Papers Presented to Local Branches

MINERAL WATERS.*

THEIR ORIGIN, INTRODUCTION, ANALYSES AND ARTIFICIAL REPRODUCTION.

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Water, an inorganic body and a compound of a definite composition, Hydrogen monoxid, is itself a mineral. It is a universal solvent. An absolutely pure water is the product of the laboratory alone. From a strictly scientific standpoint we could consider all waters as mineral waters. The definition as to what should be termed a mineral water will therefore depend largely upon the point of view; that of the chemist differing from that of the physician or that of the layman.

The term mineral water as commonly used has been applied to waters containing an appreciable quantity of minerals. The definition of what constitutes a mineral water, given long ago by Doubeny, perhaps covers the ground as well as any other. He says:—"The term mineral water in its most extended sense, comprises every modification existing in nature of that universally diffused fluid whether considered with reference to its sensible properties or to its action upon life."

From the therapeutic standpoint, a mineral water is any water which may alter in any way the physiologic functioning of the human system, no matter how feebly mineralized the water may be,—or it is any water which, by its inorganic solid or gaseous constituents, exhibits or possesses medicinal virtues.

Although some waters are much lighter in mineral constituents than the ordinary potable waters of most localities, they are yet entitled to a consideration under the appellation "Mineral water," whether its medicinal virtues be due to the presence of some substance effective in small quantities, or its purity and thereby permitting large quantities of fluid to be used.

Wherever we go we find mineral springs, some of which issue quietly and peacefully from the earth, while others are forced to the surface with great violence, either steadily or at intervals, some ascend from the bottom of the sea or lakes or rivers, others appear thousands of feet above the level of the ocean. Some issue from the earth having a temperature near freezing, others near the boiling point, some after reaching the surface of the earth are so heavily laden with matter as to cause crystaline, calcareous and other deposits or precipitations.

The origin and nature of springs depend beyond any doubt upon a leaching process occurring under the influence of atmospheric precipitations, rain water. As water passes through rocks or mineral deposits, it continually leaches out all

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soluble substances on its way to the interior of the earth, until it reaches the impenetrable layers of clay. Here it meets with other waters which may have traveled great distances through other channels or arteries, having leached other and different strata and consequently dissolved other and different substances. These waters then by hydraulic action or by the pressure of gas as the case may be, are again forced upward, passing through possible new and various strata, and again they may become active, interchanging and possibly again depositing new precipitations of matters which have become insoluble. When finally the water reaches the surface of the earth it either emanates in a quiet peaceful flow or is driven upwards with more or less, and often very great, force. In the formation of mineral waters the vast number of combinations and their operative factors always correspond with the variety in composition of natural mineral waters.

The physiological properties of mineral springs, although replete with wonders to the uneducated, have attracted the attention of scientific men from an early period. Supernatural properties have been ascribed to springs; strange stories propounded regarding their origin and tales and fables were spread regarding their wonderful powers and miraculous effects. Even to this day we find proprietors or owners of springs advertising and claiming supernatural powers and properties for their waters, but, thanks to advanced science, our Government now stops this whenever aware of such tactics.

To illustrate some of the ways of advertising I have a few of the most interesting labels and pamphlets with testimonials.

From a pamphlet of The Kentucky Carlsbad Springs Co., Dry Ridge, Kentucky, we read as follows:—

"The water cure is certainly the most acceptable way to take medicine. Any physician will tell you, after he sees the analysis of the Kentucky Carlsbad Water, that it contains every medicinal quality necessary for the cure of the diseases herein specified. We will take the albumen out of your water in three days. We will give relief of the most severe case of kidney trouble in one day and will absolutely cure any case in ten days. Stomach trouble will be relieved in twelve hours and we will guarantee it to cure any case in the world in ten days, if it has not become cancerous. Bladder trouble of any kind will be cured in ten days. It will cure any old sore by bathing in it two or three days, and if you have any catarrh, heat the water and douche it up the nose on the sore spots and in one week you will have no catarrh. It will cure any sore it comes in contact with and this is the reason it cures stomach and sore kidneys and bladder as it comes in contact with these organs."

The same Company publishes the following testimonial:—

"To whom this may concern:

I will say that I am seventy-six years old, and have had albumen in my urine for five or six years, so much so that a layer would form in the bottom of the chamber in which I urinated, but after a stay of five days at the Kentucky Carlsbad Springs my urine was perfectly clear and no signs of albumen could be seen. At the same time, I had my wife there, who had not walked for four years, and in seven days she was walking. I would sincerely recommend the water as wonderful and beyond what words could express."

