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MANITOU,

COLORADO,

U. S., A.,

ITS

MINERAL WATERS AND CLIMATE,

By S. EDWIN SOLLY,

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FELLOW OF THE ROYAL MEDICO-CHIRURGICAL SOCIETY,
LATE MEDICAL REGISTRAR AND HOUSE SURGEON
TO ST. THOMAS' HOSPITAL.

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1875.

ANALYSIS.

M. L. DeCoursey, Esq.:

Dear Sir:—With the kind permission of Lieut. Geo. M. Wheeler, in charge of the expeditions and explorations west of the 100th meridian, I send you herewith the result of the analysis of the Manitou Springs. A simple comparison with other springs shows that those of Manitou resemble those of Ems, and excel those of Spa.

I remain, truly yours,

(*Signed,*) O. LOEW,

Mineralogist and Chemist of the Wheeler Expedition

THE MINERAL SPRINGS AT MANITOU,

In 100,000 Parts of Spring Water are Contained in

—OF—	NAVAJOE.	MANITOU.	UTE SODA.	SHO-SHONE.	IRON UTE.	LITTLE CHIEF.	SPA.
Carbonate of Soda	124.69	52.26	23.82	88.80	59.34	15.16	9.6
Carbonate of Lithia	0.24	0.21	trace.	trace.	trace.	trace.	.....
Carbonate of Lime	129.40	111.00	40.00	108.50	59.04	75.20	12.8
Carbonate of Magnesia	31.66	20.51	6.10	.....	14.56	13.01	1.9
Carbonate of Iron	.....	trace.	1.40	.....	5.78	1.30	4.8
Sulphate of Potassa	16.21	13.35	trace.	5.12	7.01	6.24	1.1
Sulphate of Soda	18.42	19.71	12.24	37.08	30.86	51.88	0.5
Chloride of Sodium	39.78	40.95	13.93	42.12	31.59	47.97	5.9
Silica	1.47	2.01	trace.	trace.	2.69	2.22	6.5
Total solid constituents	361 60	260.00	97.49	281.62	210.87	213,48	43.1
Gases	.....	Free Carbonic Acid.			.....	.....	.....
Degree of Fahrenheit	50.°2	56°	.....	48.°5	44.°3	43°	.....

Reduced to grains in a pint, the analysis reads as follows:

In a Pint of the Spring Water are Contained

—OF—	NAVAJOE.	MANITOU.	UTE SODA.	SHO-SHONE.	IRON UTE.	LITTLE CHIEF.	SPA.
Carbonate of Soda	$8\frac{3}{4}$	$3\frac{1}{4}$	$1\frac{2}{3}$	$6\frac{1}{5}$	$4\frac{1}{7}$	$1\frac{1}{17}$	$\frac{3}{5}$
Carbonate of Lithia	$\frac{1}{50}$	$\frac{1}{67}$	trace.	trace.	trace.	trace.	.....
Carbonate of Lime	$9\frac{1}{17}$	$7\frac{3}{4}$	$2\frac{4}{5}$	$7\frac{3}{5}$	$4\frac{1}{8}$	$5\frac{1}{4}$	$\frac{1}{2}$
Carbonate of Magnesia	$2\frac{1}{5}$	$1\frac{1}{2}$	$\frac{1}{2}$	.....	$1\frac{1}{50}$	1	$\frac{1}{7}$
Carbonate of Iron	.....	trace.	$\frac{1}{10}$	.....	$\frac{2}{5}$	$\frac{1}{8}$	$\frac{1}{3}$
Sulphate of Potash	$1\frac{1}{7}$	1	trace	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{14}$
Sulphate of Soda	$1\frac{1}{4}$	$1\frac{1}{3}$	$\frac{3}{4}$	$2\frac{3}{5}$	$2\frac{1}{5}$	$3\frac{3}{5}$	$\frac{1}{25}$
Chloride of Sodium	$2\frac{3}{4}$	$2\frac{2}{3}$	1	3	$2\frac{1}{3}$	$3\frac{1}{3}$	$\frac{2}{5}$
Silica	$\frac{1}{10}$	$\frac{1}{7}$	trace.	trace.	$\frac{1}{5}$	$\frac{1}{7}$	$\frac{9}{20}$
Total of solid constituents	$25\frac{1}{3}$	$18\frac{1}{5}$	7	$19\frac{2}{5}$	$14\frac{3}{4}$	15	$3\frac{1}{50}$
Gases	.....	Free Carbonic Acid.			.....	.....	.....
Degree of Fahrenheit	50.°2	56°	.....	48.°5	44.°3	43°	.....

MINERAL WATERS.

History.

The use of natural mineral waters as medicinal agents has been established for almost as far back as written history can carry us. The Greeks, who may be considered as the first to place the art of healing upon a coherent and rational basis, largely availed themselves of the numerous mineral springs that existed in their various provinces. The Romans not only valued and used those in their own territory but discovered and preserved many others in the countries which they held by right of conquest; as, for example, the hot springs of Bath were much resorted to by them, and the present bath houses stand upon foundations of Roman workmanship. In biblical history, the stories of the pool of Bethesda and the washing in Jordan are instances of the early belief in the medicinal efficacy of special waters among the Jews. In tracing through the history thus briefly referred to, it is found in the main that the chief repute of those waters, whose use has been continued to the present day, was gained for the curing of the same diseases as those for which they are still found to be most beneficial, thus proving that however much the means of gaining an accurate estimate of their value was obscured by superstition, mystic rites, and an irregular and unsuitable indulgence in their use, yet the benefit derived in suitable cases was so marked as to stamp them with certain medicinal qualities, which the science of the present day shows to have been justly and rationally ascribed to them.

The reviving and increasing popularity of mineral waters demands that science should on all occasions be brought to investigate and explain the real interpretation of the advantages with which more than 2,000 years' experience has justly credited them. Wherever fresh discoveries of these springs are made and well established facts brought to light, it is specially the duty of physicians to test the value of their reputation, to guide the people to their rational use and warn them from their careless or ignorant application. The ease with which they can be taken, the popular idea of the mildness of their effects, and the example of fashion, are too apt to tempt the ignorant to their abuse, and so bring into disrepute a natural remedy which, used with intelligence, would be no mean addition to the armory of medical science.

In this vast continent, where man, though he has displayed an energy

and enterprise hitherto unrivalled in the world's history, has not probably as yet availed himself of a tenth part of its natural resources, we have almost daily coming to our knowledge fresh examples of these medicinal agents, the use of which it behoves the physician to turn into those channels which science and experience point out as the most appropriate.

Mode of action.

Their mode of action has first to be considered, and why it is that the minerals in the natural waters have as great an effect as, and a different effect from, the same ingredients in larger quantities in artificial combination. Why, by prescribing the same minerals in the same proportions from our pharmacopœa we fail to procure the same results? In answer to this query, I cannot do better than quote the words of Dr. Sutro: "They mostly contain substances insoluble in ordinary water. But what agency keeps them in solution? It is *carbonic acid* gas thoroughly impregnating the water. Were we to employ any fixed acids to dissolve lime, magnesia or iron, the chemical composition of other combinations would be changed. Carbonic acid not only dissolves the one substance without disuniting combinations of others, but it enters the system charged with these particles, and presents them to the mouths of the absorbent vessels in this highly diluted condition; it further promotes their *direct* absorption by exerting a stimulating power on the vascular and nervous systems. Thus you may understand why six-tenths of a grain of iron imbibed into the lacteals, with the above gas, may be more exciting and strengthening than three or four times the quantity of pharmaceutic carbonate of iron, which has to be dissolved in the gastric juice *previous* to absorption." Thus we see how the lesser quantity of a substance in a natural water will act as powerfully as the greater artificially combined. Then as regards the relative action of the various ingredients to one another, these, being all held in solution at the same time, will therefore each exert its separate action; and this is a matter difficult to obtain in artificial preparations, as, except as regards some simple combinations, chemical change is apt to occur between the various ingredients, owing to the acids that are necessarily present to secure their solution having greater chemical affinities for some ingredients than for others. In this way most of the properties of the medicine are changed, neutralized, or destroyed. The special efficacy of a mineral water depends upon the quality of the ingredient present in the greatest active proportion; but owing to the natural and not strictly chemical combination with its other constituents, the special action of the predominant one upon a certain organ or system is modified and beneficially qualified by them. As, for example, where iron is the chief constituent its constipating influence is prevented by a small proportion of Glauber's salt (sulphate of soda), or its too powerful action upon the blood modified by the lowering influence of chlorides; and yet its main effects are not impaired.

Carbonic acid gas, its influence on chemical combinations.

Artificial mineral waters.

Artificial imitations of certain Spa waters have been manufactured and the ingredients held in solution by the water being mechanically charged with carbonic acid; and in some instances these have been used with marked success. That they have failed to obtain, beyond a certain point, the same results as from the original Spa, must be attributed to the presumption that there are chemical substances as yet unknown, or known chemical substances in unknown states of combination contained in these natural waters.*

In some of these so-called chemically indifferent waters certain minute proportions of vegeto-animal substances have been discovered; as, for instance, the substance named glairine, in the spring of Gastein, in the South Tyrol; and there are good grounds for thinking substances of a similar nature are present in other waters, though as yet not yielding evidence of their presence to chemical tests.

Cases suitable for treatment by natural mineral waters.

As the mineral waters are never indifferent remedies, and either do good or ill to the patient using them, it is necessary to understand what are the class of ailments, speaking broadly, suitable or unsuitable to be placed under their influence.

In the first place the disease must be of a chronic nature and without active tendencies; for all acute diseases, inflammatory conditions of vital organs, inflammatory fevers, active congestion of the lungs or brain, etc., are unsuitable.

In chronic diseases it is not uncommon to find that, after a patient has recovered up to a certain point, he will halt in a condition liable to degenerate into permanent valetudinarianism, and will not answer to any of the usual medicinal remedies; nor will change of air or scene *alone* effect a cure. It is then that these natural and inimitable combinations prove their value. Their ready solubility, and their high dilution fit them for easy absorption into the tissues of the body, and without violent and sudden alterative or antagonistic action, they promote a slow but sure metamorphosis of tissue; setting up gradually but surely a natural habit of body, in the place of the perverted type of chemical change; that the body, exhausted by the effort to throw off some local or general poison or other offending matter, has fallen back upon, accommodating itself as best it can, as Nature is wont to do, to the presence

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* "That there are active principles yet undiscovered in some mineral springs, we are justified in surmising, if we take cognizance of the astonishing changes produced by certain Spas called *chemically indifferent*, because their constituents are scarcely distinguished from those of common water. It is a singular fact that these very Spas are among the most powerful. Take, for instance, Wildbad, near Stuttgardt, which is particularly renowned for curing inveterate gout, arthritic paralysis, and contractions after wounds. What do you suppose its constituents to be? No more than three-and-a-half grains in sixteen ounces; and these are about two grains of chloride of sodium, half a grain of carbonate of soda, some carbonate of magnesia, of lime manganese and iron, with some silese. Are these few grains able to cause absorption of substances deposited in the joints, or to restore pliancy and power to limbs which have for years resisted the manifold means that knowledge and experience have devised?"—*Sutro on Spas and Climatic Resorts.*

of an incubus it cannot throw off unaided. As the vice of tissue change, so to speak, that has been set up, has been slow in forming, and in doing so has modified by sympathy most of the functions of the body, so the remedy used must be slow in action, varied and manifold in its properties; and it is in these cases that Nature's polypharmacy so much avails.

