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NOTE ON THE SO-CALLED CARBOLIC ACID, OR COAL TAR CREASOTE.*

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The chief object of this note is to mention some recent experiments with this important substance, and some deductions drawn therefrom.

It is pretty well known that the creasote of the common market of late years has been made from coal tar, and that it consists mainly of two substances, often called carbolic and cresylic acids, in not very uniform proportions. In the process of rectifying the creasote for the markets, the portions which distilled over at a low temperature, say below 190° C., and at a very high temperature, say above 220° C., were rejected. An examination of this creasote by the light of advancing knowledge, showed that it was a complex substance, consisting mainly of two similar liquids of different ultimate composition and properties, which could be separated by the difference in their boiling points. These liquids, when examined for classification, were at first supposed to be acids, and that having the lower boiling point was called carbolic acid, from carbon and oil or the coal oil from which it was obtained. It was subsequently found to belong to the phenyl group, and was then called phenylic acid; and its congener, the other principal liquid of

* This note was intended as a supplement to an expected paper from Prof. Chandler, of New York, upon the chemical character and relations of this substance; and therefore the pure or accurate chemistry of the subject has not been developed here, but chemical properties and characteristics have only been added as required, since finding that Prof. Chandler has not had time to prepare his paper.

higher boiling point, was found to belong to the cresyl group or series of organic compounds and was called cresylic acid. Another liquid found in creasote, but in small proportion, and having a still higher boiling point, was found to belong to the xylene series, and was called xylic acid. In proportion as the rectification of the creasote rejected the higher and lower boiling point liquids, so it would contain more or less of these so-called acids, and thus would vary in its composition, and boiling point. Subsequent examination proved that these liquids were not acids at all, and their composition led modern chemists to consider them as alcohols. For some time they were classed with alcohols, and the coal tar creasote of the markets was then regarded as a mixture, in varying proportions, of phenyl-alcohol and cresyl-alcohol, with small and unimportant proportions of other organic compounds.

Still later investigations by modern European chemists appear to have established the fact that they are not alcohols. Their composition appears to be precisely that of the alcohols, and this led to the classification of them as alcohols. Further investigation of their properties and combinations shows that they do not behave at all as alcohols, though uniform with them in composition. The researches of Kékulé upon this point seem now to be generally accepted, and the difference in properties and behaviour are attributed to a different construction of the molecule from the same elements. Upon these views a class of organic compounds has been erected and called phenols, and the phenyl compound, or crystallized carbolic acid, under the name Phenol, seems to have been adopted as the type of the class, just as common ethylic alcohol is called simply Alcohol, and is adopted as the file-leader or type of the class or group of alcohols. Hence Phenol is the now accepted name for crystallized carbolic acid, or phenylic alcohol, and cresyl-phenol, or cresylol, or cresol, is the name for the cresylic acid, or cresylic alcohol. The so-called xylic acid appears to have been less studied, and its position is not known. If it be homologous with the others, and of similar construction of molecule, its condensed name would be xylol, and we should then have Phenol, cresol and xylol as the import-

ant members of this group at present known and partially investigated.*

These facts and circumstances render it unwise to learn to designate these substances as alcohols, since this would be quite as inaccurate as to call them acids; and it must be far better to keep up with the progress of science, even at the expense of frequent changes. Ascertained facts are always safe indications to change in the advancement of knowledge, but it is not always easy to discriminate between fact and fallacy.

The dark colored oily liquids met with in the markets under the name of crude carbolic acid for the lower grades, and impure carbolic acid for the better grades is this same mixture of these liquids in varying proportions, but commonly containing more or less tar, oil, etc., and is therefore in reality coal tar creasote. It is now not only inaccurate but positively incorrect to call this mixture (or either of its constituents) an acid, and the longer it continues to be so-called the more difficult it will be to change it. And as it is a very important substance now, and must come into far more important and far more general use; and as in practical general application it will probably always be a liquid mixture of these two or more phenols, there appear very good reasons for going back to the original well-constructed name of creasote for it, leaving the name "wood creasote" for the rare substance described by Reichenbach and others, which, however, has similar physical properties and is applicable to the same uses. When separated, each phenol should take its proper name, as Phenol and cresol.†

* The researches of M. Kékulé upon the Aromatic Series to which these substances belong, and the well and long known antiseptic properties of the aromatic oils in general, leads to the inquiry as to whether these may not be a natural general relation between aromatic odorous substances and septic processes. If there be such a relation, is it proportionate to the strength or power of the odor, as would seem to be indicated by the well known effects of oils of Thyme, Cinnamon, etc.?

† When *the* Phenol which stands as the type of the group of phenols,—namely, "crystallized carbolic acid,"—is intended, it is useful to write it with a capital P. But when *a* phenol is indicated, the word should not be capitalized. Such distinctions tend to accuracy of expression, and are therefore both nice and wise.

As these things grow into common use, and through science are applied to the necessities of mankind, they become objects of mercantile interest, and when taken up as sources of gain or profit, they are apt to be studied and applied with a bias directed by the pecuniary interest of the manufacturer. To the foresight and mercantile enterprise of Messrs. F. C. Calvert & Co., of Manchester, England, the world owes mainly the practical application of the scientific knowledge and research of Runge, Laurent, Williamson and others, in regard to this subject, and it became the interest of this firm to push forward those grades and forms of the substance which would best repay their praiseworthy labor, and large outlay. These grades were those which required most skill in their production, and in which they were least liable to an early competition. Phenol, or crystallized carbolic acid, being the most abundant and the most stable of the compounds which make up coal tar creasote, and, by dexterous and skilful management, susceptible of separation and purification into the condition of a beautiful white crystalline "carbolic acid," became their chief object, so that upon this all their statements were based, and toward it all their efforts tended, whilst with it all the early experiments were made, and upon it the trials in practice were based. The cresol, or cresylic acid, for some time was supposed to have little or no antiseptic or azymotic effect. As the field of labor and application enlarged, however, and particularly when the substance came to be applied upon so grand a scale as that of attempting to control the cattle plague throughout northern Europe, under the direction of such men as Mr. William Crookes and Dr. Angus Smith, of London, it expanded somewhat beyond the mercantile influences, and the cresol was shown to be equal with, if not superior, to the Phenol in azymotic effect. Taking this hint from the valuable paper of Mr. Crookes three years or more ago, the writer made some experiments upon fungi, which, though scarcely definite enough to deserve the name of experiments, convinced his judgment that the somewhat incongruous mixture of coal tar products, which, when properly separated from oils and pitch, commenced to boil at about 180° C., and distilled over below 235° C., though still containing water and impurities, was more

efficient as an azymotic than the pure crystals of Phenol. Through a small experience of two years or more, this conviction has been strengthened until the question of separating these substances and rejecting the cresol was no longer in doubt, though still not proven; and lately a series of experiments were made which have set the matter at rest in the writer's mind, and are now to be briefly referred to.