I herewith present a label of the Partagas Lithia Spring Water. In the analysis made by C. T. M. Marsh and which is published on the label, no mention is made whatever of any lithia, but this does not prevent this concern to market the water under the name of "Partagas Lithia, The Autocrat of Waters."

Another label of The O. J. Ferris Springs, Plainville, Ohio, reads,—"Crystal Fountain Springs. Purest and best Table Water."

A label of The Isham's Springs of Life Company, San Diego, Calif., reads as follows:—

"Isham's California Waters of Life. The World's Wonder. They possess miraculous power to destroy disease and actually rejuvenate humanity by dissolving and evacuating calcareous old age matter and microbes. The worst forms of costiveness, kidney, stomach, skin troubles, even cancers and gall-stones yield to its marvelous power. Persons troubled with obesity or emaciated victims of excessive use of liquor, tobacco and opium, involuntarily return to a normal, healthy condition and grow strong without a drooping of the spirit. With the new life comes the bright eye, elastic step and a new growth of luxuriant hair."

Another type of existing mineral waters which I have not yet mentioned, are those collected from wells which are dug. To this class belong the various Hungarian Bitter Waters, the Hunyadis, Apenta and others. Hunyadi Janos, for instance, is collected in the Kehlenfeld, consisting of a bed of marl lying in a flat valley between the Adlerberge or mountains. By digging holes, say from 10 to 20 feet deep, the water collects in these wells in a more or less concentrated form, which is dependent upon atmospheric conditions and precipitations. From these wells Hunyadi Janos is pumped into large cisterns and mixed with water from a well yielding a lighter or heavier concentration, until it shows a certain specific gravity, and in this way it is claimed by the proprietors, the Saxlehners, Hunyadi Janos is always of the same composition, a claim which may be characteristically correct, but it is certainly *not* so chemically. So here we are, Hunyadi Janos to-day is a mixture of about 128 or more wells, owned by the Saxlehners, and among which are those which in former years were marketed by their owners under such names as Hunyadi Arpad, Miclos, Lajos, Lazlo, Joseph, Sandor, etc., etc. They have mostly been acquired since by purchase or otherwise by Saxlehner with the intention of monopolizing the Hungarian Bitter Water Industry.

The success with which a great many mineral water concerns have met and whose waters have become renowned and are marketed all over the world, has been an inducement to many a man owning a spring, the water of which may have exhibited one or another peculiarity, effect or character, to start a spring company, bottle the water and flood the market with their output, advertising matter, testimonials, etc., etc., but the greater majority soon pass into oblivion. You probably remember Ballardvale, Tuckahoe, Navahoe, all lithia waters which have recently died a natural death and upon which large sums of money have been expended. There are thousands more like them.

For a proper and effective introduction of a mineral water it is necessary to ascertain its composition by analysis. This establishes its nature, virtue, character and possible therapeutic value. In fact all mineral waters are to-day introduced by bringing the results of the analysis to the attention of the medical profession. Proper medical application and careful observation afterwards, will then reveal the true medicinal value of same.

What druggist has not met the man who came to him, bottle in hand containing water from the spring of his farm or his ranch? According to his story, he thinks himself in the possession of a veritable fountain of youth, the water having effected some of the most remarkable and miraculous cures and is known to have saved the lives of quite a few who had been afflicted with some incurable disease. If nothing more, it certainly cures kidney and bladder troubles.

Our man, I will call him farmer, like all farmers with a keen eye for money,

already imagines himself the president of a large Spring Water Company; he thinks of the bottling as well as of the advertising of his already renowned water, but more so of the profits which he might be able to make at so much per gallon and costing nothing.

Our farmer having gathered advices from others, is already aware of the fact that to introduce his spring water to physicians, an analysis is of vital importance, then, too, it also impresses the public most favorably and, of course, it is a very able judge of analyses.

The first step has been taken by Mr. Farmer to procure a chemical analysis. The chemist, in many instances of doubtful ability, for the sum of $10 or $20, furnishes the required article, and this is to some extent an explanation why we come across analyses of waters which are absolutely unreliable and some even ridiculous.

