

## **Analysis of the mineral waters of Avon, Livingston county, New York.**

### **Contributors**

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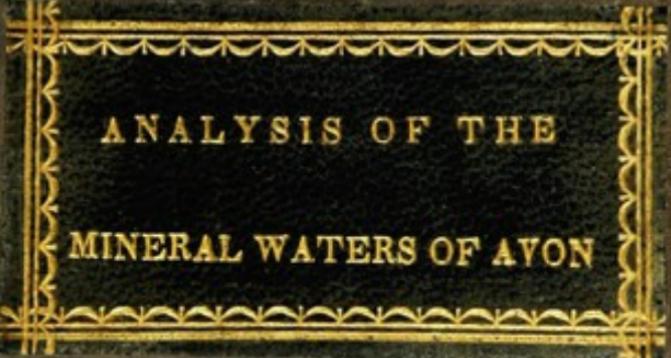
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ANALYSIS OF THE  
MINERAL WATERS OF AVON

B. SILLIMAN.

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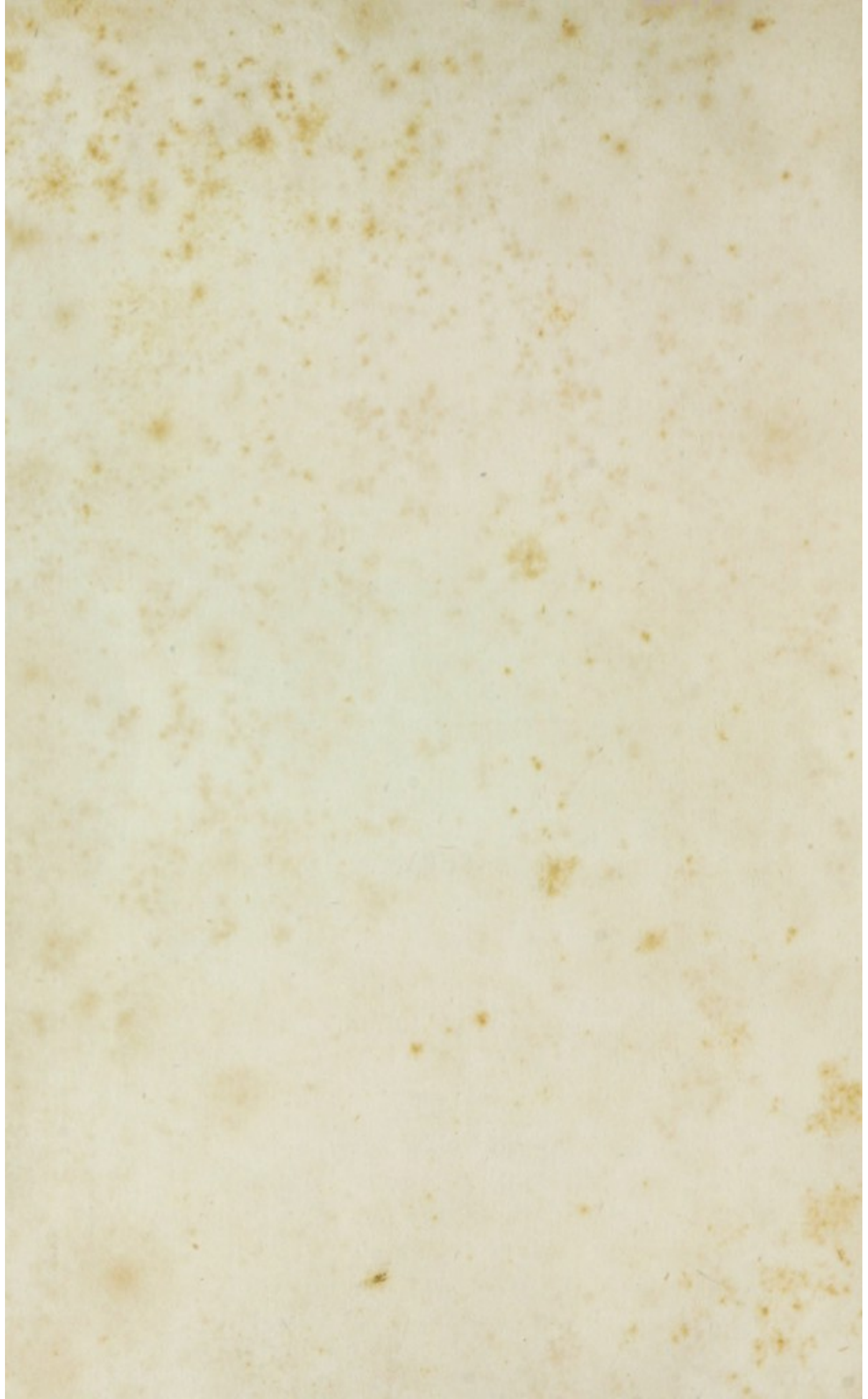


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ANALYSIS  
OF THE  
MINERAL WATERS  
OF  
AVON,

LIVINGSTON COUNTY, NEW-YORK.

BY SAMUEL SALISBURY, JR., M. D.

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Rochester, N. Y.:

PUBLISHED BY WILLIAM ALLING.

1838.

THE design of this pamphlet is to afford the visiter of the Avon Springs, some of the most important information in regard to the nature and properties of these truly medicinal waters. Age, sex, the constitutional peculiarities of the patient, the degree and nature of his disease, and above all the peculiar condition of the organs of digestion, necessarily produce a great difference in the manner of using them. The same caution is requisite, to render them efficacious, as is required in the administration of any other curative agent.

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## AVON MINERAL WATERS.

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### I.

IN forming an estimate of the virtues of a Mineral Water, there are many difficulties besides those which are common to the investigation of the properties of all medicinal agents. Many of the individuals who resort to watering places, have formed the most extravagant expectations in regard to the rapidity of their recovery ; and it is not surprising that they are disappointed, and consequently underrate them : while others whom the combined influence of pure air, exercise, agreeable society, and the use of the waters have more favorably affected, in the enthusiasm of delight at their recovery, attribute to them qualities which they do not possess. With both of the above classes, the remedy is not usually administered by an intelligent physician ; and the consequence is, that both the observers and the public are deceived as to the true properties of the medicine. The author has known many persons who have made use of the Avon water in such a manner as was not adapted to the nature and circumstances of their cases, for months, without receiving any benefit ; and many others, who pursued a varying and vacillating course, which is as little likely to effect a cure.