It was found, as expected, that a very dilute solution of the impure mixed phenols very promptly destroyed and detached the cryptogamous plants, which grew in the form of a green mildew upon the brown stone and drab stone fronts and areas of residences which were shaded and damp. This troublesome and unsightly defect being so perfectly and so easily controlled by the creasote, suggested that these plants would be an easy practical test of the azymotic efficacy of the phenols in solutions of various strengths. The cryptogams, as they grew upon a brick pavement in a damp place, were made the subject of the experiments, and the solutions were applied with a camel's hair pencil. In a preliminary series of trials, solutions of the impure mixture, of various strengths, were applied without apparent effect, the plants looking as green and healthy as ever on the evening of the day of the application. A shower came in the night, however, and in the morning the bricks were bare and clean wherever the solutions had been placed. It was then remembered that the destruction of the chlorophyl of plants was a kind of fermentation, and it was argued that these solutions killed the plants by their azymotic power, but by their antiseptic power had prevented the destruction of the chlorophyl, which is the common evidence of death in the green parts of plants. The plants had lost their hold with their vitality, and the rain drops had washed them away, leaving the boundary lines of contact of the solution as sharp as though made with a knife, though quite invisible the evening before after the solutions had dried off.

This little observation shows the need for a new word to express the peculiar power of this substance over vitality, and which might subserve the purposes of convenience and accuracy of expression now when this peculiar and comparatively new

power is coming under critical investigation. Dr. Angus Smith proposes "colytic," which is a good term, but needs the natural relation to the already well established word zymotic. This relation is supplied in the French word antizymotique, which is found in Nysten's Dictionary, and is a better word, though perhaps a little less convenient than azymotic, which is proposed by the writer and used in this note. The etymology is evident, and its meaning in contradistinction to antiseptic, the nearest word to it, is well illustrated in the behaviour of these green cryptogams.

The next step in the experiments was to separate the two phenols. This was accomplished, perhaps not perfectly, but as far as could be practically useful, by fractional distillation; and the cresol thus obtained, but not dehydrated, was used in competition with Calvert's crystallized carbolic acid, thus giving an advantage to the latter. The sensible properties of the two substances are very different when critically examined, but the greatest difference is in solubility. The Calvert's crystallized carbolic acid used was, at ordinary temperatures, soluble to the extent of about 6·6 per cent. The cresylic acid, or cresol, as imperfectly isolated here, was soluble to the extent of only 1·3 per cent. at the same temperatures and by the same management. Thus the saturated solution of Phenol contained about five times as much of this substance as the saturated solution of cresol. Filtered solutions of each, containing accurately one per cent., were made under the same conditions of temperature, etc., but the Phenol had the advantage, first, because it was dehydrated, or nearly so; secondly, because it was pure and dissolved entirely, whilst the cresol was not pure, or completely separated from other soluble substances, and left an insoluble residue of at least two or three per cent. (estimated) upon the filter. The same volumes of each were, however, accurately taken, namely, 10 c. c. in the litre, the remainder being distilled water. Then 10 c. c. of each of these solutions was diluted with 90 c. c. of distilled water; and again 10 c. c. of each of these last was diluted with 90 c. c. of distilled water. These solutions then contained, respectively, ten parts in the thousand ($\frac{10}{1000}$). One part in the thousand ($\frac{1}{1000}$), and one part in ten thousand ($\frac{1}{10000}$).

These were then used for making other solutions, from which the following results were obtained.

The trials upon the lichens or cryptogams were commenced with solutions containing one-half of one per cent., or five parts in the thousand ($\frac{5}{1000}$). A single application of either had no visible effect upon the plants. By a second application of the same solutions to the same places, the plants were completely killed by the cresol, but not visibly affected by the Phenol. A third and fourth application of the solution of Phenol to the same spot produced no apparent effect. Solutions containing one per cent. were next used. A single application of this promptly and entirely destroyed the plant in the case of the cresol, but had little, if any, effect from the Phenol. In repeating the trial, it appeared possible that the younger and more feeble plants were killed by the single application of Phenol, but this was not certain. A second application to the same places killed almost all the plants when applied in localities where they were not very abundant and very vigorous. Occasional patches of the strongest plants were, however, generally left after the second application of the solution of Phenol of one per cent. A third application of this, however, cleaned them all off, apparently as clean as did the single application of the solution of cresol of the same strength.

Mixtures of the two solutions were then tried, with results which could have been predicted by calculation upon those above given.

Then the natural admixture of the phenols as they occur in the so-called impure carbolic acid, where the liquid which distils over between 180° C. and 208° C. is taken altogether, and becomes black by exposure to light and air, 80 or 90 per cent. being soluble in water. This impure mixture produced very decidedly stronger effects than the pure Phenol solution of the same strength, the effects being estimated to be nearly, if not quite, double.

These results seem to prove that the crystallized Phenol, or crystallized carbolic acid, is by far the least effective of these two chief tar products as an azymotic. But at the same time that they are very definite in regard to the fact, they are much

less definite as to the degree. All that can be considered as proved is that the cresol has more than double the azymotic power of the Phenol in its application to these mosses; but how much more than double is not shown. In searching for a more sensitive mode of comparison, the smell and taste were finally adopted, but as it was soon proved that the smell was far less delicate than the taste, the latter alone was relied upon. The taste of the two is very different. That of the Phenol is characterized by its sweetness and comparative blandness. That of the cresol is smoky, dry as opposed to sweet, and pungent, and is not instantly developed. In very dilute solution the latter has only a smoky taste. In these trials by taste it was soon found to be necessary to consult a number of persons quite independently of each other, and also to have some criterion or test of the delicacy of different tastes, so as to exclude those which were not tolerably sensitive, and it was very curious and instructive to see how this sense varies in different persons. Solutions of common ethyl-alcohol were fixed upon for this test, and it was found that comparatively few persons could recognize a mixture of one part common alcohol in ten thousand parts of distilled water; but that many would promptly detect one part in five thousand. This test served well in selecting the tastes to be relied upon, and in no single instance did cross-examination, by change and confusion of bottles, and other efforts, succeed in materially changing or interfering with the decisions made. Ten persons beside the writer were selected from many tried, and their evidence was accepted in the following results. Four of these proved upon repeated trials to exceed the others in delicacy of taste, and two were quite sensitive, making their decisions with great promptitude and certainty. These were repeatedly tried, not only upon their own conclusions, but were used to test the conclusions of others, and the different trials were made upon different days; extended over a period of many days, and were often made early in the morning, when the senses are fresh and impressible, and before the odors of a laboratory had blunted the perceptions of those occupied in it. A series of preliminary experiments and observations were made by which to learn how to conduct them, and how best to avoid the many chances of inaccuracy and fallacy. The solutions used were made with great care and accuracy from the

same phenols used for the cryptogams, namely, Calvert's crystallized medicinal carbolic acid No. 2, and the cresol imperfectly separated and prepared by the writer. Among the many persons, probably twenty, to whom these solutions were presented, only two or three failed to detect both the phenols in solutions which contained one part in ten thousand of distilled water. The whole of the ten persons relied upon detected the Phenol, or "crystallized acid," in a solution which contained one part in twenty thousand, though all did not detect it every time they were tried, and many failed to detect it when tried soon after having tasted a stronger solution. One observer only could detect the "crystallized acid" in a solution of one part in fifty thousand, and, although his testimony is unequivocal, his evidence is unsupported. No one gave the slightest evidence of taste in a solution of one part in one hundred thousand parts of distilled water. Every one of the ten persons relied upon detected the cresol in a solution of one part in one hundred thousand parts of water every time it was submitted to a fresh, clean palate for trial, and generally detected it even after other trials. Five of the ten persons easily, promptly and repeatedly detected the smoky taste of the cresol in a solution of one part in two hundred thousand parts of distilled water, and detected it so promptly as to show that this was not the limit of easy detection, although this was the most dilute solution tried. This solution is in the proportion of 1 c. c. in 200 litres, or about 15½ grains in 52 gallons.