In looking up analyses of one and the same water, but made by different chemists, we often notice great differences in their results. One chemist finds a water to contain ten or twelve different salts while the other reports but four or five, yet both chemists may be right, both may have found the same quantities and kinds of acids and bases. The only difference I may say is, that the one chemist has apparently furnished more for the money than the other.

You all know that, in analyzing, we ascertain the kind and quantities of the acids and bases contained in the solution, in our case this being the mineral water in question.

Now then, say both chemists have found the same acids and the same bases in exactly the same quantities, the one may have followed an accepted norm in building up the combinations, while the other combined the acids and bases found, to suit his fancy or in some sort of a haphazard way. By chemists having followed their fancies more than their reasons, the grossest mistakes, yes, absolute impossibilities, regarding the nature of mineral waters have occurred.

It is a difficult matter to compare the work of two chemists and their analyses of one and the same water without laborious re-calculation.

Only of recent years, advanced chemists have adopted a certain norm in combining the results of their analyses of mineral waters, this norm was originated and used by Bunsen, Fresenius and others.

An effort is now being made and conducted jointly by committees of the American Chemical Society, the American Public Health Association and the Association of Official Agricultural Chemists to formulate standard methods for the computations of water analyses.

The statement of an analysis in hypothetical combinations, is evidently a mixture of fact and opinion, ordinary chemical tests reveal but little regarding the chemical composition of mineral waters, therefore the exact amounts of the different salts in solution in a mineral water are largely conjectural; although salts are present, it is a mathematical impossibility to apportion correctly the found quantities of acids to those of the bases, or *vice versa*.

This lack of definite information enables one to follow pretty much his own imagination, and there are many opinions as to how the acids and bases should be combined.

We know that one acid has by far a greater affinity for a certain base than

another. We also know that in the formation of salts, whenever two substances or two solutions of salts are mixed and that whenever such two solutions contain such salts as are liable to form an insoluble compound or a salt which is insoluble, such a salt is formed absolutely.

A solution of Barium Chloride and a solution of Sodium Sulphate when mixed will always form Sodium Chloride, the soluble, and Barium Sulphate, the insoluble salt, and this totally so, if the solutions are mixed in proper molecular proportions.

Knowing this, is it not reasonable, therefore, that as solutions, (mineral waters in this case) contain different acids and bases, that we should assume that the latter are combined in the solution in the ratio of their solubility in water?

A mineral water just emanated, has left all insoluble substances in the ground. In the course of its travel to the surface, it has undergone many changes; it has formed many precipitates and has left them behind. The chalk, gypsum and talcum beds found in nature are the results and the proofs of such ever-occurring precipitations.

Mineral waters, generally, come to the surface of the earth in the form of a clear, brilliant, sometimes bubbling and sparkling and sometimes foul-smelling solution and a "solution" is just what a mineral water is. Now then, is it not reasonable that,—since precipitates or matter which could not be held in solution by the water or which by interchange became insoluble and have been thrown out and left behind,—we assume that those salts least soluble in that solution or mineral water are ready next to also precipitate by the slightest physical change? It certainly is.

This is one of the reasons why Bunsen, Fresenius and other reputable chemists, in considering the results of their analyses, begin with the calculation of the least soluble substances or salts first, advancing to those whose solubility is greater and close with those most freely soluble in water.

In consequence of this the following approximate succession originates: Aluminum, Silica, Barium sulphate, Strontium sulphate, Ferrous carbonate, Manganous carbonate, Calcium sulphate, Calcium carbonate, etc., closing with those whose solubility is very great as, for instance, calcium chloride, sodium bromide, calcium iodide, etc.

Right here I want to mention the name of Dr. F. Raspe, a man who devoted almost a lifetime to the bringing of order out of the chaos of existing analyses of well-known mineral waters from all over the world. Raspe has re-calculated no less than twenty thousand analyses which means that now, these analyses can be compared intelligently, because the differences in the composition of the waters is clearly marked.

Dr. Raspe undertook this enormous task mainly in the interest of the manufacturers of artificial mineral waters.

Like everything else in this world, so has the manufacture of artificial mineral water its history.

Pliny, more than 2000 years ago, observed that "Waters are of practically the same nature as the earth through which they pass."

The first experiments to artificially reproduce a mineral water are said to have been undertaken by Thurneiser in the year 1560. This was before the discovery

of carbonic acid by Van Helmont, 1624, but his results were as poor as those of R. Hoffmann in 1685 and of those of Geoffroy in 1720.

