 42.5 of muriatic acid; instead of 31, as stated by Bergman, and quoted by Dr. Powell.

MAGNESIÆ CARBONAS.

The quantity of subcarbonate of potash to be employed for the decomposition of 4 parts of sulphate of magnesia, is reduced from 4 to 3; as advised in p. 55 of the Experimental Examination. These proportions do not exactly coincide with those indicated by the scale: supposing, as already stated, the number for carbonate of potash to be 102; 2 parts of it should decompose 3 of sulphate of magnesia: but the quantity of the alcaline salt must in some degree depend upon the proportion of water it contains, which, as already noticed, is subject to variation.

I have stated it as my opinion, in the work above mentioned, that the precipitate obtained in this process is a mixture of carbonate and subcarbonate of magnesia:—this opinion I now consider quite incorrect; it is evidently a carbonate: that is, magnesia combined with one proportion of carbonic acid. To have been consistent, the College ought to have denominated this preparation Magnesiæ subcarbonas. The Ferri subcarbonas is an

analogous case :—indeed, a bicarbonate, which the College call a carbonate, cannot be procured by precipitation; when what they consider a subcarbonate is employed to produce it.

Dr. Powell, as usual, preferring error to accuracy, even when the latter is as easily attainable as the former, gives Fourcroy's analysis of this compound; in preference to that to be obtained from the scale: the former says 48 of carbonic acid combine with 40 of magnesia; the latter indicates 48 carbonic acid to 43 of magnesia.

ANTIMONII OXYDUM.

In the late Pharmacopœia, a preparation was introduced under this name; the principal object of obtaining which, seems to have been the employment of it for making tartarized antimony. How it answered this purpose, or rather how it usually failed to do so, may be seen by referring to the Experimental Examination. Whatever disadvantages the product possessed, as it regarded the principal object of its introduction, it was usually so inert a preparation, that fortunately ten grains, the dose mentioned by Dr. Powell, might be generally exhibited without danger.

The College having learned that emetic tartar could scarcely be prepared by using the

former oxide of antimony, have nevertheless discovered that oxide of antimony may be procured from emetic tartar: and, combined with the repetition of Dr. Powell's "additional information," that 10 grains of it may be exhibited, it is truly a dangerous preparation.

This substance is now directed to be made by decomposing a solution of tartarized antimony with carbonate of ammonia; which is not a good precipitant, because a portion of it combines with the antimonial salt, and forms a soluble quadruple compound; consequently a part both of the alcali and oxide are wasted: even after long ebullition, and the addition of more ammonia than is directed, sulphuretted hydrogen throws down a copious orange-coloured precipitate. This circumstance is however of but little consequence, as I am persuaded that this preparation will never be much employed. There is no good authority for attributing to it any advantages not possessed by tartarized antimony; and the evidence against its use is very decided. Dr. Powell persists in representing it as similar to almost every oxide of antimony, however different from it and from each other, which has been introduced into the various editions of the Pharmacopœia, from the year 1720, to the present time.

It is particularly requisite for practitioners to be cautious in the use of this oxide; and in the dose mentioned by Dr. Powell, I presume no one will ever exhibit it: his error in this respect may be very fully accounted for, by the extreme inaccuracy of his ideas respecting the effects of metallic oxides on the animal system; a subject which he has been peculiarly unfortunate in attempting to illustrate.

"That the effects of a compound," he observes "upon the animal system do not depend upon and cannot be inferred from the effect of its parts, is demonstrated by those of the metals and oxygen, when separate and when united, as well as by many other chemical compounds which are used medicinally. It also appears that the violence of action of oxyds of metal is generally increased in proportion to the quantity of oxygen with which they are united."

There are three metals employed in medicine, each of which is occasionally exhibited both at the minimum and maximum of oxidizement, viz. iron, mercury, and antimony. As there is no marked difference between the effects of black and red oxides of iron, no evidence on the subject can be derived from it: peroxide of mercury is unquestionably more powerful than the protoxide; and this affords

all the support Dr. Powell's assertion can receive; but protoxide of antimony is at least 60 times stronger than the peroxide; and yet, by a singular infelicity, Dr. Powell, in a case in which the evidence is perfectly balanced, announces a general law, when illustrating the properties of that metal, which totally disprove its existence!