There are also a class of cases most suitable for such treatment. Individuals in whom, without there being actual present or past disease, there is a want of that proper balance between the wear and tear of tissue which is ever going on, and the repairing and sustaining effects of nutrition, clarification or rest; so that, without the individual having well-defined or constant signs of ill health, he is complaining of general malaise, or else irregular and uncertain action of various organs. Either the air, the water or the food he uses do not supply sufficient material for healthy repair, or his mental or physical occupations excite too much or too little the natural waste of tissue; or there may exist some congenital or hereditary tendency or defect, which, unless due allowance is made for it, disturbs the balance of health. Such cases, if removed from whatever injurious influences they may be under, and treated by a suitable mineral water, are prevented from running on into a permanent bad habit of body, which would lead ultimately to actual lesion of tissue.

Classification.

Mineral waters may be classified either by their temperature or by their predominant ingredient. Classified by temperature, they are divided into three groups. First, the *cold*, their temperature being below 66° Fahrenheit; second, the *tepid*, above this and below 95° Fahrenheit; third, the hot or *thermal*, above 95° Fahrenheit. Classified by their predominant constituents, they are divided into four chief groups (Pereira), *chalybeate, sulphureous, acidulous or carbonated and saline.* This latter is the most convenient arrangement. Chalybeate waters are of two kinds, carbonated and sulphated.

Order 1.—Carbonated-Chalybeate Waters. Contain the carbonate of the protoxide of iron. These waters also contain much free carbonic acid, which renders them brisk, sparkling and acidulous. They are called *acidulo-carbonated chalybeates.* The Pyrmont (Trinkquelle), Schwalbach, Spa (Pouhon) and the Iron Ute are Springs of this class. When, however, the quantity of carbonic acid is not large, and they do not sparkle in the glass, they are termed simply carbonated chalybeates; or, from the earthy and alkaline salts which they contain, saline carbonate chalybeates, of which Tunbridge Wells and Harrowgate are examples.

Order 2.—Sulphated Chalybeates. These contain sulphate of iron and sometimes also chloride of iron. Some of them contain sulphate of alumina, and are denominated *aluminous sulphated chalybeates.* This class is found in great abundance in Virginia, where they are

called, usually, alum-waters. The Sandrock (Isle of Wight) is also of this class. When there is no sulphate of alumina present, they are called simply *sulphated chalybeates.* The Alexisbad is the most powerful spring of this character. The acidulo-carbonated chalybeates are the most easily assimilated. The use of chalybeate waters is specially indicated in cases of anæmia or debility, and they are often of great service in female disorders, but must be shunned in inflammatory, febrile or plethoric conditions.

Class 2.—Sulphureous Waters. Are impregnated with sulphuretted hydrogen emitting the odour of rotten eggs. Aix la Chapelle, Baden, White Sulphur Springs (Virginia), Salt Lake Springs (Utah). Sulphureous waters possess a specific power over the cutaneous and uterine system and are generally stimulating.

Class 3.—Acidulous or Cabonated Waters. These waters owe their peculiar properties to carbonic acid gas, which gives them briskness and acidulous taste, and a sparkling property. Most contain carbonate of soda and are then termed acidulo-alkaline. Seltzers, Saltzbrumen, Ems (Kranchen), Manitou (Navajoe) are examples.

Those which contain also carbonate of iron in any quantity, come under the head of acidulo-carbonated chalybeates, which have been already noticed. The acidulo-alkaline waters act chiefly on the digestive, sexual and nervous systems, and are of special use in derangements of the digestive organs, especially connected with hepatic disorder in dropsy and uterine affections, etc.

Class 4.—Saline Waters. These waters owe their medicinal activity to their saline ingredients, for although they usually contain carbonic acid and sometimes oxide of iron or hydro-sulphuric acid, yet these substances are found in such small quantities as to contribute very slightly to the medicinal operation of the water. Saline mineral waters may be conveniently divided into five orders, founded on the nature of the predominating ingredient, viz.:

Order 1.—Purging Saline Waters. The leading active ingredient being either sulphate of soda or sulphate of magnesia, some cold and some hot; of the sulphate of magnesia (bitter waters) Epsom, Seidlitz and Pullna are examples, of the sulphate of soda (Glauber's salt-waters) of the hot ones Carlsbad, of the cold Marienbad are examples; some besides the sulphate of soda contain various earthy and alkaline salts as Cheltenham and Manitou (Shoshone). In full doses these waters are mild cathartics, in small and repeated doses they act as refrigerants and alteratives. They are useful in diseased liver, habitual constipation, hemorrhoids, determination of blood to the head, &c.

Order 2.—Salt or Brine Waters. In these waters chloride of sodium is the chief ingredient, iodine and bromine being often also present. Some are thermal, as Wiesbaden; some cold, as Leamington,

Cañon City, (Colorado) and Saratoga. Some contain iron, as Kissingen. Kreusnach is an example where bromine and iodine are present. Saline waters in large quantities are emetic and purgative; in small but continued doses they act as alteratives and stimulate the absorbent system.

Order 3.—Calcareous Waters. In these the predominating ingredient is either sulphate or carbonate of lime, or both; Bath, Bristol and Buxton thermal waters are of this kind. When taken internally, their usual effects are stimulant, (both to the circulation and the urinary and cutaneous secretions) alterative and constipating, and are referable, in part, to the temperature of the water, in part to the saline constituents.

Order 4.—Alkaline Waters. The mineral waters denominated alkaline, contain carbonate of soda as their chief characteristic ingredient. The thermal springs of Teplitz and Ems belong to this order. Those of this order which contain an excess of carbonic acid are acidula-alkaline, as referred to before, of which the Vichy waters are an example. They act upon the urinary organs and may be used in calculous complaints.

Order 5.—Siliceous Waters. In these silica is the predominant constituent as in the boiling springs of Geyser and Reikum in Iceland. Their action is supposed to be similar to the other alkaline waters.

MANITOU.

Manitou is situated in a beautiful valley among the foot hills of the Rocky Mountains. It is the gate, as it were, of the Ute Pass which cuts westward through the spur of the main chain, of which Pike's Peak is the highest point, lying to the northern side and almost beneath the shadow of this grand mountain. It is seventy-five miles south of Denver, the capital of Colorado, and five miles west of the prosperous town of Colorado Springs, which stands four hundred feet below it, on the opening plateau of the great plains, from whence the Denver & Rio Grande Railway connects it with Denver in the north, and New Mexico in the south. This valley stands at an altitude of 6,370 feet above sea level and 8,000 feet below the summit of Pike's Peak.

Manitou Springs; their situation.

Most of the mineral springs are to be found among the picturesque windings of the Fountain Creek, a clear, fast-running stream, with a rocky bed, which comes down from the mountain through the Ute Pass. The Mineral Springs that are at present used are six in number. They vary in temperature from 43° to 56° F. and are strongly charged with carbonic acid. Coming up the valley the first is the *Shoshone*, bubbling up under a wooden canopy, in the middle of the main road of the village, and often called the Sulphur Spring from the yellow deposit left around it. A few yards further on and in a ledge of rock overhanging the right bank of the Fountain is the *Navajoe*, abounding in carbonates of soda, lime and magnesia, and still more strongly charged with carbonic acid, having a refreshing taste similar to Seltzer Water. From this rocky basin pipes conduct the water to the bath house, which is situated on the stream a little further down. Crossing by a pretty rustic bridge we come to the *Manitou*, close to an ornamental summer house; its taste and properties closely resemble the Navajoe. Recrossing the stream a little further and walking about a quarter of a mile up the Ute Pass road, following the right bank of the Fountain, we find close to its brink, the *Ute Soda*. This resembles the Manitou and Navajoe, but is chemically less powerful, though much enjoyed for a refreshing draught. Retracing one's steps to within about two hundred yards of the Manitou Spring, we cross a bridge leading over a stream which joins the Fountain at almost a right angle from the south-west; following up the right hand bank of this mountain brook, which is called Ruxton's

Creek, we enter the most beautiful of the tributary valleys of Manitou; traversing the winding road among rocks and trees for nearly half a mile, we reach a summer house close to the right bank of the creek, in which we find the *Iron Ute*, the water being highly effervescent, of the temperature of 44.°3 F., and very agreeable in spite of its marked chalybeate taste. Continuing up the left bank of the stream for a few hundred yards, we reach the last of the springs that have been analyzed—the *Little Chief*; this is less agreeable in taste, being less effervescent and more strongly impregnated with sulphate of soda than any of the other springs, and containing nearly as much iron as the Iron Ute.

History of the Manitou Springs.

These springs have from time immemorial enjoyed a reputation as healing waters among the Indians, who, when driven from the glen by the inroad of civilization left behind them wigwams to which they used to bring their sick; believing as they did that the Good Spirit breathed into the waters the breath of life, they bathed and drank of them, thinking thereby to find a cure for every ill; yet it has been found that they thought most highly of their virtue when their bones and joints were racked with pain, their skins covered with unsightly blotches or their warriors weakened by wounds or mountain sickness. During the three seasons that the use of these waters has been under observation, it has been noticed that rheumatism, certain skin diseases and cases of debility have been much benefited, so far confirming the experience of the past. The Manitou and Navajoe have also been highly praised for their relief of old kidney and liver troubles and the Iron Ute for chronic alcoholism and uterine derangements. Many of the phthisical patients who come to this dry, bracing air in increasing numbers are also said to have drank of the waters with evident advantage.

Professor Loew, (chemist to the Wheeler expedition) speaking of the Manitou Springs as a group, says, very justly, they resemble those of Ems and excel those of Spa—two of the most celebrated groups in Europe

Classification.

On looking at the analyses of the Manitou group, (first note, see first page) it will be seen that they all contain carbonic acid and carbonate of soda, yet they vary in some of their other constituents. We will therefore divide them into three groups of carbonated soda waters. 1. The *carbonated soda waters proper*, comprising the *Navajoe, Manitou and Ute Soda*, in which the soda and carbonic acid have the chief action. 2. *The purging carbonated soda waters*, comprising *the Little Chief and Shoshone*, where the action of the soda and carbonic acid is markedly modified by the sulphates of soda and potash. 3. *The ferruginous carbonated soda waters*, where the action of the carbonic acid and soda is modified by the carbonate of iron, comprising the *Iron Ute and the Little Chief*, which latter belongs to this group as well as to the preceding one.

Soda waters are divided into strong and weak, as they contain about ten or twelve grains of soda or more in the pint, and into simple and compound, as their action is due to the soda alone or to the other ingredients as well. Further, they are called carbonated, when they contain free carbonic acid in any quantity. The Manitou Springs therefore come under the head of *weak compound carbonated soda waters.*

Group 1. Navajoe.