These results lead to the conclusion that to the ordinary sense of taste the cresol is from five to ten times stronger than the Phenol. How far this single series of experiments may be safely accepted it is difficult to decide, but their indication is unequivocal that the azymotic power in the two phenols is very different, and is in favor of the cresol in about an inverse proportion to the degree of solubility in water. That is to say, that the azymotic power of the saturated solutions is somewhere about equal, whilst the saturated solution of Phenol holds five times as much of that substance as a saturated solution of the other does of cresol. Should subsequent investigation establish any dependent relation between aromatic odorous substances and antiseptic effects, these differences between Phenol

and cresol may be usefully illustrative; for the more feeble Phenol, when quite free from the other homologues, is, as here shown, comparatively odorless and tasteless; and this, which has been an advertising card for it, may be, and probably is, a useful indication of inferiority. A series of experiments commenced at the end of February, 1869, and therefore as yet hardly well begun, yet appear to indicate that there is much less difference in the antiseptic value of the two phenols than in their azymotic value, and thus far exhibit a very unexpected difference in this respect. Weighed quantities of fresh meat digested with measured quantities of dilute solutions, and compared with similar proportions of meat and simple water, at temperatures favorable to decomposition, do not thus far (in seven weeks) show any marked difference in the antiseptic effect of the two phenols. The parallel solutions used were from one per cent. down to twenty-five thousandths of one per cent. (0·025 per cent.), and even the weakest of these presented a distinct contrast with the simple water during the first period of two weeks. The albumen was not visibly coagulated in solutions containing 0·5 per cent. or less, and the contents of all the vessels which contained over 0·1 per cent. dried up to smoked meat without putrefaction. It was noticed that in the very dilute solutions either the watery vapor soon carried off the phenols, or that the small amount present was used up or decomposed by the meat, since after about three weeks no sensible evidence of their presence could be detected, and the putrefaction thereafter seemed to go on with nearly the same rate of progress as with the simple water. Other series of experiments were started in flasks and covered vessels, and are to be continued through the summer, in order to control and check some already discovered sources of error, and if completed the results will be given hereafter. Whether these circumstances may be a good measure,—or a measure at all,—of their relative intrinsic value in use, is certainly not determined, though in the writer's judgment it is so very probable as to leave no doubt as to the impropriety of separating and rejecting the cresol; and one object of this paper will have been accomplished if this point can be raised for future experience and more accurate research. In the meantime it is very obvious that

a mixture of the two phenols in the ordinary proportions in which they occur in the available products of coal tar distillations, is at least equally useful for all the known purposes to which the crystallized carbolic acid has been applied in medicine and in hygiene, whilst such mixtures are far cheaper and far more easily obtained.

These mixtures are commonly known as impure carbolic acid until they get into hands where nothing is admitted to be impure. They then take the very bad name of "*solution* of carbolic acid," and are generally so labelled. This is intended to mean liquid carbolic acid, and is very bad because it confounds this caustic and powerful liquid with the dilute solutions of it commonly required and used. The name "solution of carbolic acid" should never be used for the strong liquid of various shades of color commonly sold in pound bottles with a mere strip label, and it is remarkable that no serious accidents have been heard of from this common use of so bad a name.* It can be justly said that impure carbolic acid is equally inaccurate, but it is not so bad because not dangerous. A far better name would be creasote, simply, or coal-tar creasote, with the synonym, so long as this may be useful, "or carbolic acid so-called."

This liquid, as obtained from different makers, varies considerably in the proportion of the two principal phenols, and always contains at least one other homologous compound in small proportion, as well as other substances which are accidental, and also in small proportion. These variations in proportion, and accidental contaminations, when within reasonable bounds which are easily controlled by simple tests, are practically quite unimportant, and may, for the present at least, be wisely and safely disregarded in a substance so important to be promptly known and recognized in general use. When freshly distilled, this creasote is a transparent, colorless, highly refracting oily liquid, heavier than water, having a pungent, sometimes slightly sulphurous odor, and pungent caustic effect on the

* As this paper is going to press an instance is reported in a French Journal of three women affected with itch, who applied the strong liquid to the surface of their bodies by sponging. One died very soon, another, after lingering a few days, but the third finally recovered.

tongue. When exposed to the light it promptly begins to acquire color, and in twelve hours becomes of a delicate wine color of a rosy tint. From this, by continued exposure, it passes through all the shades of reddish-brown to a violet black by reflected light, or a very deep brownish-red, or deep garnet by transmitted light. This change of color may be—in great measure, at least—delayed at any point by seclusion from light, and hence the lighter or darker color as usually met with is merely an indication that the manufacture has put it up in wrappers, etc., sooner or later after distillation. This effect of light is upon the impurities, and not upon the phenols themselves, all of these being colorless. And this mixture of them may, by repeated distillation, which is within easy practical reach of the large manufacturer, be rendered so free from these coloring substances that any ordinary prolonged exposure only produces a wine color in the mixture. This condition is desirable, and when attained, as it doubtless will be, for general sales and use, the practical limit of useful purification, even for the nicer medical uses, will have been reached, since no intrinsically better substance can be produced.