According to Thenard's analysis, as quoted by Dr. Powell, 100 parts of tartarized antimony contain nearly 40 of oxide; and the utmost dose which he gives of the former is three grains: and yet in his estimation, the oxide contained in 25 grains of emetic tartar, amounting to ten grains, may, when separated from the tartar, be exhibited, not only with safety, but even without any emetic effect. So monstrous a proposition will probably be sufficient to prevent practitioners from exhibiting this oxide; which I have already observed in the Experimental Examination, as stated by Dr. Aikin, "operates in the dose of two or three grains as a most violent and dangerous emetic."

ANTIMONIUM TARTARIZATUM.

A sort of fatality seems to attach to the Collegiate exertions for preparing this very

important medicine. On referring to the Experimental Examination, it will be seen that I entered at considerable length into the consideration of the last process; and attempted to supply its place, with one which might remedy its defects; the first and greatest of which was its uncertainty: a complaint which cannot be urged against the present process; for that, bad as it was, as published and praised by its inventor, has been rendered totally impracticable by the withering influence of the College. I do not mean to deny that even this is an improvement upon the last directions for this preparation; for it is unquestionably preferable to be certain of not procuring any oxide of antimony at all, than to be in doubt whether its exhibition would be followed by cure or destruction.

The following are the directions given by the College, as quoted from the process substituted for that which was cancelled.

"Take of powdered sulphuret of antimony two ounces

Nitrate of potash one ounce
Supertartrate of potash two ounces
Sulphuric acid *by weight* two ounces
Distilled water, a pint and a half

Mix the acid with half a pint of the water in a proper glass vessel, and heat it in a sand

bath; when it is moderately warmed add by degrees the sulphuret and nitrate previously mixed together; then strain the solution and boil it to dryness. Wash the residue until it is tasteless, and whilst it is still wet mix with it the supertartrate of potash, and add a pint of water. Then boil down the liquor and set it by that the crystals may form."

Now it has been very correctly remarked in the London Medical Repository, and the circumstance had previously struck me, and must have occurred to every one in the least conversant with the subject; that the whole directions for preparing tartarized antimony, are rendered totally abortive by the words "then strain the solution and boil it to dryness." The sulphuret of antimony is decomposed, and the antimony oxidized without remaining in solution in the acids employed to effect this purpose: consequently by straining the solution, and boiling it to dryness, the nitric acid is totally evaporated without the possibility of oxidizing the antimony; and sulphate of potash only can be obtained, instead of oxide of antimony. Nothing can be more evident than that the projectors of this process never employed it, or that they must have mistaken sulphate of potash for oxide of antimony.

In. p. 80 of the Experimental Examination

I enumerated what appeared to me to be the properties requisite to constitute a good method of preparing tartarized antimony: viz. the certainty of obtaining protoxide of antimony, unmixed with peroxide, or sulphuretted oxide; but combined with some substance, capable of preventing the crystallization of the tartrate of lime contained in the tartar; moderate expence; and the use of iron vessels.

When the Collegiate process is rendered practicable by omitting the straining of the solution, the oxide of antimony procured certainly answers the intended purpose; but the method is on every account inconvenient, and is ill calculated for the preparation of large quantities of tartarized antimony; the use of glass vessels alone renders it very expensive; and in addition to this, it is extremely wasteful; one of the ingredients is deficient in quantity, and all the rest are in excess.

For the purposes of making tartarized antimony, the oxide has usually been prepared by the decomposition of nitric acid: the method which I proposed consisted in oxidizing antimony by the decomposition of sulphuric acid; but provided the more important of the circumstances I have pointed out are attended to, it is of no consequence which of these methods is adopted: the College however have chosen

a process, in which both nitric and sulphuric acids are so employed, as to prepare an oxide with much trouble and expense; which might be more conveniently and economically obtained by the use of either instead of both of these acids.

Sir H. Davy considers oxide of antimony as composed of 170 antimony and 30 oxygen: - consequently the number representing antimony on Dr. Wollaston's scale will be 56.66, that of the oxide 66.66, and of the sulphuret 76.66; which will give 100 antimony to 35.29 sulphur; agreeing very nearly with Dr. Thomson's determination. The two parts of sulphuret of antimony ordered by the College, should therefore produce about 1.74 parts of oxide of antimony, to procure which they employ at the cost set against each article

2 parts of sulphuret of antimony	12
2 ditto of sulphuric acid - -	8
1 ditto of nitre - - - - -	12
	32

being the cost of obtaining 1.74 part, that of preparing one part will consequently be very nearly 18.4; this calculation is grounded in the supposition that the whole of the sulphuret of antimony is decomposed, which is not the

case, for I find that nearly one-fourth part remains unacted upon, which if the operator rejects, as he might do for any advice or information which the College or Dr. Powell give to the contrary, the cost of one part of oxide will be about 24.5 instead of 18.4.