The Avon water is *not* an universal panacea—a sovereign remedy for all the ills which human flesh is heir to ; but it *is* a powerful mineral medicine—one of nature's most active mineral solutions ; and its effect upon the human system must be either

prejudicial or beneficial. Viewing it in this light, its use should be cautiously regulated, and the nature of every case studiously investigated, in order to insure a good effect.

Again : the fact that pure water, independent of any foreign substances, is a medicine of very considerable power, renders it very difficult to determine, with exactness, the efficacy of a mineral or medicinal water, and to estimate with impartiality, how much of its medicinal powers are to be attributed to its common watery ingredients, and how much to its foreign contents. The utility of water as a medicine, in a deranged condition of the stomach and bowels, was strenuously insisted on by Dr. Saunders, and his opinions received the concurrence of the physicians of his time. The treatise of Dr. Curry, on "The effects of water as a remedy in Fever," well deserved the attention it received. It is not improbable, however, that the views of these eminent men have had the effect to prevent physicians from according to medicinal waters the confidence they deserve, and led them to doubt the efficacy of the comparatively small quantities of mineral substances, which some waters hold in solution. The effect of a mineral water, although it may be very efficacious, must often appear very uncertain and obscure to the eyes of enlightened men ; since great experience has rendered every thing which concerns the relation of cause and effect, in the succession of many phenomena, very difficult. In order to know *if* they cure, and *how* they cure, it is necessary to know, first, (apart from their curative effect,) the *kind* of action which they produce in the system ; and, again, the class and species of disease which is cured or modified by their use. This, however, has so seldom been stated explicitly by writers on this subject, that we are not surprised that physicians, when consulted upon their employment, are unwilling to recommend them. Having resided for seven years in the vicinity of the Avon Springs, I have endeavoured to make myself acquainted with their nature, and properties ; and it is my intention, if I receive sufficient encouragement, to pub-

lish the next season the notes I have collected. As a preliminary step, however, it appears to me important to embody the information, which has already been published at different periods; and, in a general and concise manner, to present to the public my views of their mode of operation.

The village of Avon is on the eastern bank of the Genesee River, and is one of the most beautiful, as well as productive, agricultural towns in the state of New York. As you approach it from the east, the valley of the Genesee is spread before you in all its richness. The immense forest trees with their exuberant foliage, the fresh and verdant meadows, and the waving fields of grain, present to the eye an almost unequalled scene of luxuriance and opulence. The village is well planned, with a large public square, which a little improvement would render beautiful. The Springs are about a mile south-west, in the valley below. The axe of the husbandman has not yet doomed to destruction all the magnificent forest trees, and the invalid may still find here a cool retreat from the summer's sun.

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## II.

THESE mineral springs were long known to the Indians, who resorted to them for the cure of diseases of the skin. A portion of the Seneca tribe inhabited a village on the opposite bank of the River, (land which is now the property of T. H. Newbold, Esq.,) which they called Cana-wagus. Capt. Parish informed me, that this term signified lively-water; and was applied to this settlement, in consequence of the great number of clear and limpid fountains of water in its vicinity. The far-famed chief, Red Jacket, as Dr. Francis informs us,\* enumerated them among his remedial measures for the cure of disorders of the skin; and *wasting disorders*, as they were termed, were supposed capable

\* United States Medical and Surgical Journal.

of being removed by their use, even when applied externally. Doubtless this term included many physical infirmities, whose pathognomic features greatly differed, and many other different sorts of pulmonary disorganization. I have myself seen several cases of pulmonary consumption, among the Indians. One whom I visited in 1835, seemed perfectly aware of the inutility of remedies in his case ; and, when I asked him if he did not use the mineral waters, pointing to the purulent sputa, which he had preserved, with a melancholy look, he said, "not now, it is too late !" Great numbers of deer were in the habit of resorting to these springs, and drinking the water : this made them desirable hunting grounds for the aborigines ; and their predilection for hunting and fishing, led them to select their neighbourhood for a residence. The outlet of the Conesus, a creek which empties into the Genesee river, near the Lower Spring, is a spot distinguished for the abundance of excellent fish, which are caught there ; and, even to this day, we occasionally find some of these sons of the forest, the scattered remnants of a once large and powerful nation, encamped along the bank of the river, and busily engaged in taking fish, for which they find a ready sale, to the inhabitants of the neighbouring villages. My esteemed friend, Wm. H. C. Hosmer, Esq., of Avon, has, with a truly poetic inspiration, described this unhappy race. I cannot forbear to quote a few lines from a little poem of his, in my possession, entitled : "*The Quiet Arbour.*"

"The dusky lord of knife and hatchet, roves  
Near these wild haunts of loveliness no more :  
He saw, amid his old ancestral groves,  
Throng pale invaders from a foreign shore ;  
Then heard the sylvan monarchs, one by one,  
With all their leafy diadems laid low ;  
And sought an undiscoverable lair,  
Toward the dim setting sun,  
With empty quiver, and a broken bow,  
And gloomy brow contorted by despair,

The game he hunted craftily, is gone,  
 And meadow-grass conceals his ancient trail ;  
 The flock is feeding, where his camp fire shone,  
 And rang his whoop of triumph, on the gale ;  
 His implements of battle, and the chase,  
 Are often found near my romantic bower ;  
 For the rich scene about it, is allied  
     To legends of his race ;  
 And mournful traces of his day of power,  
 Make *classic*, grove, and glade, and river-side."

In the year 1792, one of the inhabitants used the waters, with perfect success, in the cure of a disease of the skin, consequent upon Intermittent fever. In 1795, a case of Rheumatism of long standing, which had resisted the treatment of a number of intelligent physicians, was speedily and entirely cured by their use. It was, at this time, generally believed by those who were acquainted with the springs, that any disease of the skin, would readily yield to the external, and internal, application of the waters ; and that bathing two or three times, was sufficient in common cases of *scabies*. In 1821, a small building was erected at the Lower Spring, with a *showering box*, as it was then very properly called. This was the first improvement in the condition of these springs, made by their proprietor, Mr. Richard Wadsworth. This building was enlarged and a bathing-house erected in 1823, and some efforts made to supply visitors with the accommodations requisite for the external use of the waters. In 1828, the building which now remains at the Upper Spring, was erected. During the last ten years, these springs have had numerous visitors ; and the public houses, which are five in number and of considerable size, have been, during the summer season, well filled. In 1828 and 9, three houses were erected in their immediate vicinity ; one by Mr. Nehemiah Houghton ; one by Dr. D. Knickerbacker, and one by Mr. Cartwright. The two former of these have received additions, and are now in an improved state.