In 1750, Venel, a physician of Montpelier, proposed the dissolving of carbonate of soda in hydrochloric acid and water in a closed bottle and by this method to impregnate the resultant solution of sodium chloride with carbonic acid gas. Finally in 1767, Bewley showed a way to produce carbonic acid gas in a separate apparatus by which he was enabled to impregnate water contained in another vessel with this gas, a method which was soon improved and followed by Priestley, 1772, Lavoisier, 1773, Noll, 1775, Magellan, Corvinus, VanChaulnes and Tobern Bergman, 1777, and others. Bergman, in 1774, had already set up the principle that if to water be added the ingredients found by analysis in proper form and quantities, a water identical with the natural water should result, and it was he, who pointed out the fact that the refreshing taste and exhilarating effects of a sparkling or effervescing water is due to the carbonic acid gas dissolved in it.

After Bergman, the interest in artificial mineral waters became very generally recognized in France, England, Switzerland and Germany.

In 1780, Duchanvy in Paris published the first book on the manufacture of artificial mineral waters.

In 1787, Meyer of Stettin, Germany, manufactured carbonated waters in large quantities.

In 1788, Paul & Gosse in Geneva constructed the first intermittent mineral-water apparatus.

In 1798, the same Paul founded the first mineral-water factory in Paris, and Pierre Fiquir in Marseilles in 1800, and after these followed Schweppe in London, Fries in Regensburg, etc.

Artificial mineral waters in those times were yet imperfect products, because chemical science had not reached its present knowledge and the apparatus were of very primitive construction. These were also the main causes for artificial waters being discredited and the ideas advanced that natural waters were peculiar products and of a nature which could not be artificially reproduced.

Within the past seventy-five years, however, it has been possible to produce artificial mineral waters of absolute perfection. Bergman, Berzelius, Bischof and Struve had pointed out that the composition of natural mineral waters depends upon the amount of carbonic acid and other gases which are dissolved in the water and upon the rocks and strata which they permeate and upon which it acts, and it was Struve who proved this by direct experiment.

Struve selected for his first experiment the acidulous alkaline Joseph Spring of Bilin, Bohemia. He filled a metallic cylinder of about six feet in length with a mixture of powdered quartz sand and klinckstone both of which he took from the ground of the Donnersberg in the immediate neighborhood of Bilin, and subjected this to the action of carbonated water under pressure, he thereby succeeded in producing an artificial water identical in composition with the Joseph Spring.

Struve followed this experiment in a like manner in producing artificial Carlsbad and Friedrichshall, both of which Faraday and Liebig pronounced identical in chemical composition and physiological and therapeutic action with the respective natural waters of these springs.

It is an undeniable fact that the honor to have by his efforts overcome all technical difficulties and to have placed that which had previously been considered unattainable, upon a scientific basis, belongs to Dr. Struve. It was he to whom thanks are due for having produced the first identical reproductions of mineral waters correct in chemical composition, in physical properties and in therapeutic effects and he is therefore deservedly called the father of artificial mineral waters.

Another fact which I want to mention, in connection with the introduction by him of his scientifically prepared mineral waters, is that his efforts accomplished most towards revealing the actual nature of mineral springs and their waters, and that, through his knowledge and scrutiny, many spring and natural mineral waters have greatly profited, inasmuch as their real therapeutic value and their proper application became known among physicians as well as to the public.

Friedrich Adolph Struve, Doctor of Medicine and owner of the Salomonis Apothecary in Dresden, Germany, was born May 9, 1781. After devoting the greater part of his life to his studies in the interests of both the nature of mineral waters and that of the manufacture of artificial mineral waters, he died September 29, 1840.

Struve's first artificial mineral-water institute was opened in Dresden in 1820; this was followed by one in Leipzig, another in 1823 in Berlin, one in Brighton, England, in 1825, and others in Germany, England and Russia, all of which were under his direction and that of his sons. Since then the number of factories increased rapidly, so that in 1877 there had been over 700 of them established in Germany alone.

In America the manufacture of scientifically prepared mineral waters such as are true reproductions of the respective natural springs, is still in a much neglected condition. Very many manufacturers, even at the present time, are using as their unit of measure, in compounding their waters, an ordinary shovel. Others which are more progressive and who at least try to be honest, buy mixtures of so-called mineral water salts, under the various names of springs from manufacturers or supply houses, which, however, at most, furnish but extremely poor results for such salts cannot claim to be anything near to being true representatives of natural springs. It is impossible to compound or to produce true artificial mineral waters from any mixture of water-soluble salts, because such waters contain also substances which are ordinarily insoluble in the form of a salt.