We will now proceed to consider group No. 1, of which the Navajoe is the strongest representative. We find that it contains a large amount of free carbonic acid, about nine grains of carbonate of soda, about three grains of chloride of sodium, and of the sulphates of soda and potash, a little more than a grain each in a pint.

Soda present in the blood, its use in the human economy.

Soda being the most active constituent, it will be well first to remark briefly upon what we know of its influence upon the human body, and then consider how the chloride of sodium and the sulphates of soda and potash modify its effects.

The blood contains a large and uniform supply of soda in the forms of carbonate or bi-carbonate of soda and chloride of sodium.

By means of soda the blood is kept constantly alkaline, and thus the albumen and fibrine are held in solution; and this function appears to be equally performed by the carbonate of soda and chloride of sodium.*

The chief means whereby carbonate of soda influences change of tissue in the body is doubtless through its property of keeping the fibrine fluid in the blood Although not yet capable of complete proof, the following may be fairly taken as facts viz.: When albumen, having served its main purpose in the animal economy, requires to be got rid of, it is primarily converted into fibrine, and thus carried by the blood to the organs whose special province it is to assist in the elimination of useless and waste substances from the blood, and here the fibrine is changed into uric acid, urea, etc., and passes out by the rectum, bladder, skin or lungs.

As the fibrine continues in a fluid state through the blood being kept alkaline by the soda, we see that, in order that proper change of tissue may go on in the body, the blood must be kept alkaline by the soda; and that, further, if we increase the alkalinity of the blood by more soda, we also increase the elimination of waste products; and so it is found that if soda is taken for a long time continually, the body gets thinner, the urine contains an increased amount of waste products, and the fibrine of the blood is markedly diminished. Kemmerick, Rabuteau and Constant, by their recent experiments, have however proved that it is only *small doses* of soda and other alkalies that increase the elimination

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* Liebig has further stated his belief that carbonate of soda is the channel whereby carbonic acid is carried from the blood to the lungs, where it is eliminated in expiration.

of substance; that *large doses*, on the contrary, retard the process by diminishing the oxidation of nitrogenous combinations.*

Difference in action of carbonate of soda and chloride of sodium.

With respect to the difference in action of carbonate of soda and chloride of sodium, it may be safely stated that though both equally keep the blood alkaline and supplement each other in so doing, yet, while small doses of *carbonate of soda* promote waste of tissue by favoring the change of fibrine into urea, etc., and, if long continued, cause emaciation, *chloride of sodium* in small doses, on the other hand, checks the change of the constituents of the blood into albuminous fluid, and so retards waste, is more rapidly eliminated from the body, and is much more tardy in dissolving the albumen and fibrine. Again, in *large doses*, carbonate of soda retards the waste of tissue, while in similar doses of chloride of sodium there is a considerable increase of change of substance. So we see that in large doses, carbonate of soda diminishes the amount of urea secreted; chloride of sodium increases it, while in small doses the converse holds good.

Carbonate of soda its influence on disease.

In small doses such as eight or ten grains, carbonate of soda in its direct action improves digestion by absorbing the excess of acidity in the stomach and intestines, but if continued for some time it tends to lessen the appetite and checks the proper supply of nourishment to the body. It has also a directly diuretic effect in common with the potash salts; its more remote beneficial effects come under the head of those produced by alteratives—that is by its power of increasing the waste of tissue and getting rid of useless and effete substances; from the blood it removes the injurious products of a diseased action and stimulates the tissues to renovate themselves, and prepares the way for the reception of newer and healthier material, thus altering for good the more or less abnormal action of the body. It is however evident that if in the first place the stomach being normally acid in order to digest the food, soda has a bad effect if it removes more than what ever excess of acidity there may be; and secondly, if beyond getting rid of waste tissue it increases unduly the waste of healthy substance, also, the body will become emaciated, because the supply of new tissue will not be equal to the waste of old. Nature however in a mineral water, such as the *Navajoe*, has supplied us with correctives for this depressing tendency of the soda in the carbonic acid, which acting as a local stimulant to the stomach and intestines, increases the secretion of healthy gastric juice, and in the chloride of sodium (common salt), which checks without directly opposing the waste of substance by exerting its well

Its action modified by the other constituents.

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* About fourteen to twenty-five per cent., according to Nasse. The solution of albumen in the serum of the blood is closely connected with the presence of carbonate of soda and chloride of sodium, and when the albumen is diminished the alkaline salts and water increase; but, as yet, there is nothing to show that the amount of albumen can be lessened by the administration of an excess of alkaline salts.

known conservative action on the nutriment supplying parts of the blood.

Sulphates of soda and Potash.

THE SULPHATES OF SODA AND POTASH exert a purging influence by increasing the secretion of the mucous membrane of the stomach and intestines, and if given in large doses may even produce stools containing mucus and albumen.

Carbonate of magnesia.

CARBONATE OF MAGNESIA is allied in action to both carbonate and sulphate of soda, acting as a somewhat less powerful antacid than the former and much milder purgative than the latter.

Carbonate of Lime.

CARBONATE OF LIME is a very inert compound, being difficult of absorption, and the evidence of its reputed value in rickets and similar conditions of the body pointing to a deficiency of lime, is very unsatisfactory; it has however a useful antacid action specially when combined with carbonate of magnesia.

Lithia.

LITHIA, which has been found useful in assisting the solution of calculus and in the treatment of gout, is present in these as in most mineral waters in far too minute a quantity to be taken into serious consideration.

Temperature of the Spa water.

THE TEMPERATURE of the water modifies its effect considerably. Water of the temperature of the blood is the most rapidly absorbed, and cold water on the other hand is very slowly absorbed, but acts as a direct stimulant upon the stomach and intestines, increasing the appetite and vigor of digestion, where there is sufficient strength to cause the proper reaction. The old notion, that it is necessarily best to drink a mineral water at its natural temperature, is a mistake. The temperature of the water can be artificially altered without harm to suit the particular case, provided, where the action of the carbonic acid is desired, there is, as in most waters, more than enough of free carbonic acid to allow of its being heated if cold, or allowed time to cool if warm, without losing too much of the gas. Warm water taken internally acts as an expectorant, through its heat being directly communicated from the æsophagus to the lungs and bronchial membrane. After absorption it stimulates the vascular and lymphatic systems at the time, but deprives them of tone. Where there is local weakness of the digestion, cold water is best, and where the constitutional effects of the minerals contained in the water is chiefly desired, warm is to be preferred, but it is seen that where the springs contain a good amount of gas, a naturally cold water is the most desirable, as the heating of it will not spoil its effect by depriving it of too much gas; whereas a naturally hot spring not containing in the first place more than sufficient gas, will lose more than is desirable when cooled, so that cases requiring to take the water warm can use a naturally cold spring with as great advantage as a naturally hot one, but, on the other hand, cases requiring the water cold, can use a naturally cold spring, with *greater* advantage than a naturally hot one. And for the same reason, cold mineral waters

Advantages of a cold spring.

are better for drinking at a distance, because if required to be heated they will lose less gas.*

Having thus briefly considered the main effects of the various components of the Navajoe, we will proceed to enumerate the various abnormal states of the human body, for which this water may be looked upon as a remedy.

Diseases benefited by the Navajoe.

First, there are certain forms of ill health which though differing in outward signs, and having frequently, if allowed to run their course unchecked, very different terminations, yet may be looked upon as arising from the same fault in the animal chemistry. This condition Dr. Braun has happily termed *increased venosity*, meaning thereby, that the immediate cause of the varied train of ailments to be referred to, is to be found in a state of body where the venous blood is in excess, and circulates so feebly as to give rise to chronic congestions or stases of various organs, chiefly the abdominal ones, and by the sedative effect that venous blood has, as contra-distinguished to arterial, causes the functions of these organs to be sluggishly or irregularly performed, while it increases, probably, the molecular decay that is normally going on in all living tissue; its numbing influence, so to speak, lessens the natural stimulation that the presence of the decayed molecules causes, and which in health excites the function of the part to throw off its useless matter and prepare for new. Or, on the other hand, the vitality of the part being lowered by the amount of venous blood in it being out of natural proportion to the arterial, the nerves do not re-act sufficiently upon stimulation, therefore we find mucous membranes which, in a state of proper vitality, secrete their special fluid in due proportion to the stimulus applied, and shed and renew their surface in equal proportion to the irritation they receive, acting irregularly in this respect, having little re-action after the stimulation which is natural to them, remaining lax as it were and secreting an excess of fluid, and when irritated shedding their coat unduly. Thus may we reasonably account for many of the catarrhs of the mucous membranes throughout the body, which in one individual may arise in one mucous membrane and the other in another, being determined to its special seat by some local irritation or special tendency in that particular person. Thus from this cause may arise in some persons bronchial or laryngeal catarrh, in some catarrh

Increased venosity; meaning of the term, its general effects.

Catarrhs.

* Only a few of the soda waters are *warm*; most of them are *cold*. The more the locally stimulating effect of the carbonic acid is aimed at, the more are the cold springs to be preferred, especially in atony of the muscles of the stomach and bowels. On the other hand, the more the absorption of the soda and its transmission into the blood are desired, the more do warm waters, generally speaking, meet the object in view, and the stronger the amount of soda, the more must the heat of the water assist in facilitating absorption. The cold waters, which are rich in carbonic acid, have the advantage that they can be warmed, and can be drunk warm at a distance from the spring without losing too much carbonic acid, which is not the case, to the same degree, with the warm waters, poorer as they are in carbonic acid.—Vide Dr. Braun, on Curative effects of Baths and Waters, translated by Dr. Hermann Weber.

of the stomach or bowels, and in others catarrh of the bladder or genito-urinary passages, etc.; and these catarrhs if continuing may in the case of the bronchial or laryngeal membrane give rise to phthisis.*

Phthisis.

In the stomach may lead to ulceration; in the abdominal organs the chronic congestion or stasis may give rise, in the liver, kidney or spleen, first, to derangement of their functions, and later, to actual disease of their structure, or in any of these parts, there may spring a new but perverted growth, robbing the part of its natural nourishment, and by its increasing size destroying the tissue from whence it springs, and by the absorption of its products through the lymphatics, planting fresh growths in other membranes, in short, there may even arise any of those phenomena which are conveniently classed under the head of cancer.

Liver and Kidney disease.

Cancer.

This cause, increased venosity, which in the female is apt to tend to special diseases of particular parts, such as phthisis and cancer, in the male is usually more diffused in its evil effects, at first at least, that is, the general normal change of tissue throughout the body is perverted, and the uric acid diathesis arises, with its results: gouty dyspepsia, gravel and explosions of gout itself. The causes which predispose to this increased venosity, that is, an excess of carbonized over oxygenated blood, are probably varied.

Gout and gravel.