About a mile south-westerly, from the Lower Spring, upon what is called the Black Creek, there is a spring at which Paul Knowles, Esq., its proprietor, in 1834, erected a very large house for boarding, with accommodations for bathing. In 1835, Mr. R. K. Hickox, in digging a well, struck a vein of sulphurous water, and has opened a boarding and bathing-house upon the spot.

In 1836, the present proprietor A. Nowlen, Esq., purchased of Mr. Richard Wadsworth one hundred acres of land, which *embraces* the two springs most highly prized by invalids, called for the purpose of distinction, "Upper" and "Lower." With a laudable spirit of enterprize and zeal, for the accommodation of visitors, Mr. Nowlen has erected at the Lower Spring, a large, and elegant bathing establishment. The style of this building is chaste as well as elegant, and its accommodations are such as will, we think, satisfy the most fastidious. He has selected this spring for improvement, because, for *general* use it merits a decided preference, and by experience it has been shown to be sufficiently active, to cure the most obstinate diseases to which these waters are applicable. The large quantity of water discharged, affords an almost inexhaustible supply for external use.

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### III.

THE soil in the vicinity of these springs, is of the richest and most productive quality, yielding the cultivator an abundant reward for his labor ; that of the river's bank, consist almost entirely of alluvial deposit, while the table-land presents all the varieties of calcareous and argillaceous mould. To the botanist, an almost inexhaustible field of amusement, and instruction, is here displayed, in the great variety of plants, with which this part of the Genesee valley abounds.

The two springs which have been most used, are situated, the one an hundred and the other an hundred and fifty rods, from the

river, in a rich alluvion of black loam, near which a considerable stream of water, formed by the union of two smaller streams, called the "Great" and "Little Conesus," empties itself into the river. The vallies of these united streams are narrow, with steep and precipitous banks, a short distance from the springs; and present to the geologist, bituminous shale, superincumbent upon transition limestone. The mountain limestone is found in the bed of the smaller of these streams. Upon the higher ground, at a distance from the river, boulders of every variety of size are found strewed; and vegetable remains have been found from fifty to an hundred feet below the surface, showing evident indications of diluvial action. The banks of these two streams are, in many places, from one to two hundred feet in height. The "Great Conesus" is from eight to nine miles in length, and takes its rise from the Conesus lake, which is nine miles long and from a mile to a mile and a half wide.

#### LOWER SPRING.

THIS Spring, in its original state, formed a large pool of perhaps fifty feet in diameter; in this the early inhabitants were in the habit of bathing. It was the one first made use of; and either from its less disagreeable taste or less nauseating qualities, it has always been more resorted to than the rest, and has been generally more effective. Dr. Francis, who has for many years recommended these waters, gives a decided preference to this spring. It seems to me, however, better to use those which appear best adapted to the disease which it is proposed to treat, and to the age, sex, constitution, and habits of the patient: in most cases, the lower spring is undoubtedly superior. In the other springs, the hydro-sulphuric acid is too abundant for most persons, and oftentimes occasions a distressing nausea and vertigo. The water of this spring seldom produces any nausea or vertigo, nor is it common for any unpleasant sensation of the stomach, to follow its use even in large quantities. It rises from a fissure in a

rock, thirty-six feet below the surface of the ground, about one hundred rods from the Genesee river, and about thirty rods from the Conesus creek. The volume of water discharged from this spring, is the same at all seasons of the year, and does not appear to depend in the least upon atmospheric influence; as nearly as can be ascertained, under existing circumstances, it is fifty-four gallons in a minute. The temperature of the water is from 45 to 47 degrees Far. Its specific gravity is 10,018. Its taste resembles that of a solution of hydro-sulphuric acid, but it is more bitter and saline: it has the strong odour of this acid. As it issues from the fountain, it is limpid, transparent, and somewhat sparkling. Examined by the aid of reagents, it contains as foreign to pure water, hydro-sulphuric, carbonic and sulphuric acids, chlorine, carbonate of lime, lime, magnesia and soda. By delicate experiments, the less obvious ingredients of mineral waters are not indicated. Dr. Francis observes, that an analysis of these waters, which he caused to be made in 1832, did not afford satisfactory evidence of their containing Iodine. Nevertheless, a strong probability is, that both Iodine and Bromine enter into their composition. It should, also, here be mentioned, that an analysis of the hydro-sulphurous waters of Caldas da Raynha, whose chemical constitution is similar to that of the Avon waters, was published in the London Philosophical Magazine, for Sept. 1830, and shows that both Iodine and Bromine enter into the composition of those waters.

The water, when recently taken, acts upon Mercury, and rapidly forms the black sulphuret, while hydrogen gas is disengaged; but with sulphate of iron, it occasions a precipitation of sulphuret of iron; this effect is not due to the presence of a hydro-sulphate, but to the alkaline reaction of bicarbonate of lime. Litmus and turmeric papers are changed as by an alkaline solution, the effect is greatest after they have been exposed to the air a moment after dipping. Wholly immersed, turmeric paper is scarcely altered. From this character, as supported by the

analytical results, the solution of a portion of carbonate of lime in hydrosulphuric acid, is inferred.

*Operation First.*—8000 parts of the water rapidly introduced into a flask, the interior of which was covered with wet hydrate of deutoxide of copper: the odour of the water was removed, and a part of the hydrate had become brown. A recurved tube being joined to the flask and connected with the mercurial trough, the contents of the flask were rapidly boiled, so long as gaseous matter escaped. After the usual corrections, 943 parts by water measure of gas remained. Caustic potash absorbed carbonic acid, leaving 208; about 20 parts of this residue combined with warm phosphorus and was oxygen, the remainder was nitrogen. Gaseous constituents thus obtained were, 735 carbonic acid, 188 nitrogen, 20 oxygen.