When treating of nitric acid, I have shown that nearly the whole of the acid may be procured from a given portion of nitre, by using about half its weight of sulphuric acid; whereas in this process in order to decompose the nitre for oxidizing the antimony, two parts of sulphuric acid are used; or four times as much as is necessary: and it will appear by reference to the Experimental Examination, that this excess of sulphuric acid is sufficient to produce more than one part of oxide, when metallic antimony is used; whilst in the Collegiate process, in conjunction with the nitre, the whole quantity of oxide obtained is only about 1.3 part.

Having thus shown that waste is incurred by the large proportion of sulphuret of antimony and sulphuric acid employed, it remains to be examined, how far the supertartrate of potash is properly apportioned to the oxide of antimony actually procured: in the Experimental Examination, I have shown that 100 parts of tartar dissolve 70 of oxide of anti-

mony; consequently two ounces take up 672 grains; but as one-fourth of the sulphuret of antimony remains undecomposed, only 626 grains of oxide are procured; therefore of the tartar directed to be used, 1-15th is uncombined with any oxide of antimony; and renders the preparation imperfect.

Having thus shown the accumulated waste of this process, I shall proceed to point out its inconveniences. The use of glass vessels is not absolutely necessary, porcelain will answer the purpose: but constant stirring is requisite to prevent the mixture from spirting out of the vessel; and this operation becomes extremely difficult as the evaporation proceeds, from the great adhesiveness of the mass, consisting of oxide of antimony, sulphur, sulphuret of antimony, sulphuric acid, and sulphate of potash.

It appeared to me that much expense, waste and inconvenience would be avoided by the simple expedient of employing nitric acid already prepared: with this view, I took a portion of it diluted with several times its weight of water; having previously ascertained that its solvent power was equivalent to that of one ounce of nitre, used by the College with twice its weight of sulphuric acid, and two ounces of sulphuret of antimony. I also used this quantity of sulphuret; and heated the mixture

till the water was evaporated. On examining the residuum, I found that, within a few grains, as much of the sulphuret had been decomposed as by the Collegiate process.

To those who prefer the use of nitric acid and sulphuret of antimony, to that of sulphuric acid and antimony which I have already described, I recommend the following method:— Take 15 parts of nitric acid of sp. gr. 1.5; dilute it with about 5 times its weight of water, in a stone-ware vessel, capable of holding 3 times the quantity of the dilute acid: or if more convenient, use so much of a weaker acid as dissolves 10.5 parts of carbonate of lime, adding the requisite quantity of water; then add 36 parts of very finely powdered sulphuret of antimony; and occasionally stirring the mixture, evaporate it to dryness in a sand heat. Wash the residual mass, until it is nearly or quite insipid; and then boil it in a solution of 40 parts of tartar: reserving the undecomposed sulphuret, which will be about 4 parts, for the next operation. No inconvenience results from the excess of sulphuret of antimony; and whilst any of it remains undecomposed, there is no danger of the formation of peroxide of antimony, by the decomposition of the nitric acid: for when sulphuret of antimony is acted upon by nitric acid, the

protoxide formed by it is not so readily converted into peroxide, as the antimony of the remaining sulphuret is into protoxide.

The time, fuel, and glass saved, and the inconvenience avoided by this process, more than compensate for the expense incurred by the separate preparation of the nitric acid; and the comparative cost of the Collegiate and this method will be seen by referring to the following statement and that given at page 37.

1½ part of sulphuret of antimony, cost	9
½ ditto of sulpuric acid	2
1 ditto of nitre	12
	23

total cost of preparing 1.3 part of oxide of antimony; or 17.7 for one part, instead of 24.6, as by the process directed in the Pharmacopœia.