Neglect to take regular physical exercise, and so throw off the constantly accumulating carbonic acid in the blood, and receive in its place a fresh supply of oxygen; taking an excess of vegetable over meat diet, thus helping to accumulate carbon at the expense of oxygen; derangements of the functions of organs, not caused by actual disease, but seeming to arise from a want of proper food supply in the veins themselves. These are probably the predisposing causes of this condition. It is for the most part before functional derangement has lead on to actual organic disease, and where the symptoms are not as yet of a serious character, that the weak soda waters are found of so much use. On this point Dr. Braun observes: "In slighter degrees of this condition only *weak soda waters*, especially those containing common salt, like Ems and Neuenahr, are indicated and found successful." On comparing the analysis of Ems and Neuenahr, as given by Dr. Braun, with the Navajoe it will be found that they are almost identical, and therefore the successful results obtained at Ems in this morbid condition, may be with confidence looked for at Manitou. Ems "combines a medium amount of bi carbonate of soda (ten grains), chloride of sodium (seven grains), and very small quantities of bi-carbonate of lime and magnesia (one and five-tenths and one and seven-tenths)." "Neuenahr, like Ems, is a weaker soda water, but without common salt." Ems, it will be seen, contains less carbonate of lime, and more chloride of so-

Causes of increased venosity

Stage in which soda waters are useful.

Ems and Neuenahr successful.

Resemblance of their analyses to the Navajoe.

* By this term is here implied any of those changes in the lungs and larynx which cause wasting of flesh and strength, and destruction of the tissue of the organs.

dium (common salt) than the Navajoe; carbonate of lime is as has been stated, a very inert compound, and its effect in the Navajoe would be to aid the antacid effect of the soda. Where the slightly increased amount of chloride of sodium in Ems, viz: four grains, would be of value, it can artificially be added.*

We therefore may look upon the Navajoe as embracing the virtues of both these famous springs, and specially useful in the class of cases coming under the head of *increased venosity*.

True chronic gastric catarrh.

"REAL CHRONIC CATARRH OF THE STOMACH, *i. e.*, excessive secretion of mucus with its important consequences, requires, as a rule, waters containing carbonic acid besides the powerful stimulant of common salt in moderate quantities."—(Braun.) As regards the stimulation by the salt, he goes on to say that it can be added to a suitable amount, in the words before quoted, and further adds: "One of the best modes of treatment of chronic catarrh of the stomach consists in the careful use of the stomach pump, and in the washing out of the stomach by means of acidulated alkaline waters, such as Vichy, Neuenahr, Ems, etc."

These quotations show that the Navajoe can be safely recommended in this disease also.

Chronic catarrh of the bowels.

CHRONIC CATARRH OF THE BOWELS is usually most benefited by sea bathing, or strong sool-baths, as Rehme and Neuenahr, it being generally accompanied by atony of the skin; but where the catarrh was consequent on venous abdominal stasis, liver diseases and enlargement of the meseuteric glands, such a water as the Navajoe would be useful, but ought to be taken warm, and warm baths of the same with the addition of common salt, would assist the cure.

Absorption of exudations.

IN PROMOTING THE ABSORPTION OF EXUDATIONS, "soda waters may be used as a remedy, as they promote the decarbonization and the dilution of the blood, and have also a diuretic effect, and when taken in small doses they accelerate a change of substance." As regards gouty and rheumatic exudations, if of sthenic type, waters with more sulphate of soda are generally more efficacious; but, where they are of an atonic character, the *Navajoe* would often be found suitable, both for bathing and drinking. For pleuritic and dropsical exudations this spring will be found of value; but, where the anæmia is excessive, mineral waters generally are contra-indicated, as the injured state of the respiration, and the heart, cannot stand the irritation of the carbonic acid, and the excess of water would check the plentiful digestion of food necessary.

Enlargement of liver and spleen; corpulence.

STASIS, OR PASSIVE CONGESTION OF THE ABDOMINAL ORGANS, "enlargement of the liver and spleen, corpulence and similar conditions, likewise belong to the cases requiring soda waters; yet it is only the

* Dr. Braun says: The favorite addition of common salt to an otherwise suitable acidulated spring, or the mixture of a strong common salt water with a simple acidulated spring, to a fixed amount of dilution, reconciles many differences, and is often used in domestic practice at Spa, with the same results as the use of natural springs.

slighter cases which fall under the clinical head of increased venosity for which soda waters are sufficient, and then only the weaker kinds." These slight cases therefore would derive benefit from Navajoe water.

Resemblance of Appollinaris water to the Navajoe.

It may here be remarked that a very popular water called *Apollinaris water*, from the Apollinaris-quelle in the Ahr valley, closely resembles the *Navajoe* in composition. Concerning it Dr. Braun writes as follows: "It contains in sixteen ounces nineteen and a half grains of solids, with nine and sixth-tenths of carbonate of soda, three and five-tenths chloride of sodium, two and three-tenths sulphate of soda and three and three-tenths of carbonate of magnesia. Temperature, 62.6° Fahr. The presence of chloride of sodium and sulphate of soda distinguishes the Apollinaris from the Gieshubel and Geilman waters, and they are an useful addition. The large amount of carbonic acid is very favourable to its transmission and allows the water to be heated without entirely losing its refreshing pungency. Having largely recommended the Apollinaris water for several years, we have found it very useful in chronic bronchial catarrh, in tendency to gall-stone, to gout and to the lithic-acid diathesis" We may therefore add these latter to the list of ailments suitable for treatment by *Navajoe* water.

Chronic bronchial catarrh, gall-stone and gout.

Chronic dyspepsia.

In Chronic Dyspepsia, caused by taking food irregularly, too rapidly or excessively, or of an unsuitable character, giving rise to such symptoms as weight in the chest after meals, drowsiness, uncertain appetite, headache, giddiness, constipation and heart-burn, I have found this water effect a cure in a very short time, where pharmaceutical remedies had been only partially successful, keeping up a gentle aperient action, and almost immediately removing the pain and uneasiness; notably in a case of pyrosis (water-brash), which had been treated with carbonate of soda, calumba, bismuth, etc., without complete relief, a course of two weeks of *Navajoe* effected a permanent cure.

Incipient phthisis.

Among the numerous cases of incipient or threatening phthisis, where there was weight and uneasiness after food, etc., specially when accompanied by an irritable condition of mucous membrane as shown in redness and prominence of the follicles of the tongue and fauces, I have found the *Navajoe* remove these symptoms and prepare the way for the more perfect assimilation of nourishing food.

SODA BATHS.

Soda baths. Their general effects.

In baths of carbonate of soda water such as the *Navajoe*, whatever special effects they may produce is due entirely to the carbonate of soda and carbonic acid, the sulphates and the lime having no effect in a bath, and the amount of common salt being much too small to be taken into consideration.

If the amount of carbonate of soda to the pint falls short of forty

or fifty grains, as it does in the Navajoe the effect upon the skin is a softening one, which is caused by the chemical solution of its secretions and the scales (epidermis) and a moistening of the skin beneath; but there is no absorption of the salt itself, and therefore we get none of the internal effects of soda from the use of this bath.

Unless the bath is heated with care (as in the Schwarz method), the carbonic acid will escape too rapidly to procure any of its special effects. The effect of carbonic acid on the skin is to convey a feeling of heat greater than would be otherwise experienced by the actual temperature of the bath; it also has a decidedly stimulating effect upon the cutaneous nerves—so that a person after taking a warm *Navajoe* bath, instead of feeling the languor that usually follows warm bathing, has a sense of invigoration and elasticity; consequently visitors here, after a fatiguing day on the mountains, commonly take these baths. The warmth of the water, as in a simple warm bath, in equalizing the circulation, relieves the muscular stiffness; the soda removes the perspiration and softens the skin, while the gas gives them the tonic-bracing effect of a cold bath. We have here, then, the same compound effects that are procured by taking a judiciously regulated Turkish bath; excepting that, in the latter, the prolonged heat causes a very much greater waste of tissue through the skin and lungs at the time, and therefore, where sudden and strong action be desired, as in some cases of plethora, obesity, sthenic forms of gout, and rheumatism, where the strength is not too much impaired, the Turkish bath would be more suitable; but, in cases where the alterative action on the skin is desired to be more gradual and gentle, and the patient could not bear anything approaching a violent remedy, the warm soda bath should be preferred. In cases of so-called *muscular rheumatism*,* they have been found of great service, and, when accompanied by the internal administration of the same water, undoubtedly, by their encouraging the healthy action of the skin, greatly assist the removal of gouty and rheumatic swellings. The gas in the bath improves the power of making blood, and stimulates the healthy assimilation of food, and, as it encourages the patient to exercise, and does not decrease the appetite as does a simple warm bath, it is found to assist often very effectually the treatment of the greater proportion of chronic cases that are suitable for Manitou.

Compared to a Tukish bath.

Cases suitable for the Navajoe soda bath. Atonic Gout.

Muscular rheumatism.

Skin diseases.

In Skin Diseases, where the most troublesome feature is itching, I have found this bath to quickly allay the irritation. Where the tendency has been to a shedding of the epidermis, and leaving a raw, weeping surface, as in certain forms of lepra, the stimulation of the gas acts prejudicially; it is then best to allow of its evaporation, the soda alone often lessening the reaction and allaying the irritability.

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* Where the rheumatism is of a neuralgic character, with much irritability of the nervous system, this climate, however, is apt to aggravate the symptoms.

In Leucorrhea I have found injections of Navajoe water stop the discharge when the usual remedies had failed. Leucorrhea.

As regards the question of taking these baths hot or cold, the principle upon which simple cold or warm baths are prescribed, holds good—the leading one being that cold must only be used where the patient's strength is sufficient to bring about sufficient reaction from its sedative effect. Temperature of the bath.

All the beneficial effects that result from enlightened hydropathy can be obtained from these baths, in addition to the special influences exerted by the soda and the gas.

SECOND GROUP.

Shoshone and Little Chief.

The Second Manitou Group. The purging carbonate soda waters contain two representatives—the Shoshone and the Little Chief.

SHOSHONE.

In the Shoshone we find in addition to the same effects resulting from its being a carbonated soda water, as in the last mentioned group, also the special effects of Glauber's salt displayed. Although the amount of this salt is small, being less than three grains, with a third of a grain of its allied salt sulphate of potash in a pint, yet its purging effect is clearly marked. Six or even four tumblers (8 oz. each) taken in the day insuring a fluid evacuation every morning. As has been previously stated as far as at present known, the chief effect of sulphate of soda (Glauber's salt) is to stimulate the mucous membrane of the stomach and intestines, to secrete a thin fluid and produce watery stools. It was greatly the fashion to order largely those waters which contained the greatest amount of the salt and to produce violent action thereby, but it was found that these excessive evacuations were generally followed by sluggishness of the bowels, owing to their over stimulation and thus the mark was often over-shot and the benefit only temporary. It is now therefore generally thought in most cases better to extend the purging over a longer period, and produce the results aimed at more gradually and to prefer therefore waters containing smaller quantities of Glauber's salt, and having also carbonate of soda and chloride of sodium in them to assist and modify its influence. Glauber's salt contained in the Shoshone. Effect of large single doses. Effect of small repeated doses.