Neither color, consistence, nor odor, however, can be relied upon as any useful indication of real value, but it happens that there is one very simple and very easy test of value which is infallible. All the useful tar phenols are entirely soluble in water, while the useless substances with which they are naturally associated are not,—at least to any practical extent. But as some of the phenols require a large proportion of water to dissolve them the water in testing them should always be taken in excess. A fluidounce of the creasote well shaken with one gallon of water, and the whole passed through a small filter of two or three thicknesses of good filtering paper well wetted in the funnel at the time of using, will decide its quality at once, and the proportion of insoluble oily matters which do not pass through the filter may be roughly estimated when in sufficient quantity, by breaking the point of the filter over a graduate measure. The creasote, when of good quality, should contain from 90 to 96 per cent. soluble in this proportion of water, and then the residue which will not pass the wet filter is too small to be roughly

measured, though very easily seen, estimated, and compared with residues from other samples. Much of the impure carbolic acid, or the badly named "solution of carbolic acid," contains less than 90 per cent. of soluble phenols, while the so-called crude carbolic acid of the market varies very much, samples being met with of all values, from 10 or 15 per cent. up to 50 or 60 per cent. These are all proportionately useful for disinfectant purposes, and, when properly managed, for medical uses also, as far as they go. But they are greasy, tarry, dirty mixtures, difficult of management by ordinary means, and should therefore generally be rejected for common uses, and always when for medical uses. In applying the test of solubility to the creasote to determine its value, it must be remembered that in the interest of profit or gain, fraud may be practiced, but for the present it is generally sufficient to see that the creasote to be tested is neither acid nor alkaline to either wet or dry test papers, and that it does not smell very strongly of sulphuretted hydrogen.

When applied to the skin of full strength it turns it white, and shrivels it somewhat, producing a smarting, tingling numbness, which is diminished by holding the part low, but increased by holding it high. It is easily washed off, but leaves a mark of red irritation, which on delicate surfaces produces desquamation even from momentary contact. The free application of sweet oil tends to allay this irritation and allay the smarting. When swallowed in quantity it is an irritant poison, and very rapid in its action. As it readily mixes in all proportions with all oils and glycerin, the very first thing to be done in any case of poisoning by it is to administer any oil that is nearest at hand, but the more bland the better, and this in large quantity proportionate to the quantity swallowed. If no other oil be near by, lard or butter are better than kerosene, but the latter should be used rather than wait even a short time for a better. As soon as practicable after the oil, an emetic, consisting of a large teaspoonful, or two teaspoonfuls each of mustard and common salt, stirred quickly into about half a pint of lukewarm water, should be given, and its operation, if not prompt, should be facilitated by draughts of lukewarm water. It is not a virulent poison in

any reasonable or probable quantity, and a thorough evacuation of the stomach will commonly ensure safety.

The uses of the creasote, undiluted and undissolved, are as yet few, and are altogether sanitary or hygienic,—never medical, and rarely as a disinfectant for medical uses. Smeared over surfaces which are out of the way of ordinary contact, and where it is not liable to be rapidly washed away by drainage or sewage, its application lasts much longer than that of any solution, and is therefore better for places not easily accessible. But it is scarcely doubtful that the same quantity applied repeatedly at intervals in solution, would produce double the useful effect. Undiluted it may be applied to the sides and ceilings of cellars, water closets, stables and out-houses, and to the mouths and throats of drains, sewers, garbage receptacles, etc., and to close alley-ways and passages. But for many of these uses it is best applied diluted with some non-drying oil, as whale oil, or other cheap animal or fish oil, or petroleum, or tar oils, but not with drying oils, such as linseed oil. When mixed with any cheap oil in proportions varying, to suit the purposes, between 10 and 25 per cent. of the good creasote, it is applicable to more numerous uses. Smeared upon wood-work or other absorbent surfaces, or even upon the coats of animals, it is much more lasting, as well as stronger in effect than the solutions, and saves much time and labor where it is important to economize these.* This is the form in which it is best applied to the live-stock cars and pens of railroads, and it is also a collateral advantage of this form of applying it that the oil so fixes it and holds it upon rough absorbent surfaces, that the filth which lodges and accumulates upon the surfaces to which it has been applied will be disinfected by it, and may be washed off two or three times with water, and the surfaces still retain effective quantities of the oily mixture. Wood or plastered walls can be so saturated with such mixtures

* A friend of the writer, Mr. Ferris Bringhurst, of Wilmington, Del., mentions that such a mixture smeared upon the shaggy coat of a dog to dislodge fleas is so remarkably permanent that after an interval of many months the odor of the phenols becomes distinct every time the dog gets wet. This also illustrates the power of watery vapor for carrying these substances into the atmosphere.

as to last for a long time, but the effective influence of the agent is given off much more slowly, and is more feeble than when, in the case of watery solutions, the vapor of the vehicle passes off and carries the agent along with it into the air. This affords the plain indication for a rule that where surfaces and solid substances are to be disinfected through constant use, and through rains and ablutions, oily mixtures are best. Where the air is to be disinfected or charged with the creasote, and where frequent aspersions can be conveniently used, watery solutions are best.

Any inert powder which may serve as a vehicle can be used for mixing and holding this liquid for disinfectant uses. Half slaked lime perhaps forms the best powder in which to mix it, and a proportion of 10 to 20 per cent. is a good one. These mixtures are often called carbolate of lime. Saw-dust or sand make excellent vehicles for it; and sand, moistened with the creasote and swept over the floors of hospital wards once or twice a day, is a very efficient way of using it.

Two solutions of this creasote may be usefully recognized and established as sufficient for all its general uses, whether sanitary or medicinal. One may be called a saturated solution, and the other a standard solution, such having been used under these names to some extent in the army and in some large hospitals and found convenient, during some years past.

The saturated solution is made by shaking five measures of the creasote with one hundred measures of water, and filtering the solution off through two or three thicknesses of wet paper. It is not necessary that the water should be warm, indeed it is better used at ordinary temperatures, because the filtrate, which is apt to become turbid or milky at best, becomes much more so in proportion as it is cooled down below the temperature at which it was filtered. This milkiness, though unsightly, is of no practical importance, and may be disregarded in most of the uses to which the solution is applicable. When applied to nicer uses it may be filtered a second time, after standing. If the creasote be not very thoroughly purified the solutions, on exposure to light, become of a pinkish or reddish tinge, which renders them inelegant, to say the least. The saturated solution will contain from 2 to 5 per cent. of the creasote in proportion

as the latter consists mainly of the one Phenol or the other. As the creasote commonly occurs, it will contain about 4 per cent., while if made from the crystallized Phenol or crystallized carbolic acid, it will contain 5 per cent., and will not be strictly a saturated solution, since water at summer temperatures takes up about 6·6 per cent. of the crystals, and makes a perfectly clear and colorless solution even without filtration. At low temperatures, however, these solutions become milky if holding more than 5 per cent. Hence 5 per cent. was fixed upon as the maximum strength for what is called saturated solution. In the management of the crystallized Phenol (carbolic acid) for dispensing, it is perhaps the best practice, on buying a pound bottle of it, to melt it by setting it in water at about 37° C. or 100° F., and then add water in the proportion of one fluidounce to the avoirdupois pound. It will then remain permanently liquid except at very low temperatures, and should be dispensed by measure, being still used as "crystallized carbolic acid." When a bottle of it has been treated in this way, the person who adds the water should indicate it by passing a pen mark through the word "crystallized" on the label, or by some other significant mark on the label. It is a curious circumstance in connection with the use of this crystallized Phenol that when thoroughly melted it will often remain liquid for days and weeks, and no agitation or moving the stopper, or other ordinary means, will cause it to recrystallize. But sooner or later a time will come when, even without change of temperature, it will be found solid. The writer has seen this crystallization commence in a pound bottle which had been liquid for many days, and be completed within a few seconds. The dropping into the liquid a particle of the crystals from another bottle will determine the crystallization at once. Cooling down by ice water will also cause it to crystallize, but it must be cooled far below its melting point.