*Operation Second.*—The sulphuret and oxide of copper, when separated and washed from the water, were treated with strong nitric acid and warmed; the acidification of the sulphur was effected and its conversion into sulphuric acid insured, by evaporating the fluid to dryness and slightly heating the residue. Water, with a few drops of nitric acid, dissolved the salts; and the clear solution, on the addition of muriate of baryta, dropped sulphate of baryta; this was separated by a filter of two thicknesses from the same piece. After washing the sulphate of baryta, the edges of the filters were cut, the upper one separated and calcined, till its contents and ashes were white. When cold these were weighed, the lower burned to white ashes; and the weights of these deducted from the former weight, left 3.37 parts of sulphate of baryta, equivalent to 347 parts by water measure of hydrosulphuric acid.

*Operation Third.*—After the water and washings from cupreous sulphuret of operation second had been mixed, muriatic acid and muriate of baryta were added, and the fluid reduced by evaporation. The precipitated sulphate obtained as in operation second, weighed 29.43 parts, being equal to 10.116 sulphuric acid

The fluid and washings were mixed, and the excess of baryta removed by the excess of sulphuric acid.

*Operation Fourth.*—8000 parts of the water were boiled in a clear flask, until the odour was removed, the bulk being made up with pure boiling water. A precipitate had fallen, and solid matter incrustated the flask. When the water was removed and the grayish matter washed, muriatic acid dissolved it with effervescence, except a few filaments of vegetable matter. Ammonia, with carbonate of potash, separated the carbonate of lime, which after drying weighed 4.08, was white and free from silica.

*Operation Fifth.*—The water from the deposit of operation fourth, mixed with nitric acid and nitrate of silver, was evaporated to a small quantity. The flakes of chloride of silver which fell during the concentration, were collected and half fused; when cold 2.95, equivalent to .73 parts of chlorine resulted. The excess of silver was removed by muriatic acid.

*Operation Sixth.*—When the baryta had separated from the water and washings of operation third, the clear fluid was evaporated, and the saline mass obtained was dried, ignited and cooled in a desiccated atmosphere. When cold, it weighed 17.93 pints and consisted of the sulphates of lime, magnesia and soda A.

*Operation Seventh.*—Salts A. were digested twelve hours in water saturated with sulphate of lime at a known temperature. The vessels being kept in the same fluid bath, and the insoluble part washed in much fluid, was separated, ignited, and weighed; 9.26 parts, composed of 3.86 lime and 5.40 sulphuric acid, were obtained.

This result was rendered doubtful by similar operations on the fluid of operation fifth; for, on removing the silver from this, 9.27 ignited sulphates were obtained. The former operations were deemed the most correct.

*Operation Eighth.*—The liquor, with the washings of Salts A of operation seventh, was boiled on hydrate of lime to separate magnesia, and reduced by evaporation to a pasty mass. Boiling

pure water dissolved a part, which solution was withdrawn and filtered. The solution mixed with ammonia and oxalate of ammonia, deposited its lime in the state of oxalate, which was separated. By evaporating the filtered fluid and calcining the residue, 1.88 parts of sulphate of soda containing traces of magnesia, remained.

*Operation Ninth.*—After separating the sulphates of lime and soda, the remainder of the weight of the mass of salts obtained by operation sixth, was 6.79 parts, which was set down as the weight of the sulphate of magnesia, consisting of 2.31 magnesia and 4.48 sulphuric acid. This result different from that obtained by precipitating the lime from the solution, (which had afforded 9.27 parts of the sulphate of lime by operation seventh, the magnesia by carbonate of potash and phosphate of ammonia,) only so much as is due to the inaccuracy of the former method.

The weights of the constituents of this water then are, in 8000 parts, Hydrosulphuric acid, operation second, 493;—Carbonic acid, operation first, 1.36;—Nitrogen and Oxygen, operation first, .272;—Chlorine, operation fifth, .73;—Sulphuric acid, operation third, 10.116;—Carbonate of Lime, operation fourth, 4.08;—Lime, operation seventh, 3.86;—Soda, operation eighth, .84;—Magnesia, operation ninth, 2.31.

Arranged so as to form the compounds existing in the water, and calculated for 10.000 parts by weight are

Carbonate of Lime	5.02
United to Carbonic Acid	1.70
	——6.72
Chloride of Calcium	1.44
Sulphate of Lime	9.83
do. Magnesia	8.49
do. Soda	2.35
	——28.83

By volume 10.000 parts are

Hydrosulphuric Acid	434
Nitrogen	235
Oxygen	25

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NOTE.—The chlorine is assigned to calcium, as the chloride of calcium is oftener found in those waters which contain but little saline matter. There remains ,006 sulphuric acid apparently in excess, which is accounted for by the difficulty of separating accurately, magnesia from other earthy salts. The quantity of carbonate of lime exceeds the equivalent quantity of carbonic acid necessary to render it soluble in pure water, considerably ; and this fact affords a probable explanation of the character this water exhibits, when tested by colored papers.

#### UPPER SPRING.

THIS Spring has been in use since 1827. It has been proved by the cures which it has effected, to possess similar medicinal qualities to the Lower ; and is, by some, even more highly prized. In sensible properties, it bears a close resemblance to it ; but there is a peculiar sweetness of taste which distinguishes it. The deposit around it is mostly of a dark blue colour, while that of the Lower is white. It rises about sixty rods east of the other, and is at an elevation considerably above it. The bed of sand through which I am informed this water oozes, is about twenty feet, and the rock about thirty feet, below the surface of the ground. One gallon from this spring, according to Professor Hadley, of the Institution of Fairfield, Herkimer county, was found to contain the following substances, and nearly in the following proportions, viz :—

Carbonic Acid Gas,	.	5.6	cubic inches,
Sulphuretted Hydrogen Gas,		12.	do,
Sulphate of Lime,	.	84	grs.,
Sulphate of Magnesia,	.	10	grs.
Sulphate of Soda,	.	16	grs.
Carbonate of Lime,	.	8	grs.
Muriate of Soda,	.	18.4	grs.,

and a small quantity of other matter.

### WELL OR NEW BATH SPRING.

THIS Spring was, as I have before stated, first discovered by its proprietor, R. K. Hickox, in 1835 while digging for pure water. The soil through which the excavation was made, is hard blue clay, having a strong sulphurous odour. The excavation did not descend to any rock, so that we cannot determine, with certainty, from what formation it rises. The temperature of this water is 46 degrees Far. In sensible qualities, it resembles the other springs.

### LONG'S SPRING,

WHICH has been in use since 1833, is the property of Paul Knowles, Esq. It rises from the surface of an alluvial deposit, through the centre of which passes what is termed the Black Creek, a small stream, having its rise some miles to the south. It is about a mile, in a south-westerly direction, from the others. The temperature of this is 45 to 48 degrees Far.; and its sensible properties are similar to those of the others.