Dr. Braun in discussing the compound soda springs containing small quantities of sulphate of soda, after stating that they exert the special influence of this salt, writes as follows:

"We are therefore inclined to seek for the stronger effect in those component parts which are added to the Glauber's salt, namely, in the carbonate of soda as a dissolvent of the albumen in the blood, in the chloride of sodium as a gentle stimulant of the

ntestinal membrane and as a promoter of the change of substance, and in carbonic acid as a stimulant of the mucous membrane and the muscles of the intestines. And we are equally inclined to suppose that these elements not only increase, but also correct the action of the Glauber's salt, as they allow of smaller doses of this salt to be taken, and also counteract its injurious local effect. The carbonic acid does this by stimulating the stomach, and the chloride of sodium by its conservative participation in the formation of cells and by stimulating the digestion. For gentle and yet prompt effect, however of Glauber's salt upon the albuminous secretion of the bowels, carbonate of soda is perhaps the most necessary condition. By its dissolvent effect upon the albumen of the blood, it can *dispose* the latter to serious transudation, and thus prepare the way for the effect of smaller doses of Glauber's salt, a matter which larger doses only obtain by force, and at the expense of the catarrhally irritated intestinal membrane."

Glauber's salt diminishes fat.

An almost invariable effect produced by a soda water containing Glauber's salt is *the diminution of fat*, and this would appear to be indirectly due to the loss of albumen through the excessive secretion from the intestines, as well as through the effect of the carbonate of soda and chloride of sodium upon the blood, giving rise to an increased consumption of proteine matter, which loss of proteine substance is in some unknown way compensated for by the absorption of the fat accumulated in the tissues. So we find a patient continuing a course of such a water, will become more or less emaciated, through loss of fat, without losing muscle, and without suffering in appetite, digestion or general health. Although it is not proved that sulphate of soda exerts a direct action upon the liver, it unquestionably does so indirectly, as the flow of bile is markedly increased. Such a water as the *Shoshone* is of great value in cases where there is torpidity, or irregularity of action in the liver, giving rise to the varied symptoms which are commonly called *biliousness;* where there is chronic congestion leading to enlargement of the organ. In tendency to the uric acid diathesis and in slight cases of gout, specially gouty dyspepsias, this water may be looked upon as of great service. Sir Henry Thompson, in a lecture upon the preventive treatment of stone in the bladder, published in the Lancet, January 13, 1872, urges with considerable force, that we ought to look upon the liver rather than the kidneys as the chief offender in that perversion of the animal chemistry, which brings about the morbid condition of system which we call the uric acid diathesis, on account of the waste products of the body being found in the urine in the form of uric acid instead of having been previously further changed as in perfect health into urea. Starting with this as an axiom, he proceeds to show how he has found waters containing sulphate of soda as well as the carbonate of soda, much more efficacious than the purely alkaline waters. Where this diathesis is very far developed and the patient is plethoric and strong, probably, as he states, it is better to drink a water containing sufficient sulphate of soda to cause a thorough evacuation of the bowels by one small dose in the day, taken before breakfast; but there is no doubt where the symptoms are less urgent and the patient weaker, it is better to gain the effect more gently, and obtain at the same time the good influence of the soda, etc., by drinking a water which requires

Its action on the liver.

Formation of stone.

Merits of strong and weak purging waters.

larger and repeated doses to produce its aperient effect. For these cases such a water as the *Shoshone* is very useful. I have found that a semi-fluid bilious stool is obtained by a patient taking one or two glasses before breakfast and four or five glasses during the day. As this water, unlike the usual so-called purging waters, is agreeable and effervescent, it can be drunk at the table with advantage. In some cases the aperient effect is not sufficiently produced unless the water is warmed, and where the constipation is extreme I have found the water has been made to work efficiently by putting a small amount of additional Glauber's salt, generally a teaspoonful in the first glass taken in the morning as is done at Carlsbad, Tarasp, and other springs. In many cases suitable for the use of the Shoshone, I have found it of advantage to commence the treatment with a full dose of a bilious purge, such as podophyllin, or blue-pill and rhubarb.

Shoshone drunk at the table.

Heating additional Glauber's salt.

In a patient, the subject for many years of habitual constipation with occasional attacks of hepatic congestions, accompanied by feverishness and slight jaundice, and who came under my care while passing an hepatic calculus, as soon as the acute attack had passed, I recommended the drinking of six glasses of Shoshone daily, commencing with two before breakfast, and found that a good bilious evacuation was procured daily. The appetite, which was previously capricious, became regular and the general health good. At first, a teaspoonful of Glauber's salt was added to the first glass, but after a few days this was discontinued, and by the patient taking a little more of the water at meals, sufficient effect was produced by the water alone. In a case of hemorrhoids occuring in a person of full habit of body somewhat inclined to free living, I found a few glasses of Shoshone ward-off a return of the symptoms and secure an easy action of the bowels daily. In a case of icterus (jaundice) of several weeks standing, arising probably from catarrh of the gall-bladder, accompanied by very considerable enlargement of the liver, with much languor and vertigo and the passage of hard, clay-colored stools, after taking podophyllin and rhubarb for eight days, he discontinued them and took Shoshone water alone, six glasses a day. His improvement advanced, his bowels acting freely twice a day, and at the end of the three weeks and a-half he was under treatment, his liver had returned to its normal size, his skin was clear, his bowels were natural, and he felt strong and well.

Gall-stone.

Hemorrhoids.

Jaundice.

These illustrations, I think, show that in most cases of functional derangement of the liver, in preventing attacks of gall-stone in hepatic dyspepsias and their consequences, such as hemorrhoids, etc., a safe remedy can be found in the *Shoshone*.

Hepatic dyspepsias.

In contrasting its analysis with that of the *Navajoe*, it will be seen that they are much alike in composition. In the Navajoe there is rather more of the carbonates of soda and magnesia, but less of the sulphate of

Shoshone and Navajoe compared in action.

soda than the Shoshone. Therefore, although they may supplement each other and be of avail in the same train of ailments, yet where there is acidity of stomach and other symptoms which soda is specially found to remedy, the Navajoe should be preferred; on the other hand where the chief symptoms appear hepatic in origin, the Shoshone will prove the most beneficial.

LITTLE CHIEF.

Little Chief resembles both the Shoshone and the Iron Ute.

We will now turn to the merits of the *Little Chief*, a spring which in quality has been stated to belong to both the purging and chalybeate waters, for on referring to its analysis it will be seen that while on the one hand the Little Chief contains a grain more Glauber's salt than the Shoshone, on the other it also contains iron in about half the proportion of the Iron Ute, iron being a constituent absent from the Shoshone. We see also that it has very much less soda than either, that it has with the Iron Ute about a grain of carbonate of magnesia, an ingredient absent from the Shoshone; and that they have all three about equal proportions of chloride of sodium; lastly, that the Little Chief has less carbonic acid gas than either, and consequently the chalybeate taste is more noticeable than in the Iron Ute.

The aperient effect of the slightly increased proportion of sulphate of soda, as it would be supposed, is more than compensated for by the constipating influence of the iron; and this is practically found to be the case. It requires, in most persons, a glass or two more than the Shoshone to gain the same amount of aperient effect.

Hepatic derangement of two kinds; plethoric and anæmic.

The class of ailments which exhibit signs of hepatic derangement in a greater or less degree, may be broadly divided into the plethoric and the anæmic; the former being those in whom there is a full habit of body, and where there is, for the most part, a power of assimilating and absorbing large amounts of rich and stimulating food, but an imperfect power of disposing of the waste material caused by this excessive absorption, the result being an overloading of the liver, leading to varied derangements of function. The latter division containing those, on the other hand, where the fault may be said to lie at the opposite end of the scale—that is, where the power of disposing of the waste of tissue is not so much in error as the capacity for absorbing and assimilating the food taken in by the mouth. So that in the first class, we have too much rich blood; in the latter, too little; therefore, in the first the organ cannot act efficiently because of being gorged, that is congested, with blood—having too much work to do; and in the second, though it may be also congested from the weakness of the coats of the vessels, preventing the carrying the blood onward, yet the chief cause of mischief lies in the fact that the organ is not sufficiently nourished by rich blood to enable it to keep in working order.

The class of liver disorders occurring in anæmic constitutions, is found chiefly among females, specially in young girls, who neglect taking sufficient exercise, while they eat immoderately; and is generally accompanied by irregularities of uterine action. Where the hepatic symptoms are accompanied by signs of imperfect circulation, it will generally be found that the Little Chief proves of greater benefit than the Shoshone. In a case of chlorotic amenorrhea, with hepatic dyspepsia, where the Shoshone and the Iron Ute had failed to give efficient relief, I found this spring decidedly beneficial; whereas, in the more plethoric and sthenic type, as has been pointed out, the Shoshone is of the most avail. The *Little Chief*, therefore, is best adapted for treatment of those cases in which the administration of iron is indicated, and at the same time some disturbance of the functions of the liver is a pressing symptom.

Chlorosis, with hepthic dyspepsia.

THIRD GROUP.

IRON UTE.

The last of the three groups, viz: the Chalybeate, of which the Iron Ute is the representative, has now to be considered; but before proceeding to its immediate discussion, it will be well to remark briefly upon the use of iron in disease.

Use of iron in disease.

It it well known that the healthy blood contains a fixed quantity of *iron*, and that this quantity is liable to be diminished by any cause which depresses the general vitality of the system, and when this occurs the condition is called anæmia (want of blood) or spanæmia (poverty of blood).

In health the iron necessary for the blood is obtained from the ordinary food of the individual, but when the organism is depressed by disease, it is often found unable to draw its proper quantity of iron from the food. But, although it will appear, at first sight, as it did to the older physicians, that whenever there was a deficiency of iron, the best thing was to give it either pharmaceutically or in a mineral water. This is by no means necessarily the case, for in fact, the causes of anæmia are broadly divided into two very different classes as regards treatment. The first may be called *direct anæmia*, in which there has been some sudden and considerable drain upon the blood more than the ordinary diet can compensate for, for some time. In fact, the state of weakness caused by the loss of iron deprives the machinery of digestion of the extra strength necessary to utilize the larger amount of food required to supply the deficiency of iron, so that here small quantities of iron added to the food, are clearly of use and rapidly give the necessary strength to the body to draw its supply of iron once more in the natural manner. Hemorrhages of all kinds, acute formations of

Anæmia, two classes as regards treatment direct or indirect.

purulent matter, whether in ulcers or abcesses, rapid effusions as in pleurisy and pneumonia, are examples of the causes of direct anæmia.

These cases, however, though some of them might be well suited for treatment by mineral waters, being acute in character, are generally treated by pharmaceutical preparations of iron at home.

The second class of cases are those where the *anæmia* is *indirect*, depending upon the imperfect working of some organ or upon some derangement of digestion or some mal-assimilation. Here the primary indication is *not* to give iron which cannot be used, and, therefore will only irritate if it has any effect at all, but to remedy the cause of the derangement of the animal chemistry by other agents such as alteratives. And then, if the deficiency of iron remains still so great that it leaves the digestion too weak to regain for itself its lost iron, would be the time to give the iron.