The saturated solution is useful for many surgical and medical purposes, but chiefly as a disinfectant for pouring upon infected clothing and washing infected furniture and utensils in time of epidemic or contagious disease, etc. If the circumstance

developed in the experiments with dilute solutions be accepted,* namely, that the creasote is itself destroyed or used up in proportion to what it accomplishes, it will serve as a key to its use in more or less concentrated form. It is often if not commonly used in great excess, and up to this time no one appears to know how little will serve the purposes to which it has been successfully applied.

The standard solution is a one per cent. solution, and is made by agitating one measure of either the crystallized or the liquid creasote with one hundred measures of water, and filtering through two or three thicknesses of wet paper when necessary. It is almost identical with the officinal "Aqua Creasoti," which is directed to be in the proportion of one fluidrachm to the pint of distilled water, or one to one hundred and twenty-eight, and the two may be used indiscriminately for most purposes. This appears to be the solution best adapted to the largest class of common uses of this substance, and perhaps it would not be too much to say that it subserves all but the exceptional uses. Its chief and great recommendation is that it may be profusely and even carelessly used with good average effects, without risk or danger of any kind, and without being very disagreeable to most persons, even when first used. A pint of the creasote to twelve gallons of water, or three or four pints to the barrel, makes a sufficiently definite solution for profuse general use, and those hospitals and asylums which have adopted it in this rather rude though practical way, have generally been well satisfied with the results obtained. For medical purposes, external or internal, it should be made with more accuracy, and for nicer uses should be filtered, but this filtration is addressed to the eye, rather than to any important good actually obtained by it, unless the creasote be of poor quality. With the cheaper liquids,

* Reference is here made to some collateral observations in the experiments with very dilute solutions which were not investigated, much less proved. And as the indications are in opposition to the generally received opinion they cannot be trusted. The bare circumstance is that dilute solutions made with water containing organic matters, appeared to give less taste and smell than when made with distilled water, and appeared to lose a part of their taste and smell on standing but a short time.

and even with some of the dearer ones sold prior to the present time the solutions had either to be filtered, or be allowed to stand until the light oils rose to the surface and the heavy ones fell to the bottom, but much of that now produced affords good solutions, which for most disinfectant uses do not require filtration.

The method of making this solution upon the most economical scale, recommended about two years ago for army and other hospital uses, and adopted with success in some instances heard from, is to take an ordinary tight barrel to stand on one end, upon a box or other elevation in some convenient place, fitted with a common faucet placed an inch or two above the lower hoops, and having a hole bored in the head that stands uppermost, and the bung permanently secured in place. Half fill the barrel with cold water, and add to this about three pints or three pounds of the creasote, (impure carbolic acid). Turn the barrel down upon its bilge with the faucet uppermost, and the hole in the upper end corked, and agitate it backward and forward very thoroughly. Then set it up, and fill it nearly full of water at ordinary temperatures, cork the opening, and again turn it down and agitate it well. It is then ready to be placed upon its stand, and after standing a few hours is ready for use, at a cost of not more than 20c. per gallon. In times of epidemic diseases, or any large and frequent demand, this plan is recommended to pharmacists, who might sell the solution by the pint or gallon, at say 6c. per pint, or 40c. per gallon.

The uses and applications of this solution are so numerous that it is impossible to allude here to more than a few of the prominent ones. When it is remembered that this substance in very small quantities (how small no one yet knows,) is azymotic —that is, opposed to or fatal to all the lower orders of both animal and vegetable life ; and is antiseptic—that is, opposed to putrefaction or decay, preserving even the organisms which it kills. And when it is remembered that all contagious, infectious and epidemic diseases are believed by good authorities, to be zymotic—that is, of the character of a fermentation dependent upon living organisms ; and that all the processes of putrefaction and decay are zymotic also—that is, dependent upon fermentations of the kind which are caused and kept up through

the agency of cell-life, or organisms of low vitality, a good key to its powers and uses is at once obtained, and at the same time a good guard against its misapplication is established. Thus it will be seen at once that it is not a disinfectant at all, in the sense of deodorizing, except in its effects upon the causes which produce some odors; and its whole reputation as a deodorizing disinfectant is unsound and fallacious. Applied to the causes and sources of most of the hurtful odors which are not purely chemical or inorganic, it at once arrests the processes which give rise to them, and thus it cuts off the supply of these emanations. But the odors already formed, as such, are probably not at all influenced by it, except in being masked and covered up by its own overwhelming odor. All odors, to a great extent at least, follow the laws of diffusion of gases, and the sources of supply once cut off, these laws of diffusion so quickly dilute and disarm these mere results or effects, that they become practically insignificant; and it is a matter of but little moment as to exactly how the result is attained, or to what agency the credit belongs, if it was not for the undisputed fact that accurate knowledge is the essential element of the greatest success in all things. The hurtful material in all foul emanations and foul air is probably inodorous and insensible, but is endowed with vitality, and the laws of nature tend to direct this embryonic material to a soil and climate fitted for its functions of germination and reproduction. When the material fails to come under these favorable conditions it either dies, or lies dormant until the vicissitudes of nature become favorable to its development. But here the opposing influences working under the same laws come to exert their powers, and the same laws which distribute and disseminate these germs of fermentation are as ready and effective in distributing the antidote or azymotic. Hence, as an illustration, cattle acclimated to a given zymotic disease, through which they have more or less perfectly passed, disseminate the cause or seed of this disease by means of their excretions. The germs fall with the excretions upon the soil of the roads and fields over which these cattle pass, and may or may not there find the conditions necessary to their germination and growth. The excretions dry up to dust, and the winds scatter this dust and

these germs over the pastures and through the atmosphere, and they are thus present in sufficient quantity, when other cattle not acclimated nor protected against the influences come within the infected locality. Carried into the lungs and stomachs of such, with the air and food, they meet with the conditions necessary to their growth and reproduction. Now if the azymotic could be distributed in the same way, there would soon be an end of zymotic diseases, but with it an end of all fermentation, and an end of the present order of creation, in which fermentation performs an indispensable part.

By following out some such abstract of the present state of knowledge, gleaned from the various authorites, the safest, best and most permanent indications to direct the uses, and prevent the abuses and misapplications of such a substance, may be easily obtained; and it remains only for the writer to mention some special uses which might not be reached through reasoning or which have been most prominently successful in practice.

In the treatment of burns and scalds this is the best application known at the present day; and so far as the intense pain and its depressing effects, during the early stages of these accidents, is concerned, it leaves little to be desired. This standard solution, or the officinal solution of creasote, applied of a strength varying somewhat with the degree of the injury and the character of the surface burned, by means of light cloths frequently wetted, very promptly relieves the pain. Upon delicate, sensitive surfaces the solution should be diluted with an equal volume of water; but upon ordinary and exposed surfaces it may be used with little or no dilution. It is a perfectly local anæsthetic, and whenever the pain and its causes are perfectly local, and partake of this character belonging to burns, it may be used with prompt good effect.