Having submitted the waters of both the *Well* and *Long's Spring* to a qualitative examination, I have found them to be made up of the same general constituents as the others. The usual tests indicate the presence of iron in the water of the *Well*; and other observers report it in all our springs; but the quantity of this substance is probably so very small, as not materially to change its remedial powers.

A short distance from "Long's Spring," are several sulphurous springs, one of them having a strong taste of the muriate of soda, or sea salt. This may, at some future time, be an interesting subject of chemical investigation.

All the waters are clear and transparent, until the temperature is raised, when decomposition takes place ; if not exposed to the air, however, and the water be restored to its original temperature, the solution is again effected. If the waters, in a clear glass bottle tightly corked, and placed for a few hours in a warm place, become milky and deposit a sediment, place it in the spring until it acquires its former temperature, and it is restored to its original state. This is not only interesting, as a chemical fact, in relation to this water ; but, should it ever be an object of transportation, is of practical importance.

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#### IV. \*

ALIBERT has very truly observed "*la science des eaux minerales est a refaire ;*" for however advanced their chemical history may be, their medical history has received very little attention. It is true, analyses have been published of a few of their most celebrated mineral waters in the United States, and the chemical constitution has become generally known ; but very little has been said of their medicinal properties, and application to the cure of diseases. We are told, for instance, generally, that certain waters are useful in rheumatism of the inflammatory grade ; we are not informed, however, in what particular stage of that disease they are useful, or what is the proper mode of using them.

"To know the composition of a mineral water," says Bergman, "is to outrun, in some degree our experience." A medicinal compound is presented for our consideration ; if it be composed of substances, the medicinal efficacy of which is known and appreciated, a knowledge of the laws of the animal economy will

\* Boston Medical and Surgical Journal.

serve to instruct us what its action on the human system will be. In regard to many mineral waters, there is, it is true, a great discrepancy between the deductions of experience and those of analysis. This may be accounted for, by considering the powerful and high'y medicinal efficacy of pure water, apart from all the foreign ingredients which it contains ; and, again, it is not improbable, that the action of some waters which contain but very minute proportions of certain medicinal agents, is proportionate, not to the quantity of these agents, but to a change produced by them in the other constituents of the waters. The activity of the Bath and Buxton waters is, as yet, wholly unexplained by analysis ; and many cures have undoubtedly been effected by waters remarkable for their purity.

An intimate acquaintance with the effects of the constituent principles of any compound, separately considered, is of great importance, in order to enable us properly to appreciate the share of influence which each has in its general effect. Viewing, in this manner, the nature of the hydro-sulphurous waters of Avon, we find them distinguished for the large quantity of free hydro-sulphuric acid (sulphuretted hydrogen\*) which they contain, a compound, as is well known, of sulphur and hydrogen.

Sulphur† is laxative and diaphoretic ; its action on the mucous membranes, particularly those of the lungs, entitle it to some consideration as an expectorant: it increases the secretions from the alimentary canal, and solicits the excitement and the fluids towards the skin. In some diseases of the skin, it is

\* NOTE —Hydro-sulphuric acid was discovered by Scheele in 1727 ; and being found to be a compound of hydrogen and sulphur, received the name of sulphuretted hydrogen. It being afterwards discovered that it possessed the properties of an acid, it, very properly, received the name of hydro-sulphuric acid.

† It is not to sulphur, but its various combinations, that is due the character of hydro-sulphurous waters. Sulphur is not soluble in water ; but the hydrogen, the oxygen, and the alkalies, combine with it readily, and form compounds which are soluble in water and mineralize it.

considered one of the most essential remedies we possess. The change in its chemical constitution, which follows its union with hydrogen in mineral waters, appears to modify and increase its therapeutic action.

Again: we find Avon water impregnated with an alkaline carbonate, (carbonate of lime,) which substance manifests a peculiar action upon the lymphatic system of vessels, producing the speedy resolution of glandular engorgements and indurations, both cellular and visceral; its effects on the urinary organs are manifested, both by exciting them to action, in the same manner as diuretics properly so called, and also by changing their secretions; hence it is used in scrofula, and some diseases of the bladder. The sulphates of lime, magnesia, and soda, are other compounds found in this water. The last two are saline aperients or purgatives, according to the dose in which they are administered; and the efficacy of this water in increasing the discharges from the alimentary canal, is, in a measure, to be attributed to this impregnation.

The chloride of calcium is, in small doses, a tonic and deobstruent; and has been successfully used in typhus fever, ill-conditioned ulcers, and in some diseases of the skin.

The medicinal effects of any substance, should, we think, be considered as of two kinds; first, its *immediate* action upon the human system; and second, its *curative* effect in the removal of disease.

In viewing the phenomena which very soon follow the internal use of the Avon water, it is important that we designate the peculiar action which is the foundation of all its curative effects. This *primitive* or fundamental action is modified by a variety of circumstances, so that some degree of obscurity envelopes it; other things being equal, however, it is more or less intense, according as the constitution and temperament of the patient, and the nature of his disease, render him more or less susceptible. This effect is an increased action of the heart and arteries,

as exhibited by a greater fulness, strength, and frequency of pulse, a general sensation of warmth, a flushing of the face, and other evidences of increased action, which vary much in different individuals. Plethoric subjects, on using this water without due precautions, experience a heavy and dull sensation of the head, a propensity to sleep, and other symptoms which indicate a determination of the fluids towards the head. Others, again, whose stomachs are preternaturally irritable, experience a distressing nausea for some time after its use, or reject it altogether by vomiting. Particular local diseases determine the effect produced by this agent, and serve to explain the mode of its operation. Where local inflammation has existed, and the part has not yet recovered its power of resisting morbid impressions, a return of the previous inflammation may be induced by its incautious use. Cases of this nature are frequent; one, however, will serve to illustrate my meaning. In the summer of 1833, I was called to visit a young gentleman from Middletown, Conn., 18 years of age, suffering from a renewed attack of acute rheumatism. He had resorted to these springs, by advice of a distinguished physician, when but partially recovered from a long and painful course of this disease. Instead of using the quantity prescribed by the physician, he drank, in three days, nearly four gallons of the water; and the result was (as might be expected) a renewal of this painful malady. In short, this immediate effect sometimes consists of a febrile excitement, not morbid, which restores the action of the weakened organs, and rouses them from their torpid and engorged state; the skin, the cutaneous and sub-cutaneous tissue, the urinary organs, the intestinal and pulmonary mucous membranes, become vividly excited, and the excitement is frequently prolonged for some time after the use of the waters; sometimes, even for weeks.