Chlorosis.

There is further true *chlorosis* in which there would appear an inherent deficiency of iron. The subjects of this morbid condition are young girls for the most part, from sixteen to five-and-twenty, in whom there is a very evident want of iron and whose symptoms appear very clearly to arise from this want. Chlorosis would seem to occur in girls who are delicate and have been more or less below par from their birth, but who do not develop the symptoms due to deficiency of iron in any striking degree, until the natural drain of menstruation comes upon them, when it finds them unequal to the task and in the place of this healthily recurrent flux, there is set up an irregular one dependent upon the congestion caused by the irritation of debility, or there is total suppression of the function, but almost invariably an unhealthy weakening discharge; so that although here the primary cause is probably to be found in some defect in the individual type of organism, yet in pure chlorosis the trouble is so clearly directly arising from the deficiency of iron that the practice of giving it artificially is found to be most beneficial.

Menstrual derangement.

With respect to the administration of iron in the various forms of derangement of the menstrual function apart from pure chlorosis, it is not actual symptoms that have first to be considered, but their cause, for anæmia may give rise either to amenorrhea or menorrhagia.

Relative merits of giving iron pharmeceutically and in a mineral water.

The advantage of a pure iron water over a pharmaceutical preparation consists in the special benefits derived from carbonic acid and water, and further in the fact that in an artificial preparation it is necessary to give a larger dose as a much smaller proportion is absorbed, and therefore what remains in the intestines passes off as sulphuret of iron, and is apt to exert a constipating influence upon the mucous membrane; however where the digestion is extremely weak, it is sometimes found that the carbonic acid and water rather check absorption than otherwise. But when we come to compare a compound iron spring, such as

the *Iron Ute*, with iron administered pharmaceutically, we find within the limits of cases to which mineral waters are applicable, very much greater advantages, for in addition to the iron we have all the beneficial effects upon assimilation, digestion, etc., exhibited by the carbonate of soda, sulphate of soda and chloride of sodium, which they contain.

Special advantages of compound iron springs.

Looking at the analysis of the Iron Ute, we find that it contains average quantities of all these salts and a considerable amount of free carbonic acid, and that its temperature is 44.°3 F.

With regard to the temperature of iron springs, it is best that the spring should be cold, as it is better suited for most cases; and when the cold water and excess of carbonic acid are prejudicial it can be easily warmed, and thus the cold and gas got rid of together.

Temperature.

Chlorosis is usually treated with greater success by iron waters than by pharmaceutical preparations of iron, on account of the beneficial effects in compound iron springs, such as the *Iron Ute*, of the other ingredients upon the digestion; but specially is the benefit greater on account of the healthy out-door life that residence at a Spa entails. Sometimes the amount of cold water can not be borne, and the carbonic acid may lead to congestions of the head and chest—it is then advisable to warm the water first. The amenorrhea which usually accompanies chlorosis, may be looked upon, so to speak, as a conservative action on the part of Nature to save the already exhausted system from further drain, and therefore we must not look for recession of this symptom till convalescence is approached.

Treatment of Chlorosis.

The anæmia which arises from bad confinements and from prolonged, exhausting nursing, is generally benefited by iron springs. When, as is often the case, there are dyspeptic symptoms present, it is of advantage to take a short course of a soda spring, and, in extreme cases, to supplement it by taking also some convenient preparation of charcoal, such as Bragg's charcoal biscuits, before commencing the chalybeate water. If there is, as often happens, more or less spinal irritation, a course of soda baths, hot or cold, according to the recuperative power of the patient, is indicated to be taken at the same time.

Anæmia caused by exhausting parturition or prolonged lactation.

The varieties of the derangement of the menstrual function, are much more often dependent on local causes than is usually supposed, in which case they are not subjects for mineral water treatment; but where there is decided anæmia and no special local difficulty, iron waters are of much benefit, both in amenorrhea and menorrhagia, but only in the latter condition where the flux is of a thinner, paler character than normal, and it is even then advisable to omit the drinking during the period, as it would increase the local congestion. The benefit of iron in such cases of menorrhagia is not, as used to be stated, from its astringent effect, which is doubtless entirely local, but from its improving the quality of the blood, and so, the tone of the vessels, causing them to contract after they have

Amenorrhea and menorrhagia.

lost only a sufficiency of blood, and restoring the general balance of the circulation.

Atony of stomach and intestines.

Where there is want of muscular tone in the stomach and intestines, iron is generally indicated; because the iron is doubly beneficial: in the first place, by its direct local influence on the alimentary canal, stimulating its coats, and astringing its flaccid vessels, and secondly, by its constitutional effect upon the blood; and further, iron is almost always taken with greatest advantage in a compound chalybeate spring, as the carbonic acid and soda increase and add to the local benefit derived from the iron.

Nervous affections.

In the various forms of nervous affections the use of iron waters is, for the most part, doubtfully beneficial, except where the history and symptoms point to anæmia as a preceding condition, and where there is no evidence of actual change of structure. In most cases of hysteria, and in excessive spinal irritation, such waters had better be avoided.

Speaking of anæmia generally, the benefit of iron is greatest where the duration of the anæmia has been the shortest, and the benefit least where the duration has been the longest.

The amount of iron in chalybeate waters.

As regards the exact amount of iron that a typical chalybeate water should contain, nothing satisfactory can be said. That very much less than an average pharmaceutical dose is required to produce the beneficial effect of iron is well known, and that the strongest iron springs are by no means the most effectual is also known. In looking at the list given below of some of the most successful of the compound iron springs it will be seen that the one we are discussing, the *Iron Ute*, has above the average quantity of iron; and in the analyses of the component parts of each it is found that Iron Ute occupies a very favorable position with respect to its amounts of soda, common salt and carbonic acid gas.

THE MOST CELEBRATED CHALYBEATE WATERS.

IN A PINT ARE CONTAINED:

	Iron.	Fixed component parts.	Total.
Driburg	0.78	lime 25, sulphate of soda and magnesia 15	40.
Pyrmont	0.57	lime 20, sulphate of magnesia 3	25.
Iron Ute	0.40	lime 4, sulph. soda 3, carb. soda and magnesia 5	15.
Spa	0.37	bi-carb. soda and chloride of sodium	4.
Schwalbach	0.54	lime 1½, carbonate soda and magnesia 3	4.
St. Moritz	0.18	lime 7, sulph. soda 2, carb. soda and magnesia 2	11.

Spa and Schwalbach compared with the Iron Ute.

Spa and Schwalbach are the most celebrated of the pure iron springs—that is, of iron waters whose whole component parts are not more than a few grains. Of these *Schwalbach* contains rather more iron, and *Spa* rather less, than the *Iron Ute*.

The temperature of the iron springs varies between 4° and 17.5° cent.; but this difference is not of importance, as the addition of warm water when advisable has very slight effect upon the precipitation of the iron. As Dr Braun points out, the greatest importance is to be attached to the climate, and especially to the *height of the situation.*

Resemblance of St. Moritz to Iron Ute.

The highest of the European iron springs are St. Catarina, 5,600 feet, and St. Moritz, 5,464. The height of the *Iron Ute* is 6,400 feet.

Spa, which has been compared with Manitou, enjoys none of the advantages derived from an elevated situation, as it is in a mild, relaxing valley, 1,000 feet only above sea-level.

Pyrmont.

Pyrmont is lower than Spa, and Schwalbach about the same elevation.

Height of situation important.

The cases requiring chalybeate waters usually require also the fresh bracing air of the mountains, and it is for this reason that a good iron spring at a high elevation is so valuable.

CLIMATE.

Sea and Mountain Air.

We will now pass to a brief consideration of what is known of the special advantages of mountain air, and what are probably the causes of its peculiarity.

Oxygen.

Oxygen is essential to procure change of substance; and as the oxygen in the air diminishes in proportion as we rise above sea-level, it might be supposed that healthy change of substance would be retarded in mountain air; but this is practically found to be otherwise, and the reason doubtless is, that as only about 25 per cent. of oxygen is on an average used in respiration, probably there is more than sufficient oxygen at any height that has as yet been attained by man.

In fact it is clinically proved that the two extremes, sea and mountain air, both promote change of substance, though each in its special way.

Benefit from changes of density.

Besides the degree of absolute density of atmosphere, the relative variations of density exerts a very powerful influence upon the animal economy, in addition to the regular variations of the barometer, which take place during the course of each day, month and year. There are the irregular variations which occur least often in wide plains, but most constantly on the mountains and the sea shore, and these variations are essential to the highest condition of health. In the same way that we cannot endure either constant dryness or dampness, so we cannot endure a very constant state of the barometer without suffering in our breathing or nerves. In fact there is little doubt that rapid changes of the barometer are more favorable for the more important functions of life than its relative stability, and this probably explains in a great measure the value of both mountain and sea air.

Both sea and mountain air promote formation of blood and nutriment.

Both sea and mountain air promote the formation of blood and nutriment, increase the capacities for digestion and assimilation, improve the nervous functions and, as the result of this general effect, produce natural recovery, or essentially aid in the artificial recovery, of various chronic conditions of sickness. We will now consider the difference in action of sea and mountain air. As this is very ably put by Dr. Braun, we will quote his remarks in extenso:

Difference between sea and mountain air.

"The sea air acts more rapidly, the mountain air more slowly; the sea air gives a more vigorous appetite, compels a more increased ingestion of food, stimulates the digestion more powerfully, and increases the bodily weight, in a perceptible degree, in a short time, while mountain air acts in all these respects as a more subtle stimulant; sea air presupposes robust assimulative functions; mountain air exerts its gentle influence also on the atonic and catarrhal conditions of the gastro-intestinal cause. Sea air demands a certain robust integrity of other functions, especially of the heart and lungs. Mountain air, on the other hand, exerts its general beneficial influence also on natures which suffer in this respect from weakness with increased irritability. The sea air easily overpowers persons affected with irritable weakness, while the mountain air has a calming and indirectly strengthening effect upon them. In general, the choice between sea and mountain air is regulated not by the name of the sickness, but by the individual character of the sick individual. Both the sea air and the mountain air operate most plainly and powerfully on the anæmic tendency of chronic morbid conditions; the sea air does so all the more, the more the organs of circulation and the nervous system discharge their functions feebly and bear strong stimulants, and the mountain air all the more, the more easily the organs of circulation, and the nervous system respond with excitement and agitation to new and even necessary vital stimulants. There are cases of chlorosis, which bear a course of sea baths equally well and with an equally rapid result, as a strong course of iron, or a course of Bavarian beer and similar remedies. But there are other cases of chlorosis, and especially of complicated anæmia, which can endure no other treatment than the gentle and scarcely perceptible influence of mountain air; and lastly by many difficult and easily upset invalids, fresh stimulants, and especially warm baths, are more easily borne in an elevation above their ordinary place of abode. The more a high degree of excitable weakness of the organs of digestion, circulation and the nervous system is combined with the anæmia, accompanying chronic illness, all the more is the case, to the exclusion of other means, limited to the mild effect of mountain air."