I cannot conclude my observations on this subject, without referring to the manner in which Dr. Powell notices the late process for preparing tartarized antimony; and to the reasons which he assigns as having caused its rejection. Alluding to the different methods which have been proposed for this purpose, he says, " others again [have employed] the precipitate from its muriate called pulvis Algarothi, and as an approximation thereto the

former edition* prepared an oxyd from a mixture of muriatic and nitric acid; to this however it has been justly objected that it cannot be prepared upon the large scale and in wide mouthed vessels." I can scarcely suppose that the first of these objections had any weight with the College, because the present method (when rendered practicable) possesses the same defect: and the latter objection is very imperfectly stated; for if the experiments I have detailed are referred to, it will be seen that the employment of narrow mouthed vessels is equally unsuccessful, as that of wide mouthed ones; and that the only sort of certainty which attended this process, was that of its not answering the purpose.

Judging from the evidence afforded by the nature of the late process, I consider it as more than probable that it originated with Dr. Powell; it would therefore be unreasonable to suppose that he would enumerate all its defects; but it was unwise to state one which is not remedied by the new method, and unfair to allow only one half of another.

* The processes of the late and present Pharmacopœias seem to agree in one remarkable respect—the absence of antimony—the former edition, we here learn, "prepared an oxide from a mixture of muriatic and nitric acids," and the present Pharmacopœia (to adopt Dr. Powell's phraseology) prepares one from a mixture of sulphuric acid and nitre.

In the late Pharmacopœia, 51 parts of nitric acid were ordered for dissolving 24 parts of silver: I have shown that little more than 20 parts are requisite; and the College have now directed 34 parts of acid for this purpose.

It is amusing to observe Dr. Powell's resources for avoiding the direct acknowledgment of an error. In his translation of the late Pharmacopœia, he says, "nitric acid dissolves about half its weight of silver, but there is no objection to a superabundance of acid, as, if it exist in the first, it is driven off in the subsequent parts of the process." Dr. Powell having since learned, and probably from a source he cannot prevail upon himself to acknowledge, that nitric acid dissolves rather more than an equal weight of silver; now omits the word *half*, and observes, "nitric acid dissolves about its weight of silver, but there is no objection to a superabundance of acid, as, if it exist in the first, it is driven off in the subsequent parts of the process;" and he adds, "but in the former edition this was properly stated to be unnecessarily great, and is therefore now diminished."

Having quoted from Dr. Powell's former translation, all he says respecting the proportions of nitric acid and silver, I am at a loss to discover by any rules of construction that statement, which would have been proper had it been made, respecting the "unnecessarily great" quantity of nitric acid: indeed the knowledge of the fact ought to have prevented the necessity for stating it; and it could not with any degree of propriety have been connected with the assertion then made, and since repeated, "that there is no objection to a superabundance of acid."

The matter stands thus: Dr. Powell in his first edition, asserts that about 48 parts of nitric acid are required to dissolve 24 parts of silver; but as 51 parts were directed to be used, he must consequently have supposed that there were 3 parts of acid in excess. In the present translation he allows that about 24 parts of nitric acid are sufficient to dissolve 24 parts of silver; although 34 parts are directed in the Pharmacopœia.

From Dr. Powell's present statement, we must now conclude, that when he supposed there were only 3 parts of acid more than requisite, he thought the quantity "unnecessarily great;" whereas on the present occasion, when he knows that there are 10 parts of acid

in excess, we are told "that there is no objection to a superabundance" of it: so much for consistency of opinion and practice.

ARSENICI OXYDUM PRÆPARATUM, ET LIQUOR ARSENICALIS.

The directions for the useless resublimation of oxide of arsenic are retained. It may now be pretty clearly understood from Dr. Powell's translation, that only so much water is to be added to the arsenical solution, as with it and four fluidrachms of compound spirit of lavender shall occupy a pint measure. These directions are not however strictly proper; four fluidrachms of water do not necessarily evaporate during the solution of the oxide of arsenic, as I have heretofore shown: consequently, the addition of this quantity of compound spirit of lavender may make the arsenical solution exceed a pint measure, without the addition of any water. It would have been preferable to have directed only 3-4ths of a pint of water to be used at first; and then, after the addition of the compound spirit of lavender, to have ordered enough water to have occupied a pint measure with the arsenical solution. Dr.

Powell has now corrected the dangerous errors, which he committed in the former editions of his translation, as pointed out by me.

LIQUOR CUPRI AMMONIATI.