The credit of being the originator of scientifically produced artificial mineral waters in America, belongs to Dr. Carl H. Schultz, who started their manufacture in New York in 1862. Schultz was followed by Dr. Enno Sander of St. Louis and W. T. Wagner's Sons of Cincinnati. These establishments have chemists to compound their waters and have made a name for themselves and their products, and I express the hope that inasmuch as there are very great opportunities outside of New York, St. Louis and Cincinnati, others may soon follow in the uplift of this industry.

It is the duty of a manufacturer of artificial mineral waters to compound his waters in such a manner that when his product is finished, it will conform exactly to the analysis of the respective spring. All and even the minutest quantities of

the various salts shown in the analysis of a water should be taken into consideration by him and should be one of the component parts of his product; nothing should be left out, even if it be considered superfluous or inert.

It is true and it cannot be denied that the salts in a natural mineral water are not always combined exactly in the manner as stated by chemists in their analyses, but this has no bearing whatever on the product of a compounder of an artificial mineral water.

It is entirely immaterial, for instance, whether a chemist or analyst, in his analysis, denotes one molecule sodium sulphate (Na_2SO_4) and two molecules potassium chloride (2KCl), or one molecule potassium sulphate (K_2SO_4), and two molecules sodium chlorid (2NaCL). It is also immaterial whether a solution, or in this case a mineral water, contains these substances as such, meaning as actual salts or as molecular fragments (ions). The artificial product, whether made by dissolving either one molecule sodium sulphate (Na_2SO_4) and two molecules potassium chloride (2KCl), or by dissolving one molecule potassium sulphate (K_2SO_4) and two molecules sodium chloride (NaCl) in water, will contain the same ingredients, the potassium and the sodium as bases and the hydrochloric and sulphuric acid, as acids, in precisely the same quantities and form or forms as in the natural product because they are bound to follow and do follow the same natural laws in one, the natural solution (the mineral water), as in the other, the artificial solution.

Another example:—If we make a solution of proper amounts (the molecular weight) of potassium bromide (K Br) and sodium chloride (NaCl), in distilled water, we will get the same result or exactly the same product as by dissolving (the molecular weight) of sodium bromide (Na Br) and potassium chloride (KCl) in an equal amount of distilled water. Both solutions will have the same action, therapeutically, physically and chemically.

The natural-water men who have been fighting all these years and have tried their best to discredit scientifically-prepared mineral waters, have, to this day, failed to prove the slightest physical, chemical or therapeutical differences between the natural solution of salts, the natural mineral-water, and the scientifically-prepared solution of salts, the artificial mineral-water.

In the manufacture of true artificial mineral waters every ingredient is added to the water in a soluble form, all precipitates which are formed by the mixing of the solutions, are redissolved by and under the presence and pressure of carbonic acid gas.

If the various acids and bases contained in either, the natural and the artificial solutions, agree quantitatively and qualitatively, then as said before Nature will absolutely follow or apply the same law to one as it will and does to the other. Both solutions have been proven to and do act alike physically, therapeutically, chemically and electrochemically; they are absolutely identical in every sense of the word and this in spite of all assertions to the contrary as made by those interested and more especially, financially interested in the natural mineral-water industry.

The following illustration given by Dr. Raspe shows what may, at first sight, appear to be the analyses of three entirely different products or composition, or the analyses of three waters entirely different in composition.

These analyses do not seem to agree in the slightest, yet they have exactly the same value.

	10000 Parts		
	A	B	C
Sodium Chloride	3.297	5.846	.....
Calcium Chloride	2.418	.....	5.546
Sodium Sulphate	1.035	.....	1.775
Calcium Sulphate	0.708	1.700	.....
Sodium Bicarbonate	2.178	.....	5.625
Calcium Bicarbonate	3.310	5.400	.....
	12.946	12.946	12.946

A. Represents an analysis and an application of acids to bases very generally found, in which the chemist has followed no particular norm, but simply his own fancy. With a greater number of elements, the complication would naturally be greatly increased.

B. Represents the same analysis as does A., but in another form, that of the so-called Normal Analysis as adopted by Dr. Raspe and who follows, with but few exceptions, the principles of Bunsen, Fresenius and others.