This *primitive* action of the Avon water produces, consecutively, *secondary* or curative effects, which are, a perceptible increase of the secretions from the alimentary canal, the aug-

mentation of the cutaneous and pulmonary respiration, and of the secretion of urine ; in other words, they become cathartic, diaphoretic, expectorant, and diuretic.

In regard to the cathartic operation of this water, we find some upon whose digestive organs it acts promptly and effectually ; others, again, upon whom the largest doses produce not the slightest effect. In some cases, the water acts readily at first ; and, in a short time, perhaps after the first week, seems rather to produce constipation. This disparity of action we conceive to be owing to some peculiar state or condition of some of the different parts or organs of the body of the individual using the water, which renders them more or less susceptible to its influence ; what this state or condition is, in the present imperfect state of our knowledge of hydro-sulphurous waters, it is impossible to determine : a long course of observation and numerous cases are requisite to decide with any degree of exactness. In some cases which I have seen, the stimulant effect has been perceptible upon the skin solely ; and it would appear probable, that the excretions from the cutaneous surface were so abundant as to deprive the system of all the products of intestinal action. Generally, four or six half-pint glasses, drank during twenty-four hours, produce a mild cathartic effect ; and under its long continued use to this extent, no debility ensues, but, on the contrary, the appetite and strength are very much increased.

It is, however, for its action upon the skin particularly, that this water is conspicuous. This increased activity which the functions of the skin receive, is manifested by an itching sensation, or, as it has been described, a feeling similar to that of the stinging of small insects ; and there is often a florid colour of the body, showing the high degree of capillary excitement produced. There is also, in most cases, a sensible increase of perspiration ; and frequently, even gentle exercise produces profuse sweating. The oily, unctuous feeling of the surface of the body,

on leaving the bath, also shows the capacity of this mineral water to cleanse the skin: the alkaline carbonate, which is one of its component parts, forming a species of soap with the oily matter collected upon the epidermis.

“As a striking example of their alterative influence on the cutaneous surface,” says Dr. Francis \* “I may mention the case of an individual, now in the twenty-second year of his age. incommoded by congenital ichthyosis; and whom I recommended to repair to these springs last season. The free use of these waters, internally and by bathing, for some ten weeks, so effectually removed this morbid alteration of the skin, as in divers parts to leave no trace of the previous existence of disfiguration.”

Other instances, equally remarkable, might annually be adduced, illustrative of the diaphoretic effect of this water. Cures of the most obstinate herpetic, psorous, and leprous eruptions, are very numerous; and are matter of astonishment to those unacquainted with the powers of this medicine.

This water possesses, also, a peculiar property of stimulating the urinary organs. This property is manifested, not only by the discharges of urine being more copious, but also by the changes produced in the quality of the urine. Some hours after its use, either internally or externally, the urine becomes more highly colored, depositing a sediment.

I have stated that this water is an expectorant; and this property, from experience in very many cases, I accord to it most fully. It is not merely by a sympathetic effect, that the pulmonary organs are affected by it; but the simple respiration, in an atmosphere so highly charged with hydro-sulphuric acid gas as that around the spring, must have an immediate action upon the mucous membrane. In restoring the normal secretion from the skin and bladder, there can be no doubt but the pulmonary

\* Avon Mineral Waters, New York, 1833.

functions are benefitted: and this action is direct; for, by a revulsion or counter-excitation, we remove any local determination which may give rise to pulmonary irritation, and thus the lungs are invigorated and enabled to expectorate any offensive matter. In the administration of this remedy in cases of pulmonary disease, the utmost caution is requisite; as it will be readily perceived, that the misapplication of a medicine endowed with such a power of excitation, cannot but be attended with the most fatal consequences.

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## V.

THE limits which have been assigned to this pamphlet, will not admit of many particular remarks upon the diseases to which this water is applicable. Space will only be afforded to introduce such observations as will be practically useful to the invalid and explain the mode of operation of Avon water in a few diseases. To arouse the attention of observers,—to establish in the minds of both the physician and his patient, the precise effects which this remedy produces, and to remove the indecision, which now very generally prevails, in regard to its use, is my present object.

*Rheumatism.*—This water has, from the earliest period at which it was known, been used freely in cases of rheumatism. Perhaps there is no disease in which it is more generally useful. Nevertheless, there have been some instances in which it has failed of success, and others, in which the cure has been very gradual. In such, we should inquire if the disease be not neuralgic in its character, or if there is not some other disease existing, with which the rheumatism is complicated, which operates as a continual cause, and which is aggravated by the use of the water.

The good effect of the Avon water seems to be in some measure dependant upon its action on the capillary vessels: if free and healthy perspiration be produced and sustained, the resolution of the disease speedily follows. As a condition of its successful application, the disease should have lost its inflammatory character; and when this is not perfectly the case, resort should be had to vene-section, previous to the use of the water. As acute rheumatism is a disease in which both the sanguiferous and nervous systems are deeply implicated, it is important that the effects of this remedy be cautiously watched. The cures of persons afflicted with this painful disease have been annually numerous; and it is my opinion that seven-eighths of the cases in which this remedy has been made use of, have been either relieved or cured. At some future period it may be in my power to present the public with an accurate report of the whole number of cases, during a season.

*Diseases of the Skin.*—In the treatment of the various diseases to which this tissue is subject, the Avon water may be very successfully used, both externally and internally. It is not, however, those cases which are the most recent, which are most susceptible to its influence. In the acute stage of eruptions of the skin, its exciting qualities often tend to aggravate the evil; and it would be better, previous to its use, to have recourse to such remedies as will lessen the excitability of the system. To illustrate this, I will relate a case which fell under my care in 1834.

J. A., aged 24 years, of a sanguine temperament, had been well until six weeks before his arrival here, when a diffuse purorous eruption made its appearance upon his arms, and extended itself gradually to his neck and shoulders. The itching and smarting was very distressing, so much so as to deprive him of sleep, and threaten to injure his health. The use of the water produced a considerable aggravation of his sufferings and extension of the eruption, when he called upon me for medical advice.