I have stated, that owing to the large proportion of water directed for the solution of the ammoniuret of copper, about one half of it is decomposed: alluding probably to this statement, Dr. Powell says, "if the ammoniated copper be newly prepared, the solution is complete and the liquor transparent: at least I have seen only a slight turbidity at the bottom of the bottle after it has stood through a day." I have now only to add, that if the length of time which the preparation has been made, and more especially, the circumstances under which it has been dried, render its composition subject to variation; such a proportion of water ought to have been directed, as would compensate for it: I have observed some, which although it suffered partial decomposition by the large quantity of water directed in the Pharmacopœia, was readily and perfectly soluble in half the quantity.

No alteration has been made in the directions for this preparation, although they required particular attention. I have shown that when the mixture of carbonate of iron and muriate of ammonia directed in the Pharmacopœia are subjected to a red heat, carbonate of ammonia is formed according to the proportion of carbonic acid contained in the carbonate of iron. I have since found that when carbonate of iron is boiled in a solution of muriate of ammonia, the heat is sufficient to decompose them, carbonate of ammonia being readily formed even at this comparatively low heat. The ammonia in 100 parts of muriate combine with about 41 parts of carbonic acid, consequently when this quantity is mixed with an equal weight of carbonate of iron containing as already noticed 14.5 of carbonic acid, 35 parts of the muriate of ammonia must be decomposed, and 26 of carbonate formed, so that more than one-third of the muriate of ammonia must be wasted before any ammoniated iron can be formed.

Dr. Powell observes that "as great heats cannot be well defined or correctly regulated, I have doubted whether this and many other

metallic preparations, dependant upon temperature, might not otherwise be prepared more uniformly; as for instance, if a given proportion of tinctura ferri muriati [muriatis] was added to a solution of muriate of ammonia, and the mixture evaporated to dryness."—There can be no doubt but that this method might be employed; and it is equally evident that no one, who has any regard to safety or economy, will adopt it. A solution of muriate of iron is prescribed in the Prussian Pharmacopœia, as Dr. Powell may perhaps have seen in Dr. Duncan's Dispensatory; but whilst borrowing, he has totally spoiled the process by the addition of the spirit.

FERRI SUBCARBONAS.

This process has been altered, but without the improvement which it might have received. I have described at considerable length the different methods of preparing this substance. The College have now reduced the quantity of subcarbonate of soda, used to decompose 8 parts of sulphate of iron, from 10 parts to 6: the former proportion was about as much too large, as the present is too small. The number for subcarbonate of soda on Dr. Wollas-

ton's scale, as I have several times mentioned, is about 180; equivalent to 174 of sulphate of iron: consequently, 8 parts of the latter require 8.2 parts of the former salt; instead of only 6 parts as now, and 10 as formerly ordered by the College; and I find by direct experiment that these proportions answer perfectly.

Dr. Powell remarks that "subcarbonate of soda is preferred for the precipitation to that of potass, on account of the greater solubility of the sulphate of the former than that of the latter, and the consequent facility with which it may be washed away." These remarks are probably introduced in consequence of my having recommended carbonate of potash instead of carbonate of soda; and if the objection to the use of the former be valid, it ought also to have induced the College to have directed carbonate of soda for the decomposition of sulphate of magnesia; but in this case, Dr. Powell says that "enough water is not only ordered in the first instance to dissolve the sulphate of potash, but it is afterwards, for its perfect separation, well washed with more:" it is for Dr. Powell to explain, how a salt which has been dissolved by water "in the first instance," can be separated or washed by any addition of it. But let us examine

into the sufficiency of the water ordered by the College in the precipitation of the sulphate of iron by carbonate of soda, to dissolve the sulphate of potash; supposing carbonate of potash to be used. Eight ounces of sulphate of iron require about 4.75 ounces of potassæ subcarbonas for their decomposition, forming about 5 ounces of sulphate of potash; which, according to Dr. Powell's statement at page 85 of his translation, are soluble in 80 ounces of water at 60°: supposing, then, the College had ordered a gallon even of cold, instead of boiling water, there would have been enough, "directed in the first instance," to dissolve more than seven ounces of sulphate of potash.

In my observations upon the former Pharmacopœia, I committed an error with regard to the composition of sulphate and carbonate of iron, by copying Dr. Thomson's statement of the analysis of the peroxide of this metal. This he has since rectified, and the erroneous conclusions which I drew from it will be readily corrected by Dr. Wollaston's scale.