In erysipelatous inflammations, and under other circumstances of exalted sensibility, care is needed not to use solutions too strong, since such produce pain of the same character as that sought to be relieved. There is a very curious point in the relations of this substance to pain which the writer has never seen noticed, and which is worthy of note and investigation. If a part of the hand or foot be burned and painful, the pain is much

relieved by putting the part in an elevated position, as is well known. If to a burnt surface the solution of creasote be applied too strong, the pain appears to be but imperfectly relieved, and if the part be then elevated the pain and tingling is much increased. This is the bare fact, confirmed by repeated observations, and when taken in connection with the circumstance previously mentioned, that the burning and irritation caused by the application of the strong creasote to the skin is increased by holding the part in an elevated position, it seems to indicate that the pain of burns, and of erysipelas, etc., may be supplanted and replaced by the pain of the creasote, when this is applied too strong or too freely; and that the test is, that while the original pain is relieved by draining the blood out of the part, the superinduced pain, or the pain of irritation from excessive use of the creasote, is aggravated by this procedure.

Another prominent use of great importance is its power to prevent and arrest suppuration or the formation of pus. Many of the recently published results of its use for this purpose are wonderful, in many respects; and not the least wonderful of these results is the apparent impunity with which so powerful and so caustic a substance as the crystallized Phenol has been introduced between the flaps in surgical operations, and within the wounds and injuries in compound fractures, etc. This inconsiderate and heroic practice cannot, however, be needed or justified in order to obtain the best results of the agent; and he must be a bold man who originated the practice, unless he reached the results by the failure of more dilute applications.* All suppurating surfaces, whether of pyogenic membrane or of altered

* Since this paper was written Professor Lister, of the University of Glasgow, to whom this criticism refers, has used a watery solution, which he says has in no instance failed, and which being a less powerful irritant does not produce sloughing from caustic action, nor produce obstinate vomiting for twenty-four hours after its application, as the crystallized acid sometimes did. Professor Lister's papers "On the Antiseptic System of Treatment in Surgery" show how easy it is to overdo a good work, and to almost hopelessly complicate a simple expedient in surgery by cumbrous and hurtful directions and details. That an earnest, honest worker may sometimes do this is within the experience of the writer of this note.

mucous membrane, appear to be benefitted by the application; but it is often a very nice point to determine the strength, or rather the dilution, best adapted to the object in view. For gargles, washes, injections, &c., used in relation to inflammations, suppurations, etc., the standard solution is, in a large majority of cases, much too strong, even when the weaker crystallized Phenol is used. Under this division of its uses may be classed its applications in diptheria, croup, aphthous diseases, chronic cystitis, leucorrhœa, ulceration of the rectum, fistula, abcess, carbuncle, etc. From some observations yet incomplete and unpublished, it appears to be very effective in the treatment of gonorrhœa and primary chancre, an effect well understood if the zymotic character of these diseases be proved. In all herpetic and impetigenous diseases of the skin it is very effective. The writer has seen half a ring-worm, herpes circinatus, cured by it, whilst the other half, to which it was not applied, remained. Dilute solutions used as mouth washes soon wear out the at first unpleasant taste and odor, and when habitually used, as in the daily brushing of the teeth, they prevent the accumulation of tartar, which is a parasitic growth, and keep the mouth and teeth clean and healthy. This habitual use corrects and prevents fœtor of the breath from decayed teeth, and when taken internally corrects and prevents that which proceeds from the stomach. The internal uses of the creasote are, as yet, not well studied; they are, however, numerous and important, and present a large field for investigation, particularly in their relations to the exanthemata, and indeed to all zymotic diseases. Recently published accounts of its use, both externally and internally, in scarlatina are favorable.

From a sanitary or hygienic point of view its uses and applications are more general than those of any other article, or perhaps even than all the other agents taken together. Indeed it is of almost universal applicability, but with the single important disadvantage of its disagreeable odor. This odor is, however, less disagreeable as the oils and tars are more perfectly separated, and in the best crystallized Phenol are not very objectionable to persons in general. Even when very disagreeable at first, it becomes less so, and, in a great majority of instances, soon

ceases to be disagreeable at all. All the evidence that can be collected goes to show that the odor and vapor are wholesome and never hurtful, even by prolonged exposure to a saturated atmosphere. It is stated to be a tonic to those who work in it, and to have a general tendency to robust health. Its antiseptic or preservative powers have been long known, though but recently investigated, and it is now believed, on good authority, that the process of embalming used by the ancient Egyptians, whereby their mummies are handed down through thousands of years, owes its efficacy and success mainly to this substance and its homologues. Many generations of our own time have protected and preserved their meats and fish through its agency as derived from smoke, and all the preservative agency of smoke, tar, soot, etc., is derived from this group of substances. Small animals, insects, etc., killed by it dry up in the air without putrefaction, and it has been said by a French writer that 15 grammes of it would preserve an adult human body for sixty days after death. For use about the dead it is probably destined ultimately to take the place of ice, and of all modes of embalming. It is said that a dead body enveloped in cloths, kept moistened with dilute solutions, may be kept well preserved and in a natural condition, without hurtful emanations, for any reasonable length of time, and that its free use after death from contagious or infectious diseases, destroys the influence of the diseases. When bodies are to be preserved for some time the solution should be injected into all the natural openings, and may be introduced into the abdomen and thorax, and even into the cranium, by means of a trocar and canula without mutilation. Careful injection of the blood vessels is, however, the most sure and effectual process for preservation.

In all cases of infectious, contagious and epidemic diseases the standard solution, either entire or not diluted more than its volume, should be freely used upon the bedding, clothing and utensils of the sick many times each day, by sprinkling, sponging, etc.; and the exposed parts of the body, and those soiled by dejections, may be frequently sponged off with great advantage. All bedding, clothing, etc., removed from the sick and dying, should be at once well moistened with the solution and

be then immersed in water; after being washed and ironed it should be lightly sprinkled with the solution. A portion of the solution should be put into close stools, urinals, etc., immediately after these have been cleansed, to remain there and receive the next dejections. The disinfectant thus gets immediate action upon the infected matters, and they go together into the sewers under the best sanitary conditions. Walls, ceilings, carpets, floors and furniture of infected rooms should be occasionally sprinkled with the solution. This may be conveniently done by dipping the end of a common dust brush into the solution poured out into a soup plate, and then throwing the solution off the brush in a kind of shower upon the walls, ceilings, etc.

It is not only in contagious and infectious diseases that the solution is useful, but wherever deficient ventilation, or want of cleanliness, or offensive discharges corrupt the atmosphere of apartments used either by the sick or well. Its free use is fatal to all the small vermin which infest and prey upon the bodies of the diseased or healthy, and even tends to diminish the annoyance from flies and mosquitoes.