Venesection to the extent of 12 ounces, mild purgatives and diaphoretics, allayed the intensity of the cutaneous irritation, and he had recourse to the waters under more favorable auspices, which entirely cured him in three weeks.

It not unfrequently becomes necessary, during a course of these waters, to suspend their use for a few days, and resort to emollient applications and demulcent drinks; the eruption becoming very much exasperated and a temporary return of the irritative stage taking place. This may be accounted for, by supposing that the latent internal cause has never been fully removed although the eruption had disappeared, and that some change unfavorable to the operation of the water, has taken place in this cause.

R. A., aged 31 years, resorted to the Avon Springs for the cure of *Impetigo figurata* of the hands and wrists of two years standing. This disease had succeeded to a bilious fever which had been attended through its whole course with acute pain and tenderness of the right hepatic region. The use of the water for three weeks, removed entirely every vestige of the disease, and he was about returning home. The day before his anticipated return, he drank twelve glasses of the water, which was nearly double the average daily quantity he had used. During the night he was seized with a return of pain in the side, and in the morning found the eruption had returned. A six weeks course of the water again cured him.

It has been frequent subject of remark at these springs, that the good effects produced by the waters, are not always apparent until after their discontinuance. It is not uncommon to see diseases of the skin apparently resist the operation of the remedy, during the continuance of the treatment, but yield a short time afterwards in consequence of its curative effect being prolonged. Many cases have occurred, which would establish this beyond a doubt.

*Diseases of the Urinary Passages.*—The curative or palliative effect of our alkaline-sulphurous waters, in the treatment of diseases of the urinary organs, may be readily understood, by a reference to their diuretic properties and their chemical composition. Among the number of diseases of this nature, in which they are manifestly useful, are, chronic catarrh of the bladder ; chronic inflammations of the urinary organs, whether the discharge be muco-purulent or purulent ; the lithic diathesis, or the disposition of the urinary organs to the formation of *calculi*, in common language, the *gravel*. In these cases, however, the greatest caution is requisite in the administration of this remedy, it should not be employed to the extent of producing active inflammatory reaction ; it should never be made use of, until these inflammations have passed to a chronic state ; and it is almost always necessary, during the treatment, to resort to antiphlogistic remedies, and opiates, occasionally, in order to moderate the excitement produced by the stimulant properties of the water. I have never, as yet, advised them in cases of chronic catarrh of the bladder and gleet, except in union with some mucilage ; though I have known a number of cases where, unaided, they have effected a cure. In two instances, the cures were rapid and complete.

Bordeu advances the opinion, that the waters of Bareges, which are alkaline-sulphurous, dissolve urinary calculi by a chemical action. Home and Mascagni have observed the efficacy of the alkaline bicarbonates, in cases of gravel ; and their opinions rather favor the theory of the chemical actions of the alkaline carbonates of hydro sulphurous waters. There is, however, no necessity for resorting to any speculations of this nature, since their known efficacy in producing and facilitating healthy urinary secretions, either by removing from the urinary system the irritative causes of disease, or by correcting the morbid disposition of that system, is sufficient to account for all the phenomena which follow their use. The alkaline carbonates have frequently quieted, in a few hours, the most severe nephritic

pains ; \* a longer time would seem to be required, for the chemical decomposition of calculi.

*Diseases of the Digestive Organs.*—In the various and complicated disorders of the primæ viæ, unattended with inflammatory action, the Avon water has proved to be eminently useful. Of these chronic affections of the stomach are the most common, in consequence of the nature of its functions, and its sympathies with other organs. The diseases of this part, are readily communicated to other parts of the system, and it feels sensibly the diseases of all the rest. In obstinate dyspepsia attending a debilitated or depraved state of the digestive functions, acidity, flatulence, and heartburn, in that which succeeds to acute diseases, and is accompanied by jaundice, frequent vomiting of mucus, pain in the right side or the region of the stomach, this remedy may be so administered as to afford prompt and effectual relief. The remarks of Dr. Fraucis coincide with my own experience.

“Clinical observation has enabled us to affirm, that few disorders of a constitutional origin are more perplexing in their diagnostic character than the maladies arising from long persistence in errors of diet : from this, among other sources, the digestive functions become enfeebled or broken up, and the irritations of impaired digestion, associated with the undue secretion of uric acid in various forms, lead to the production of gout, gravel, and other formidable and agonizing derangements of the kidney and urinary functions.

“In cases of this sort, Dr. McLean and others of enlarged experience have testified to the eminent usefulness of the Saratoga waters ; and I believe it will be found that those of Avon possess merits of a similar quality, if not of a higher degree. It behooves us, however, previously to relieve the system, by unlocking the several emunctories, to abate inordinate action, and regulate the habits of the sufferer : for even of waters so comparatively feeble

\* Prout Treatise on Gravel, &c., p. 195.

as the Bath waters, England, it is said by Dr. Parry, that they are in no form whatever beneficial, during the paroxysm of gout, or in any inflammatory disposition which may exist in the interval.

“After the preliminary management of the case by depletory means, and appropriate alvine aperients, the use of the water of Avon for a few days, or perhaps weeks, has wrought an alteration the most gratifying, evinced by improved appetite, increase of flesh, and invigorated health; and while the body receives the impress and partakes of all the advantages of increased physical energy, a corresponding improvement marks the capacity of the intellectual powers.”

*Diseases of the Chest.*—Bordeu has extolled sulphurous waters in chronic diseases of the chest, but the indication which calls for the employment of this remedy, must be very manifest, and its application seasonable, or it will aggravate the evil which it is designed to cure. The stimulation produced by the Avon water is, so far as my experience extends, attended with fatal effects, in the advanced stage of tubercular phthisis; and speedy dissolution has in several instances, followed its misapplication. Its action, however, in promoting a healthy secretion of the mucous membranes, renders it beneficial in certain chronic pulmonary affections succeeding pleurisy or acute pneumonia; in asthenic pulmonary catarrhs; in mucous phthisis, even when these diseases are accompanied by marasmus, hectic fever, night sweat, and all the characteristics of *consumption*. “In the incipient and active stage of pulmonary irritation,” says Dr. Francis, “it becomes our duty to precede their employment by venesection, and the other customary means of depletion, analogous to the practice we have recourse to with the Ballston or Congress waters. The same observation applies to hemoptysis, to acute disorders of the digestive organs, liver, and other viscera. The direful consequents which inevitably occur in such cases, from the Sar-

atoga waters, when these cautions are not heeded, are too painfully known to be dwelt upon in this place."