In the Experimental Examination, I have stated that the greatest proportion of carbonic acid which existed in carbonate of iron, carefully prepared, amounted to 14.5 per cent.; and also that a solid compound of carbonic

acid and peroxide of iron is not procurable. By the scale it will be seen that carbonate of protoxide of iron must be composed of 27.54 of acid, and 44.5 of oxide; consequently the precipitate above mentioned consists of

	Carbonic acid . .	14.50
	Oxide of iron . .	23.42
or	Carbonate of iron .	37.92
	Peroxide of iron .	62.08
		100.00

In his remarks upon the Tinctura ferri muriatis, Dr. Powell says " it evidently contains the red oxyd of iron, and hence the convenience of using the subcarbonate which contains the metal in that state:" but from what I have above stated, it is evident that only in such proportion as the carbonate of iron is imperfect, does it contain red oxide of iron; and consequently, that red oxide, and not carbonate of iron, should be employed for the muriated tincture. Dr. Powell, referring to the oxides of iron, says " the latter or red oxyd consists according to Proust of iron 52, oxygen 48, and in its relation to black oxyd is composed of 66.5 of that oxyd, and 33.5 of additional oxygen," but if the translator had not, as usual, neglected his own advice, as to

the necessity of consulting Dr. Wollaston's scale, he would have found that 66.5 of black oxide of iron consist of about 51.5 iron and 15 oxigen; requiring 7.5 of oxigen for their conversion into red oxide, instead of 33.5 as he states.

FERRI SULPHAS.

In stating the analysis of this salt, Dr. Powell has preferred Kirwan's incorrect statement to that of the scale.

HYDRARGYRI OXYDUM CINEREUM.

This process remains without alteration; and is of course subject to the objections I have made to it. I may add that the best mode of obtaining black oxide of mercury, is probably to decompose a solution of crystals of nitrate of mercury, by potash or ammonia; without using any heat, either in preparing the precipitate or drying it, in order to prevent the formation of peroxide, by the absorption of oxigen.

Instead of referring to the scale, Dr. Powell has given an incorrect analysis of this oxide.

HYDRARGYRI OXYMURIAS.

This process has not been altered. The proportion of common salt directed to be employed for the decomposition of the sulphate of mercury is more extravagantly large even than I had supposed.

In preparing muriatic acid, 48 parts of common salt are decomposed by 40 of sulphuric acid; but in this preparation, after a large proportion of 30 parts of sulphuric acid have been decomposed by the action of the mercury, the remainder is deemed sufficient to decompose 48 parts of common salt.

In stating the analysis of this "dead white, shining, spicular" substance, Dr. Powell has again preferred inaccuracy to the scale.

HYDRARGYRUM PRÆCIPITATUM ALBUM.

The quantity of muriate of ammonia formerly employed in this preparation, is now reduced to half, consistently with my recommendation; but the proportion of subcarbonate of potash has not undergone the requisite, and advised increase.

LIQUOR PLUMBI SUBACETATIS.

The College have now reduced the litharge, to be employed with a given quantity of vinegar, from 28 to 24 parts; the reduction, as I have shown, might have been advantageously much more considerable.

Dr. Powell having, in the former editions of his translation, represented this solution as possessing "a deep brown colour;" I pointed out the error, and described its true colour: he now says, "this liquor is usually dense, and of a deep brown colour, as such I had usually seen it, and as such I therefore described it in the former edition;" and he adds, that it has been stated "that the colour ought to be a greenish yellow which is correct." Here then we arrive at the almost incredible conclusion, that Dr. Powell, after having assisted in reforming the Pharmacopœia, translated, and furnished two editions of it with notes, had not ascertained the true colour of one of the most common preparations directed in it.

SULPHUR PRÆCIPITATUM.

In the late Pharmacopœia, about five times the requisite quantity of lime was directed to be used in this process: the College have now reduced it from 3 parts to 2; and as I have shown, much less would have answered the purpose with greater advantage.

EXTRACTUM CINCHONÆ,

ET

EXTRACTUM CINCHONÆ RESINOSUM.

In the former editions of the translation, Dr. Powell says of the directions for preparing the first of these medicines, "by this process the whole effective part of the bark is separated from the inert woody part, which afterwards yields nothing further either to water or spirit:" and yet of the latter preparation, he says "it is a much more efficient preparation than the former." It has long, and justly, been judged difficult to decide when Doctors disagree; but who shall venture upon the arduous task of deciding when a Doctor differs from himself?