Chlorosis.

Anæmia.

Phthisis.

The decrease of pressure in a rarefied atmosphere causes a diminution of the gases of the blood and lymph, and this probably checks the advance of phthisis, as it is unquestionably beneficial in certain cases. In phthisis where the weakness is not excessive, but there is anæmia and want of assimilation, a high elevation, with a moderate supply of stimulants and a course of cold douches is generally beneficial.

The greater dryness of mountain air acts beneficially in phthisis, probably for the most part, in the manner indicated by Dr. Herman Weber: "We may here mention that, although the loss of moisture to the whole organism may not be greater in high than in low elevations, yet the

acknowledged greater loss through the lungs, may be accompanied by local effects on certain morbid conditions of the respiratory organs, as well by producing a more active circulation in the lungs, in order to supply the required moisture, as also by favoring a kind of drying up of surfaces, secreting a morbid amount of mucus and pus, and, also of moist exudations within the tissue. Possibly the improvement in many cases of chronic catarrhal pneumonia may be produced by this increased afflux of blood and increased loss of moisture."

Advantages of high elevations greatest in winter.

"VERY HIGHLY SITUATED PLACES ARE ADAPTED FOR WINTER TREATMENT (OF PHTHISIS) ON ACCOUNT OF THE GREATER NUMBER OF CLEAR DAYS."—Braun. And for another reason they are specially desirable in the winter, because in high elevations there is less moisture during the winter, than at any other season of the year, and therefore, the air being dry, the greater actual cold than in lower climates is felt less severely, and if the body is warmly clad, the lowness of the temperature exerts only its tonic influence. The air being rarefied, the *sun* which is always more constantly visible in mountainous districts, has a *much greater influence* and enables the enfeebled invalid to spend several hours, almost daily, in the sunshine with very great advantage.

MANITOU.

We have thus pointed out the advantages derived from a health resort at a high elevation, which *Manitou* enjoys in common with others. We will now proceed to remark upon how it differs in situation and surroundings from the rest of the elevated health resorts of the world, beyond the boundaries of Colorado.

Manitou stands on the upland plateau of North America.

MANITOU STANDS UPON THE UPLAND PLATEAU OF NORTH AMERICA, as yet the only great upland plateau of either hemisphere, accessible to the traveling invalid. It is only a few years since, that the building of the trans-continental railway, joining the Atlantic and Pacific coasts was treated as problematical. Now, no less than three different lines span the great plains, carrying the traveler to the foot of the Rocky Mountains.

That for the purpose of a sanatorium, these upland plateaux enjoy advantages in addition to those they possess in common with health resorts at similar elevations, even the short experience already gained makes evident. But as yet our knowledge on this subject must be regarded as rather empirical than scientific. It will, however, be of advantage to consider shortly what are the peculiarities of this special situation. The great plains stretch away to Missouri, a thousand miles east, while to the north, they reach to the British possessions, and southward, find their limit in the Gulf of Mexico. Except for this sea, eight hundred miles away, there is no tract of water within a thousand

The Great Plains.

miles; and in the mountains which are, however, well supplied with numerous small streams, there are no lakes of any size. Here there is no perpetual snow or ice, and the geologist looks in vain for marks of recent glacier action; only small brooks running from the mountains irrigate the plains; and except for the short grass which covers them, little or no vegetation appears upon their vast surface, and there is no dew. There is, therefore, extraordinary dryness of atmosphere, which is only temporarily relieved during the summer months by occasional thunder storms.

The buffalo grass forming a thick, dense sod, rapidly sheds the rainfall, the surface water being carried away by the gulches and water courses, thus leaving an inappreciable amount of moisture to be taken up by the atmosphere. It is unquestionably owing to the proximity of this enormous volume of dry air, that none of the evidences of damp are encountered at Manitou, even in those occasional seasons when the rainfall is considerable.

Position of Manitou.

Manitou, though it lies in a valley amidst the mountains at an elevation of six thousand three hundred and seventy feet, is unlike other mountain health resorts, which are either, as in Switzerland, hemmed in on all sides by mountains, or, like those lying on the slopes of the Pyrenees, overlooking a country covered with growing crops, woods, towns and water. Manitou, though hills gradually rising to the dignity of mountains protect it on three sides from the winds, while their gentle slopes do not shut out the sun, yet opens out at its northeast extremity onto the great plains themselves, thus reaping the benefit of so vast an open space filled with an atmosphere highly rarefied and dry, and, above all, free from all the impurities which emanate from decaying vegetation, swampy soil or crowded cities. The mountains shelter Manitou from the wind and dust storms, which make life upon the plains during the winter and early spring, almost impossible to the delicate invalid, while their height is not great enough to shut out the sun; so that, even on the shortest days of winter, there are at least six hours of warm sunshine to tempt the invalid to exercise.

Five miles distant is the flourishing town of Colorado Springs, where the advantages of good stores and pleasant society are to be found. The position is more open, and the change from Manitou is often an agreeable one.

Neighborhood.

The Denver and Rio Grande Railway enables the invalid, if he desire it, to change his locality to the colder and more open situation of Denver, or the warmer climate of Pueblo and Cañon City. Manitou being placed at the great entrance to the mountains, the Ute pass, it is easy for a patient to find there the advantages that a higher elevation or the mere change of surroundings so often gives. It is probable that, before long, several spots within easy distance among the

mountains, will be prepared for invalids, where at present only the rough fare of the ranch house is afforded. One mountain retreat has already been made available, affording a delightful change from Manitou, and, from its connection with it, has been named *Manitou Park*. It is a twenty-mile ride through the pass, and stands at an increased height of twelve hundred feet, in a beautiful green valley twelve miles in length, belted by pine woods through which drives open up the country beyond; here is a good hotel with livery stables, and the streams which water the valley are filled with trout.

Pine forests.

The advantages to the consumptive accruing from mountain air blowing over pine forests which belong to this district generally, are pre-eminently to be found in this park.

Manitou itself has all the resources of a fashionable watering place, having five hotels, which afford unusually luxurious accommodation, drawing at the same time wholesome supplies for the invalid, of milk, butter, eggs and meat, from the neighboring farms. The amusements of the visitors are well cared for, bowling alleys, billiard saloons and croquet grounds abound, while band-playing, balls, concerts and theatricals, enliven the various hotels. But what is of more value to patients, there is a good supply of horses and carriages, enabling them to gain the benefit derived from taking some of the many excursions that can be made through this beautiful country. In the summer, camping tours through the mountains with the attractions of fly fishing, often complete the convalescence of the invalid; whilst in the winter, the country around abounding in all varieties of game, invites the sportsman to harden his constitution by healthy exercise and exposure.

Amusements.
Supplies.

The Seasons.

Throughout the greater proportion of the year the days are fine and bright, the atmosphere remarkably clear with sunshine. In summer the air being dry, if the head is only protected, the sun is never too hot to prevent the enjoyment of riding, driving and walking even at mid-day, and as the nights are cool, sound, refreshing sleep is always insured; there is also a charming absence of mosquitoes and their allies. During July and part of August, afternoon thunder showers, lasting from ten minutes to half an hour, keep the trees and hillsides green and fresh through the summer heat, while they lay the dust without leaving mud or damp behind upon the surface of the light sloping soil. With respect to thunder storms it may be remarked as a noticeable feature of the country, that those feelings of uneasiness and oppression, which in other localities usually precede their advent, are never experienced here. There is always a highly electric condition of atmosphere, and it may be to this that the quite exceptional feeling of exhilaration that this air imparts is mainly due. In the early spring snows are frequent but rarely remain more than a day, are seldom deep enough to make walking inconvenient to the invalid, and the ground is for the most part

Summer.

Spring.

bare through the winter and spring. In May and June the whole country is covered with innumerable wild flowers of varied color, and numerous song birds are found in the shrubberies of Manitou. The autumn as it imperceptibly merges into winter is usually free from rain or extreme heat, with bright clear days; the trees are for the most part pines and cedars, the deciduous foliage being confined to the margin of the stream, so that the usual dampness arising from the fall of the leaves is absent, and this season is in many respects the most enjoyable of the whole year. *The winter is, however, the season in which most cases of consumption reap the greatest benefit*, the air being then extremely dry and highly electric, with no rain and very little snow; the thermometer shows great variations between day and night, sometimes at that period going below zero; but the absence of moisture and the shelter of the hills prevent any depressing influence from the low temperature being felt, and with a moderate amount of woolen clothing, only its bracing effect is experienced upon the human body; during the day, from ten till four, the *sun shines almost uninterruptedly and with sufficient power* to enable even the enfeebled invalid to enjoy outdoor exercise, without additional wrap or over-coat—the hillsides round not acting as a screen to the sunrays, but as a trap concentrating their effect. There is probably no climate in the world where out-door life is so thoroughly enjoyable through every season of the year as that of MANITOU.

Autumn.

Winter.

Sun.

This fact is of special force as regards the *winter* season, when we consider how few *bracing* health resorts there are in the United States, that do not suffer from the disadvantage of excessive cold.

GENERAL SUMMARY

OF CASES SUITABLE FOR MANITOU.

We will now proceed to a general consideration of the various classes of invalids who may find cure or relief at Manitou. That the high reputation that Colorado enjoys for the cure of phthisis is not undeserved, the large number of restored consumptives, forming the greater proportion of its permanent population, prove beyond question, that this climate, like most others when their advantages are first brought before the public notice, has suffered in repute from patients flocking to it without discrimination or selection, is also true.

Phthisis.

With respect to the advantages of Manitou for the treatment of phthisis, space will not permit me to make more than a few general observations, even if the data at present at command allowed of a more minute analysis of its effects. First we will premise here, as at an earlier page, that the term phthisis embraces all those changes in the lungs which cause first, alteration, and later lead to a destruction of tissue, and are always attended with more or less wasting of flesh and strength, with the exception of emphysema, which, though it would pathologically come under this definition, is, as regards treatment, widely separated. In the treatment of phthisis, it is now generally admitted, that as far as we at present know there is only one form which need be looked upon as absolutely incurable; that is the fortunately rare disease *genuine acute tuberculosis*. This condition is rapidly fatal, and unless it should change into the chronic form, all that science can at present recommend is palliative treatment at home. As regards *chronic tuberculosis*, although this is rarely cured, life can be unquestionably prolonged by suitable treatment; above all, by removal to a high, bracing air.

Acute Tuberculosis.

Chronic Tuberculosis.

It has fallen within my own experience and that of other physicians in this country, to find after death, evidence of this disease, chronic tuberculosis, in persons whose cases had been given over some years before, as hopeless, and had come out here as a *dernier ressort*, but had so far recovered as to pass several years of useful and enjoyable existence in this country.

Broncho-Pneumonia, etc.