C. Represents a re-calculation by Raspe in the soluble form, the form which is necessary for the manufacturer of mineral waters.

If you will take the trouble to calculate the quantities of the elements or if you like, the acids and bases contained in either A., B. and C., you will find them to agree perfectly.

It is a fact also that, if you will compound a solution in water so as to contain in 10,000 parts, the amounts of elements, or of acids and bases or their equals in salts, in proper quantities, as given in either A., B. or C., you are bound to get the same results, because the natural laws of changes and interchanges of the ions or molecules in solution will apply themselves to the one solution as to the other. It is experimentally proven as mentioned before, that salt solutions, formed by different salts but corresponding to the same Ionic table, have the same physical properties.

Many controversies have been carried on between those balneologists who speak in favor of natural mineral waters and who claim a superiority for them, and those scientific men who declare themselves in favor of and who prefer and recommend the use of scientifically-prepared artificial mineral waters; especially does this preference apply to the bottled and shipped natural waters as found in the market, which often, are quite aged before they reach the consumer.

It might be interesting to you to listen to the words of a few authoritative men opposing the contentions of those who, in their arguments against artificial mineral waters, claim that man cannot produce anything new in nature by artificial means nor produce artificially such a thing as an artificial mineral water. In doing this I wish to call your attention to the fact that the opponents of artificial waters lay special stress upon the unknown substances and the hidden powers contained in natural waters and which they say chemists to this date have not been able to detect.

Dr. Wachter (Heidelberg) says:—"Does not man by use of reason and choice selection breed animals, does he not bring thousands of plants in close contact with each other for the production of a new heretofore unknown species? Yet no

one will assert that he is the real creator of the newly-acquired result of the cross-breed. . . . . As every one may know, fluid water is composed of two gaseous elements, oxygen and hydrogen, a mixture of which gases can be brought to unite by but a weak electrical discharge into a fluid form,—into water. Now, no one will assert that this water, seemingly produced by man (the artificial), is different from the atmospheric or terrestial (the natural water). No one will doubt that it is water at all because the coarsest reasonable conception will enable one to identify it as such."

Dr. Max Roloff of the University in Halle says:

"Wherever physical chemistry has been treated with knowledge and logics and has not been pressed into the service of water-advertisements (Brunnenreklame), there is not the slightest point to show a principle of physical or chemical difference between artificial and natural waters. . . . . Has not the surrogate manufacturer just the same right to assert that his product surpasses the natural spring because it does not contain those harmful mysterious impurities? Further, I have never found that a spring was recommended because of the curative power of the unknown ingredients, the therapeutic effects were always founded upon the known and, in proven quantities, present salts and because of these quantities compared with similar springs. The balneologists then, do not themselves believe in the action of these mysterious matters, these only serve as an argument in fighting competition."

Prof. Carl Ernst Bock, of Leipzig, in speaking of artificial mineral water, says:—"Artificial mineral waters take the place of the natural mineral waters in every respect, although many physicians are prejudiced against the former."

Dr. W. Jaworski, Prof. int. med., University, Krakau, says:—"The scientific investigation so far has not been able to prove any specific properties in mineral waters which were not also possessed by the artificial solutions. Both salt solutions follow the same natural laws. The contrary assertions are spread for reasons of personal interests. . . . There is no proven difference to be found in the action of the artificial salt solutions and the mineral waters upon the system. The experimental investigations have not been able to prove a difference, but on the contrary, they have proven the identity in action of the natural and artificial salt solutions. . . . The natural mineral waters are crude products (*Medicamenta cruda*) of accidental composition, which, in modern therapeutics, may be placed among the many obsolete products of nature."

In conclusion, I, herewith, give another quotation from Dr. Wachter. . . . "The manufacturer has done his duty as soon as he proves that his artificial water agrees with the natural water in every way in chemical and physiological respects, and it is, as soon as he has fulfilled these conditions, a deep re-acting wrong, if physicians and laymen assert that a proven difference exists between the spring waters and that produced in the laboratory, while they are at the most entitled to say:—'It is possible that a difference exists, but that it is not detectable with our present analytical means,' and never was a physician in the position to maintain of an artificial water which fulfilled the requirements of a chemical analysis, that the artificially produced water has a different action upon the system than the natural, but you always hear them say, 'I take it for granted that they act different because they are not natural." . . .