EXTRACTUM COLOCYNTHIDIS.

In the observations which I made on the late Pharmacopœia, I stated that the extract obtained was very spongy; and soon became hard and mouldy:—I have since seen extract which did not possess these properties. The quantity of water has not been increased, as it ought to have been.

EXTRACTUM COLOCYNTHIDIS COMPOSITUM.

The College have now, very advantageously, restored the formula of the Pharmacopœia of 1787; although, according to Dr. Powell, the proof spirit employed to dissolve the scammony, totally failed in answering this purpose.

EXTRACTUM HUMULI.

The quantity of water employed has been advantageously doubled.

EXTRACTUM OPII.

No change has been made in this preparation, and it remains subject to the objections I have made to it.

MISTURA MOSCHI.

One drachm of musk is now directed to be used, instead of two scruples, as in the Pharmacopœia of 1787: which, according to Dr. Powell, is an increase of one third.

ALCOHOL.

In the late Pharmacopœia, this was employed in one insignificant preparation only, the Spiritus ammoniæ succinatus. Rectified spirit is now properly substituted for it; and this preparation might have been spared without any inconvenience.

SPIRITUS AMMONIÆ,
SPIRITUS AMMONIÆ AROMATICUS,
ET
SPIRITUS AMMONIÆ FŒTIDUS.

I have pointed out, in my remarks upon the late Pharmacopœia, the difficulties of the processes directed for obtaining, and the danger of employing, some of the ammoniacal preparations. They are now rejected; and as it could scarcely fall to the lot of the same individuals, again to contrive other methods equally bad with the former, I naturally expected, and have actually found improvement.

Although the changes effected in preparing the spiritus ammoniæ are considerable and important, yet Dr. Powell has not bestowed a single remark, either on the defects of the late process, or in praise of the present: the former, it may perhaps be unreasonable to expect; and the latter it would be inconsistent to find; because the practicability of the new method depends upon the incorrectness of Dr. Powell's assertion, "that alcohol dissolves ammonia but not its carbonate."

In the Pharmacopœia of 1787, the directions for preparing Spiritus ammoniæ were as follow:

Take of proof spirit, three pints
sal ammoniac, four ounces
pearlash six ounces:

Distil a pint and a half.

In the present Pharmacopœia, a similar process is adopted: with the exception of employing purified instead of impure carbonate of potash. To this method, it may be seen, I have objected that the quantity of carbonate of potash is too small to decompose the muriate of ammonia; and that, of 28 fluidounces of rectified spirit which 3 pints of proof spirit contain, 24 only being distilled, 4 are wasted.

I have already mentioned that the number for potassæ subcarbonas on the scale is about 102; that of muriate of ammonia is 67; consequently, the potassæ subcarbonas ought to be nearly $48\frac{3}{4}$ parts to 32 of muriate of ammonia, instead of 48 as directed.

The Spiritus ammoniæ compositus, of the same Pharmacopœia, was prepared by mixing aromatic oils with the simple spirit; their quantity was so small that the power of the two preparations, as far as regards both spirit and ammonia, might be considered equal. I have stated the objections to this method to be, that the oils being commonly adulterated, the mixture was rendered turbid; and I advised in the process which I recommended, that the aromatics should be put into the retort, with the charge for preparing the Spiritus ammoniæ; and this part of my advice the College have adopted.

The proportions, now directed by the College for making the Spiritus ammoniæ aromaticus, are as follow:

Take of water, two pints
rectified spirit, one pint
muriate of ammonia, ten drachms
subcarbonate of potash, twelve drachms:
Distil (having previously added the aromatics) a pint and a half.

I have just mentioned that in the Pharmacopœia of 1787, the simple and aromatic spirit of ammonia might be considered to be of equal strength; and even in the late Pharmacopœia, with all its imperfections, no alteration was made in this respect: but it will now be seen that a wanton and mischievous change has been effected; and the two preparations, instead of varying merely as to being simple, or aromatic, possess every difference which imbecility could desire or bestow.