With respect to the other varied conditions of phthisis, representatives of them all are to be seen among the many who have found relief or

cure in this climate, and it would be difficult to define what are the conditions, considered pathologically, unsuitable for treatment here, though doubtless there are some phthisical patients whom sea air would benefit more than mountain air; and here the indications pointed out in the general remarks on the subject of air, hold good; but, as phthisis more often occurs in persons more adapted for mountain air, the cases are comparatively few. There are also cases where, for a time at least, a mild, warm climate is more indicated; but, though a mild, relaxing climate will often allay the urgency of the local symptoms, yet heat stimulates, especially when combined with damp, the unhealthy action of the tissues, and, with the general sedative effect, lessens the appetite, and inclination for exercise is lessened, thereby depressing the general health. It is therefore advisable, where the local symptoms are wearing the patient out, to procure their recession by a short sojourn in a mild climate, and then transfer them to a bracing one. Where there are extensive cavities, and the softening stage is advancing rapidly, a mild climate will ward off the fatal termination for a few weeks or months; whereas a sudden change to a high elevation would only accelerate it. There is, however, a way in which patients in this condition have come here and received a new lease of life, a plan more common before the railroads were made—that is, by crossing the plains from Missouri in wagons, and so creeping slowly up the slopes, reaching these mountains already half restored. It is undoubtedly *only* by such a route that *advanced* cases can be advised to come here; but if they will brave the tedium involved, they will often find in such a journey the only chance left to them of life. Where the symptoms are acute, with fever and frequent hemorrhage, it is sometimes, but not always, better to wait until the acuteness has succumbed to treatment; for though it might be supposed that risk would be run by patients coming out here within a week or ten days of such attacks, yet there are numerous instances of persons who have done so, in whom there has been no return of hemorrhage while resident in this country. In fact, experience so far prompts one to look for much success in those cases in which hemorrhage is an urgent symptom.

Advanced Phthisis.

Manitou enjoys with Colorado generally, an undeniable repute for the relief of asthma; but the particular locality in the territory, as regards elevation, where the greatest ease is procured by the asthmatic, can only be decided by the experience of the individual.

Asthma.

As a prophylactic against phthisis, specially in that condition of general malaise, with more or less dyspepsia, that is so common among the young men and women of many of the large cities of the states, the climate of Colorado is beyond dispute. Here are to be found direct antagonistic forces, to the heat of summer or the depressing damp cold of winter, to the undue concentration of the mind by the men upon their

Prevention of Phthisis.

business, and by the women upon pursuits, intellectual or social, these occupations depriving them of the time to take sufficient out-door exercise, and the enervating climate disinclining them for the physical exertion if the time be found, to the dyspepsia which ushers in incipient phthisis, and the dyspepsia, which is so common a result in this country, of the injudicious diet so many of its citizens pursue, notably the habit of eating freely and rapidly of hot moist food, and imbibing at all hours copious draughts of iced water. Here the bracing climate exhilarates such persons, inclining them to out-door life, while the rarefaction of the air compels greater expansion of the chest, thereby insuring a more frequent change of air, stimulating the lungs to more perfect action, and strengthening by use the muscles of respiration, while the carbonated soda waters remedy, more directly, the evils of dyspepsia. So well is the fact that a remedy can be found here for most forms of dyspepsia becoming recognized, that the number of persons among the permanent residents, who have come here for that reason, are not far short of those whom consumption has sent hither.

Dyspepsia.

Increased Venosity.

All those cases which may be looked upon as the result of the condition termed *increased venosity*, will derive benefit from the climate, even when the waters are not specially suitable.

Broken down constitutions.

In this air, constitutions broken by habits of dissipation, or the result of long continued syphilis; persons left enfeebled after fevers and other acute diseases, and those suffering from the effects of a prolonged residence in a hot debilitating climate, such as the valley of the Mississippi, will find relief.

Scrofula.

In cases of scrofula, the rule laid down in drawing the distinction in action between sea and mountain air must prevail.

Nervous affections.

In nervous affections of all kinds, the evidence and opinions as to the benefit derived from this climate are conflicting; but probably the general rules laid down with regard to other diseases hold good where the symptoms are due mainly to anæmia, as in cases of so-called nervous debility, advantage may be looked for, but where the vitality is excessive and the habit plethoric, a milder air is usually more beneficial.

That many nervous affections suffer some aggravation at first, appears to be the case; but how far the effect is only temporary and admits, with care, of being modified, is at present uncertain.

Emphysema.

In emphysema of the lungs this climate should be avoided. With respect to affections of the heart, all experience, here and elsewhere, at high elevations warns the patient from them, where change of structure exists. Where the derangement is only functional and the cause lies in anæmia or muscular weakness, and not primarily in the nervous system, there are many cases if brought here with care whom the tonic effects of the climate would relieve.

Heart disease.

Rheumatism.

In Rheumatism of the joints, benefit is gained by the use of the

soda waters for drinking and bathing, but the climate appears to often aggravate muscular or neuralgic rheumatism unless the cause lies clearly within its field of action.

As might be expected the general tendency of this climate is to increase acute symptoms, while it tends to the cutting short of chronic disease.

METEOROLOGICAL OBSERVATIONS

— TAKEN AT —

COLORADO SPRINGS, COL., U. S. A. SIGNAL OFFICE.

ELEVATION, 5,975 ft.—LATITUDE, 38° 50′ 45″—LONGITUDE, 28° 17′ 45″.

	THERMOMETER (IN SHADE AND OPEN AIR.)									SKIES.			
Months.		7 a. m.	Day of M'nth	2 p. m.	Day of M'nth	9 p. m.	Day of M'nth	Mean of Day.	Day of M'nth			Rain.	Snow.
Dec'm'r 1872	Maximum	44	25th	60.5	4th	40	24th	44.5	4th	Cloudy days	7		
	Minimum	—14	21st	10	21st	4.5	20th	4 3	21st	Fair days	3		
	Range	58		50.5		35.5		40 2		Clear days	21		
	M'n for mo.	17.50		38.50		22.70		26.20		Monthly total		00.23	3.8
Janu'ry 1873	Maximum	48	7th	57.5	11th	38.5	11th	44.2	20th	Cloudy days	00		
	Minimum	—20.5	28th	—5	27th	—6.5	27th	—3.3	27th	Fair days	9		
	Range	68.5		62.5		45		47 5		Clear days	22		
	M'n for mo.	18.6		39.70		24		27		Monthly total		00 13	00.4
Febru'y 1873	Maximum	37.5	3d	58	9th	43	9th	40.8	9th	Cloudy days	1		
	Minimum	6	8th	29	20th	14	1st	18.5	1st	Fair days	10		
	Range	31.5		29		29		22.3		Clear days	17		
	M'n for mo.	19		42.20		26.62		29.27		Monthly total		00.05	00.5
Mean for Wint'r '72-3		18.37		40.13		24.44		27.49		Total fall R & S		00.31	4.7
March 1873	Maximum	52	14th	69	11th	51.5	13th	54.3	14th	Cloudy days	2		
	Minimum	9	3rd	35.5	24th	20	2nd	25.5	2d	Fair days	6		
	Range	43		33.5		31.5		28.8		Clear days	23		
	M'n for mo.	31.32		55.32		39.09		41.90		Monthly total		00.19	00.6
April 1873	Maximum	56	3rd	77.5	21st	62	21st	63	3d	Cloudy days	6		
	Minimum	14	24th	23.5	7th	19	7th	20.5	7th	Fair days	7		
	Range	42		54		43		42.5		Clear days	17		
	M'n for mo.	35.23		49.92		36.66		40.61		Monthly total		00.96	8.3
May 1873	Maximum	66	29th	77	29th	66	30th	68	29th	Cloudy days	12		
	Minimum	33.5	8th	39	8th	34	8th	35.8	8th	Fair days	7		
	Range	32.5		38		32		32.2		Clear days	12		
	M'n for mo.	48.03		61.94		48.15		52.84		Monthly total		1.76	....
Mean for Spring '73		38.19		55.73		41 30		45.12		Total fall R & S		02.91	8 9
June 1873	Maximum	76	22d	88	26th	72.5	27th	77.3	27th	Cloudy days	7		
	Minimum	50.5	2d	55	9th	51	3rd	53	9th	Fair days	6		
	Range	25 5		33		21.5		24.3		Clear days	17		
	M'n for mo.	62.83		76.28		61.38		66.83		Monthly total		2.65	....
July 1873	Maximum	79	22d	90	21st	75	21st	78.5	21st	Cloudy days	5		
	Minimum	49	1st	62	1st	55	25th	55 5	1st	Fair days	12		
	Range	30		28		20		23		Clear days	14		
	M'n for mo.	65 00		78.63		64.29		69.33		Monthly total		4.53	....
August 1873	Maximum	70	28th	84.5	13th	73	5th	74	5th	Cloudy days	6		
	Minimum	54	15th	64	29th	56	15th	58.2	23d	Fair days	7		
	Range	16		20.5		17		15.8		Clear days	18		
	M'n for mo.	62.73		75 87		63.32		67.31		Monthly total		3.28	....
Mean for Sum'r '73		63.52		76.93		63.00		67.82		Total fall R & S		10.46	....
Sep'ber 1873	Maximum	65.5	17th	81.5	4th	71	16th	68.5	16th	Cloudy days	2		1st frost
	Minimum	34	29th	56	24th	37	24th	43.5	29th	Fair days	4		Sept. 20.
	Range	31.5		25.5		34		25		Clear days	24		
	M'n for mo.	52.32		69.05		54.60		58.65		Monthly total		1.70	
October 1873	Maximum	58.5	5th	82.5	7th	59.5	7th	65.2	7th	Cloudy days	4		
	Minimum	10	26th	23	24th	14.5	24th	18.7	25th	Fair days	2		
	Range	48.5		59.5		45		46.5		Clear days	25		
	M'n for mo.	36 90		58.48		39.45		44.95		Monthly total		.65	8.7
Nov'ber 1873	Maximum	62 5	17th	70	14th	52	6th	48.5	6th	Cloudy days	1		
	Minimum	7.5	28th	27	27th	16.5	27th	18.7	27th	Fair days	2		
	Range	55		43		35 5		29.8		Clear days	27		
	M'n for mo.	32.02		54 08		45.27		40.46		Monthly total		0.00	0.00
Mean for Autu'n '73		40.41		60.54		43.11		48.02		Total fall R & S		2.35	8.7

	1873.	1874.	1875. SIX MONTHS.
Total of Cloudy Days in Twelve Months	53.	75.	43.
" Fair " " " "	75.	79.	14.
" Clear " " " "	237.	211.	125.
Rain and Snow Fall " " "	38.33	16.38	3.40

The cloudy days were those on which there was snow or rain. The fair days were those on which the sun's rays were more or less obscured by clouds, but there was no snow or rain. The clear days were those on which the sun shone uninterruptedly throughout the day. The rain and snow fall was not separated in the official reports, from which these tables are taken, in 1874 and 1875, but in 1873 the snowfall was 22.3 inches, and the rainfall 16.03 inches. The thermometric observations for '74 and '75 were not received in time for publication.