Much of the above information is gleaned from the current Journals, foreign and domestic, and as the authorities are too numerous to be quoted, the statements are guarded by a caution which becomes necessary to avoid over-advertising a novelty which is in some risk of becoming fashionable.

Since commencing this note the writer has received from Messrs. F. Crace Calvert & Co. a series of samples of their products, which he takes occasion to exhibit to the Association in connection herewith. Their "crystallized carbolic acid No. 1," is a very beautiful product, hitherto rarely seen among us. It is very dry and white, showing no signs of discoloration by light for some time, but ultimately becoming of a dusky pink color. The No. 2, medicinal acid, shows but little liquid, even at this summer temperature, but is not so nice as the No. 1. The No. 3 is a still lower grade, and contains much liquid. Quantities of this grade, imported by the Chief Medical Purveyor of the army a year or two ago, and put up by the writer, was almost entirely liquid, even at low summer temperatures.

The liquid specimens, Nos. 4 and 5, have not been examined

for want of time, but it is supposed that the No. 5 is practically better than any. The grade No. 3 is that adopted for the use of the British army and navy, because it well subserves all the uses, medical as well as disinfectant. In connection with these is shown a specimen of the creasote put up for the use of our army during the past two years, under the name of impure carbolic acid, by the writer. It contains about 90 per cent. of the tar phenols and has proved a most efficient article in use. This is made by the coal-tar distillers around New York, but at a much higher cost than the preparation from abroad which resembles it in appearance. A specimen is also shown of the standard solution put up unfiltered, in quart bottles, with directions for use. This was put up as cheaply as possible for the Metropolitan Board of Health, and, although unsightly and unpretending, it is really an efficient and useful disinfectant, capable of subserving almost all the general uses of the creasote.

Brooklyn, April 16th, 1869.

NOTE ON RHUBARB.

The difficulty in getting good medicinal rhubarb within the last three years has been a cause of general complaint in this market. When the Russian government abandoned its long established practice of inspection, accumulation and annual sales of surplus rhubarb, that most valuable grade of quality disappeared from the market, and has since been entirely inaccessible, though very respectable houses still continue to sell rhubarb under that name at very high prices. When this particular grade of inspected and selected rhubarb disappeared from the markets, it was natural to expect that other grades from which this had probably been selected, and which reached the markets through other channels, would be improved by having this quality left in, for it was not generally believed that the portion rejected by the Russian Government Inspectors was destroyed in accordance with law, but that it came to market through Asiatic Turkey and other routes, and supplied the demand for inferior grades of "Turkey Rhubarb." This expected improvement of other grades, however, did not occur, and the absence of this high standard grade from the markets permitted or invited a downward tendency in both quality and price, with the result of causing much complaint from those who look to quality first, and price afterward. The effect upon the general market of losing an article of uniform high grade as a standard for comparison always at hand, though used perhaps in small proportion to the whole, is well worthy the attention of the thoughtful. Both the article and its influences upon the market are now lost, and the general market has run down in quality, though the supply is abundant, of what may, without much exaggeration, be called mere trash, to be had in second hands at prices ranging from $1.25 to $1.75 per pound, gold, fifty cents in gold per pound of this being duty.

Now, to inquire into some of the causes of this and to suggest

a train of thought directed toward a remedy, is the object of this note.

Let it be remembered, first, that the market is the meeting of demand and supply where these are mutually cancelled or satisfied, and next, that the ultimate object is always pecuniary profit or gain. The first law of all markets is that demand precedes supply in a natural order, and these bear to each other a natural relation of cause and effect. So far all is plain and simple enough, but this union of demand and supply, like the nuptials of Peleus and Thetis, is disturbed by an Apple of Discord, called gain. This apple is inscribed not "to the fairest," but in this case "to the sharpest and the shrewdest," and the scramble for it in the drug market has not the dignity of an assembly of gods. The demand is for the highest quality at the lowest price, and this dishonest demand, which is in its nature impossible, is met by dishonesty in the supply. These propositions, if true, embrace the whole difficulty, and but little thought and analysis are needed to show that price is the great obstacle and the natural antagonist to quality. Profit must be ample, and must remain so regardless of price, and with far less variation. Therefore quality becomes the most variable element in a general market, and is sure to be depressed and debased under the pressure of price. Just at this point in the order of progression, another influence comes into the market, that of applying knowledge and skill, of whatever kind, to so cover the defects and improve the appearance of lower grades as to justify higher prices upon fictitious quality; and here the great advantages of the presence in a market of articles of a uniform high grade of quality as standards of comparison,—and of knowledge and experience in the interest of high grades of quality to counteract the knowledge and skill applied in the interest of low grades, becomes most important. It is not difficult, in following back this train of mercantile influences and their results, to understand that the original difficulty is at the starting point, namely, in the demand which creates, controls, and regulates the supply; and if it then be asked where the demand arises, the answer must be that it arises with the consumer, but that it is so controlled and influenced by those who directly supply the

consumer, that practically it may be said to arise with them. These latter are the members of this Association and the class and interest which they represent. To us belongs the discredit of demanding the impossible condition of high quality and low price, and of attempting to satisfy these conditions without yielding in price. If we put on the screw to prices and keep it always turning downward, those who supply us must, in their competition, yield to us, and we should accept the result, for it is inevitable.

From 1852 to 1862, inclusive, the close importation cost price of Russian rhubarb varied between $3.25 and $4.00 per pound, the market price in first hands ranging from $3.75 to $4.50. Every piece of this was sound and good, and all were so well satisfied with it that at second hands or among the jobbers and druggists it sold easily at $5.00 and $6.00 per pound, which would now be equivalent to $7.00 and $8.40. Now the point desired to be made is that if pharmacists were only willing to pay such prices now, rhubarb of a quality fully equal to the Russian in medicinal value might be had, and would soon be as plentiful as ever it was. In proof of this statement the writer can offer the fact that he has never been without rhubarb which was fully equal to the Russian in his judgment, and that his price until just now has never been above $7.00, and is now $8.00, in consequence of unusual scarcity of high grades in the foreign markets. As the writer has never imported more than one package direct, and that from London, but has always gone through importing houses, the prices paid have been higher than if the market was supplied for a general demand. The last two packages received are exhibited at this meeting in connection with this note. The first of these is a chest of 130 pounds, imported to special order from Bremen, by B. W. Bull & Co., of New York. This cost 10*s.* 6*d.* sterling, which with the duty and charges make it cost here $3.75 gold or $5.50 currency. The contents of this chest were separated in two equal parts without any selection, and every lump of one-half was opened and examined. On separating the unsound and discolored pieces, which are considered unfit for medicinal uses, they are found not to exceed 20 per cent. of the whole. This, if deducted,

brings the currency cost up to $6.60, or with the labor of opening and selecting say $6.80. This furnishes a grade of rhubarb which will be pronounced by judges as unexceptionable, and which at $8.00 per pound pays nearly 18 per cent. profit. In addition to this the 20 per cent. of rejected lumps, yields by labor about 12 or 15 per cent. of its weight of sound rhubarb as good as the larger portion, only that it is in small fragments. This, when the labor of separating is charged upon it, increases the profit on the whole to over 20 per cent. These different portions may well be seen in the chest as exhibited, although the fracture is not as bright and clear as when freshly made about ten days ago. The mode of separating the rejected portions, and the character of that which is saved may be seen. The mode of opening rhubarb adopted by the writer as a speedy and convenient one, is by means of a coarse comb of steel attached to a lever of sufficient power. The teeth of the comb are forced into each lump until the lump splits. With this simple contrivance a person can open the lumps of an entire chest in about half a day and separate the bad ones.