In preparing the simple spirit, 32 parts of muriate of ammonia are now to be decomposed by 48 of carbonate of potash; which as I have mentioned, are insufficient for the purpose: in making the aromatic spirit, 10 parts of muriate and 12 only of carbonate are to be employed; consequently 2 parts of the former remain undecomposed, and are wasted: the simple spirit is intirely rectified; whereas the aromatic consists of two parts of rectified spirit and one of water: now this quantity of water, although useless, would have been of little consequence in the simple spirit of ammonia, because in using it for the Spiritus ammoniæ fœtidus (the only purpose to which it is applied), the water would remain in the retort; but it is of importance that the aromatic spirit should contain as little water as possible; that

in preparing the Tincture of guaiacum, the solution of it may not be prevented.

With regard also to the proportion of ammonia in these preparations, it will be seen that the difference is enormous. Twenty-four fluidounces of the simple spirit contain the carbonate of ammonia obtained by the decomposition of 32 drachms of the muriate; whilst an equal quantity of the aromatic spirit contains the carbonate procured by decomposing only 8 drachms of the muriate of ammonia: it is indeed true that 10 drachms of the latter salt are ordered to be employed; but by the obvious and unaccountable inconsistency of using only 12, instead of 15 drachms of carbonate of potash, one-fifth part of the muriate of ammonia escapes decomposition, as already observed.

In the Experimental Examination, I showed that the Spiritus ammoniæ of the Pharmacopœia of 1787 possessed only about one-third of the strength of that of 1809; and the present preparation being of only one-fourth the power of that of 1787, it follows that the strength of the Spiritus ammoniæ aromaticus of 1809 was 12 times greater than that of the present Pharmacopœia: and yet such seems to be the power of Dr. Powell in controuling the constitutions, not only of his patients, but of the public at large; that provided the same

name be given to preparations, however different in power, similar doses of them may be exhibited.

The method of preparing the Spiritus ammoniæ fœtidus exceeds in wastefulness, even that of Spiritus ammoniæ: I have shown that of 28 parts of rectified spirit employed in that preparation, 4 are wasted; and in using the remaining 24 to prepare the fœtid spirit, 6 more are thrown away; consequently, out of the 28 parts of rectified spirit originally made use of, only 18 are eventually employed.

As the simple spirit of ammonia is only made use of in the preparation of the fœtid spirit, I would propose to discontinue any formula for its preparation. In my observations on the late Pharmacopœia, I suggested a method, which seemed to me exempt from the objections to which both the former and present methods are liable; and I shall here repeat it, premising, that the aromatics or assafœtida should be put into the retort, as either spirit may be wanted:

Take of carbonate of ammonia, two ounces
rectified spirit, one pint
water, four fluidounces:
Distil a pint.

TINCTURA MYRRHÆ.

The formula for preparing this tincture is improved, by employing a stronger spirit than in the late Pharmacopœia: I question, however, whether it is yet sufficiently free from water.

ÆTHEREA.

Scarcely any alteration has been made in these preparations; which, however, would have admitted of considerable improvement. In preparing the Spiritus ætheris nitrici, the College have adopted my suggestion; by ordering only 24, instead of 26 fluidounces, to be distilled.

Dr. Powell repeats the error of his former translation, in directing rectified æther to be distilled at a temperature of about 200°, instead of 120°, as ordered in the original: and he still maintains that æther boils at a lower temperature than that required to volatilize it; the boiling point, he says, is 98°, but it requires 112° to volatilize it, although "it dries the moment it is poured upon the hand."

SYRUPUS SENNÆ.

This syrup is perhaps improved by omitting a portion of the manna, which made it more nearly resemble a pudding than a syrup: probably a *fluid* half ounce of it may now be exhibited. Apparently after having re-considered the subject, Dr. Powell again asserts, that when 30 ounces of sugar are used instead of 29, the increase amounts to one-fifth.

I shall conclude these remarks with calling Dr. Powell's attention to the opinion of a learned physician and fellow of the College; being also one of those to whom the Translation is dedicated, the advice is probably that of a coadjutor, and certainly of a friend. After exposing some of Dr. Powell's less important errors, Dr. Young observes, (London Review, vol. 2. p. 352.) "These may be considered as "things too puerile to deserve the notice of a "practical physician: but for one who has no "longer the fear of the birch before his eyes, "it would have been better to have left them "altogether to schoolboys, than to have com-"mitted so many little errors of any kind, in "a work which ought to be a standard of pre-"cision."

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