The last package received was a half picul chest, imported direct, through the kindness of Messrs. Allen & Hanburys, the well-known house in Plough Court, London, who selected it. This package is also exhibited to the Association in connection with this note. This cost 7*s.* 3*d.* per pound in London, the courteous buyers declining to charge a commission on the purchase because they feared it did not come up to the order in quality, though the best they could do in their market. About one-fourth of the lumps, taken without selection, have been opened and examined. In comparison with the Bremen chest this is not so handsome, externally, but opens more uniformly, with fewer discolored pieces. The color of the fracture is in the main excellent, better than that of the Bremen chest, but the texture is less compact, and the odor and taste more feeble and less aromatic, besides being inferior in quality of flavor, and the rhubarb is more mucilaginous in the mouth. In short, it appears to be a much younger or less mature, rhubarb, though collected, dried and preserved with more care. It is, however, of excellent medicinal quality, and though somewhat below the

Bremen chest, it leaves little to be desired, and at the same time costs far less. The prime cost of this half chest is not much over $3.00, gold, or $4.35, currency, even had the usual commission for purchasing been paid. Many of the pieces of these chests are bored after the manner of the Russian Government Inspectors, some with a narrow-bladed pen-knife and others with a small tap-borer, either of which answers the purpose well; but a better instrument is found in that used for boring charcoal in blow-pipe examinations. This boring is almost as critical as splitting the lumps, and exposes far less new surface to the air.

Another parcel of rhubarb, expected through the importing house of Messrs. Dodge & Olcott, of New York, promises by description to be better than either of these, though at about the same cost as the first chest.

After inspection of the two parcels exhibited it will probably be admitted that rhubarb can be had in our market of as good, intrinsic, medicinal value to-day as ever it could, provided we are but willing to pay a price proportionate to its true value, and that price not higher than the cost of Russian rhubarb six years ago; and all will admit that, the profits being the same, importers would rather bring these into the market than the lower grades.

But now if we look for a moment at the more common rule of practice in the market, a little of the same kind of analysis will show how it works and how it effects the common supply of the market. A distant druggist or a pharmacist wants rhubarb to supply the physicians of his neighborhood and his incidental sales, and he goes to a central market, or employs a broker there, who usually does better for him, in one sense, than he could do for himself. He finds a range of prices, which, though all low, vary very much. He looks at the root or the powder, as the case may be, and is apt to think the higher prices much too high for the slighter differences in appearance, for he rarely opens the lumps, or more than two or three of them, and the powders he must take upon faith or appearance. He never thinks of the prices being all far too low, but takes the lowest, and the merchant who has this makes the sale. A less fortunate neighbor and competitor of this merchant sees this and finds that he must

buy his rhubarb lower next time. The times arrives, and he sees a lot which can be picked over, and the best of of it dusted with some yellow powder will present a fair appearance, and the remainder can be made into a handsome powder by skilled millers. The price gets a shade lower and he buys. The importer of this may have sold the lot whose price successfully attracted the pharmacist, and thus made two sales where the importer of the better and unsuccessful quality only made one sale. Or, if both grades are held by the same importer he finds the lower one go off two to one. He says "I have mistaken my market, and before these higher priced parcels are sold I must have some more of the lower, or my neighbors will get my trade away from me." His orders go out promptly with limitations which are sure to avoid the mistake for the future. And thus the common market is largely supplied, the lower grades going off rapidly, the higher grades with very slow sale and much trouble, while the highest disappear from the market, or are only heard of once in a while through some "Miss Nancy" who is rather nice than wise.

Rhubarb is a very delicate and sensitive drug, and much of it bears evidence of having been gathered immature or at a wrong season, and much of it of having been spoiled in the drying, but far more appears to get damaged in transportation, so that it is not improbable that a very small part only of the total product ever reaches the market in a normal condition. No matter how or where it is damaged, it must be sold, and if it can be properly "doctored" there is but little of it that cannot be made to sell pretty well, either upon faith and the reputation of the seller, or upon appearance or upon both.

The following case well illustrates this point:

In March last Messrs. A. A. Low & Brother entered in the New York Custom House a lot of twenty-five cases of Chinese rhubarb, and by sample cases in their office offered the rhubarb for sale. The cases shown as samples presented an appearance of rhubarb of a low grade, the lumps being dark and discolored throughout, and some of them hollow. Mr. A. A. Low accounted for these appearances by the circumstances that the ship had had a very long passage, having put back once or oftener, and

that the rhubarb not having been properly enclosed in sheet lead or tin had become damp and discolored, and that cockroaches had eaten out the interior of the lumps. The rhubarb, when purchased in China, was of strictly prime quality and at the highest cost of any imported by him, and the dampness, discoloration and insect damage did not interfere materially with its intrinsic value. Within a few days, however, the examiners at the custom house decided that the quality was such as to prevent its being legally admitted into the country. The owners did not avail themselves of the right to appeal from this decision, but sent it to London, where, in their interest, Messrs. Maclean, Maris & Co. bought a lot of superior rhubarb to mix with it, and had the two powdered together by Messrs. Allen & Co. of London. A portion of the powder (1000 lbs.) was reshipped to this port by Messrs. Maclean, Maris & Co., consigned to Messrs. G. W. Dow & Sons, the drug brokers who usually sell the drugs imported by Messrs. A. A. Low & Brother. The powdered rhubarb passed the custom house unsuspected and unquestioned, having an excellent appearance, and was offered for sale in this market in August, with a letter from Messrs. Maclean, Maris & Co., giving an outline of their management of the shipment.

The reasons why this instance is published so prominently are, first, because it is strictly true, and its history unusually complete in every step, and because it is believed to be a good example of a not unfrequent practice that is generally better concealed.

Secondly, because the principals in the transaction are well known, and known to be of the highest commercial standing, and defend the transaction as being entirely right and proper; and because if they should be right, this writer is totally wrong.

And thirdly, to make a point which does not appear in the transaction: This is, that Mr. Low has good cause of complaint though not in a position to use it, that the officers of the custom house have passed rhubarb for him which was quite as bad as this, though it cost far less, a circumstances well known to the writer.

Brooklyn, Sept., 1868.