*Diseases of Females.*—The indirectly tonic properties of Avon water, render it a valuable remedy in many forms of menstrual derangement; and these properties, resulting from its general action upon the organs of secretion, it may commonly be administered without any apprehension of danger. The nature of this remedy, however, requires that, previous to commencing its use, in almost every case, a depletion, adapted to circumstances, should be adopted. It has been much used, and with benefit, in chlorosis, leucorrhœa, amenorrhœa, and difficult and painful menstruation. The universally-acknowledged efficacy of bathing, in disorders of the menstrual function, render its use in this form, very common, and our experience somewhat enlarged. Great caution is requisite in the administration of either the hot or cold bath: for general use the tepid bath is to be preferred. In pregnancy, Avon water is inadmissible; it is, however, generally reputed to possess peculiarly prolific qualities.

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## VI.

*Internal Use.*—There is one fact which is of some importance, and should be borne in mind by the invalid visitor of these springs. Upon exposure to the atmospheric air, or if the temperature of the water be changed, a partial decomposition takes place; and the same effects cannot be expected to follow its use, as will, if drank as it issues from the fountain or at its source. Its medicinal effect cannot but be very much altered by exposure or changes of temperature. Suitable precautions should be taken, if the water be drank at a distance from the springs, that its original nature be preserved. *Quo propius aqua bibitur a fonte, eo efficacior; quo remotior eo fit languidior,*\* was the assertion of Hoffman.

\* Hoffman Op. T. IV §15. The nearer to the fountain water is drank, the more efficacious; the more remote, the weaker the action.

The use of milk associated with sulphurous water, was recommended by Hoffman and Bordeu. The latter relates the case of a very delicate and feeble woman, who was cured of a hemorrhage from the womb, by the waters of Baresges. When she drank them pure, they caused a very great heat and a high fever. Cases of a similar nature have occurred at the Avon Springs. The treatise of Hoffman, "*De Connubio aquarum mineralium cum lacte, longe saluberrimo*," is still extant. The disagreeable taste of the water is, in some measure concealed by this admixture.

"The operation of Avon water upon the human system, is modified by the quantity drank in a given time, and by the constitution, habit, and disease of the individual. Generally speaking, four or six half pint tumblers of the water, drank during the day, produce a mild cathartic effect ; and under its long continued exhibition to this extent, no debility ensues, but, on the contrary, the appetite and strength are very much increased. In very large doses, as from ten to fifteen tumblers a day, it operates powerfully upon the bowels, kidneys, and skin. A moderate use of this water, persevered in for a considerable length of time, will insure to it a powerfully alterative effect, in cases where there is no acute inflammation.

"A judicious mode of commencing the use of the Avon water," says Dr. Francis, "is to take six or seven half-pint tumblers during the twenty-four hours ; a couple of tumblers may be advantageously drunk before breakfast, and some two or three hours after that meal, the same quantity may again be taken, and an additional tumbler-full or two in the afternoon. To the sense of smell, they present the usual properties of sulphuretted hydrogen gas, but in a very small degree ; they are nowise oppressive to the digestive organs. Some, however, take them in larger quantity, and oftener repeat the draught. Others, again, never use them until after the first meal. Like the Ballston and Saratoga waters, they are sometimes drunk to a most pernicious

extent. It is expedient, therefore, in all cases, to regulate their administration by their immediate effects ; and every regard must be paid to age, sex, disease, constitution, and individual peculiarity. To guard against undue local determination, either cerebral, thoracic, or visceral, will always become a matter of professional duty."

No rules can be given which will apply to many of the complicated and intractable cases which annually present themselves at these mineral fountains. With some, from half a pint to a pint daily, is all that can be administered ; while there are others, upon whom six or eight half pint glasses make but a trifling impression.

There is sometimes occasioned by the use of this water, a painful tension of the epigastric or hypochondriac regions, a sensation of weight or constriction of the stomach, nausea, loss of appetite, or a suppression of some of the natural secretions. In these cases, the excitement which is produced, is not distributed in an equable manner. This difficulty may be obviated by lessening the dose, by using gentle exercise, in order to produce slight perspiration, and by various means adapted to individual peculiarities.

*External Use.*—The stimulating properties of this water, render it peculiarly medicinal, when used externally. General directions for the use of baths, cannot be adapted to the nature of different diseases, and to individual susceptibilities. One person is but little affected by a hot bath, while to another it almost gives pain. As, however, many of those who visit these springs, do it rather to preserve health than to remove disease, I shall endeavor briefly to give some general rules.

The time of bathing should be when the stomach is empty, and not engaged in performing its office of digestion.

The duration of the *hot* bath should not be more than half an hour ; that of the *shower* bath, not more than five or ten minutes.

Immediately on leaving the bath, the whole surface of the body should be rubbed briskly, until it is perfectly dry : and the bather should put on his clothes as expeditiously as possible.

Instances of the injurious effects resulting from a neglect of these precautions, have been frequently witnessed at these springs : in one case, such neglect was fatal.

A hot bath of Avon water is peculiarly stimulating. Under its influence, the pulse is increased in frequency and fulness, the animal heat is increased,\* respiration becomes more rapid, a copious flow of both insensible and sensible perspiration is produced, and all the secretions are temporarily encouraged. The degree at which the hot bath may be said to commence, may be reckoned at 92 degrees Far., and to rise as high as can be borne by the skin without pain ; this however, must vary according to the temperature of the individual. There are two opposite intentions in the use of the warm bath. It may be used for its stimulating or exciting, or for its sedative and relaxing effects. It is, primarily or immediately, a stimulant ; secondarily, a sedative. The stimulating effects of warm water, or the increase in the force and activity of the circulation produced, are followed by a greater relaxation and perspirability of the skin and a diminution of animal heat. When this primary effect is desired, the temperature required, is not as high as when used for its indirect or sedative effect. It should be borne in mind, that the use of the hot sulphurous bath, with a view to the diminution of animal heat, subsequent to the direct excitement which it produces, is not unattended with danger ; and where there is any tendency to local determination, is manifestly inadmissible. In the case of a gentleman from Onondaga county, in this state, which occurred at these springs, in 1831, the use of a bath at 98 degrees, by the advice of a person unacquainted with the laws which govern the animal economy, was followed by apoplexy and consequent death

The warm bath is contra-indicated, and should not be had recourse to, without medical advice, where there are appearances

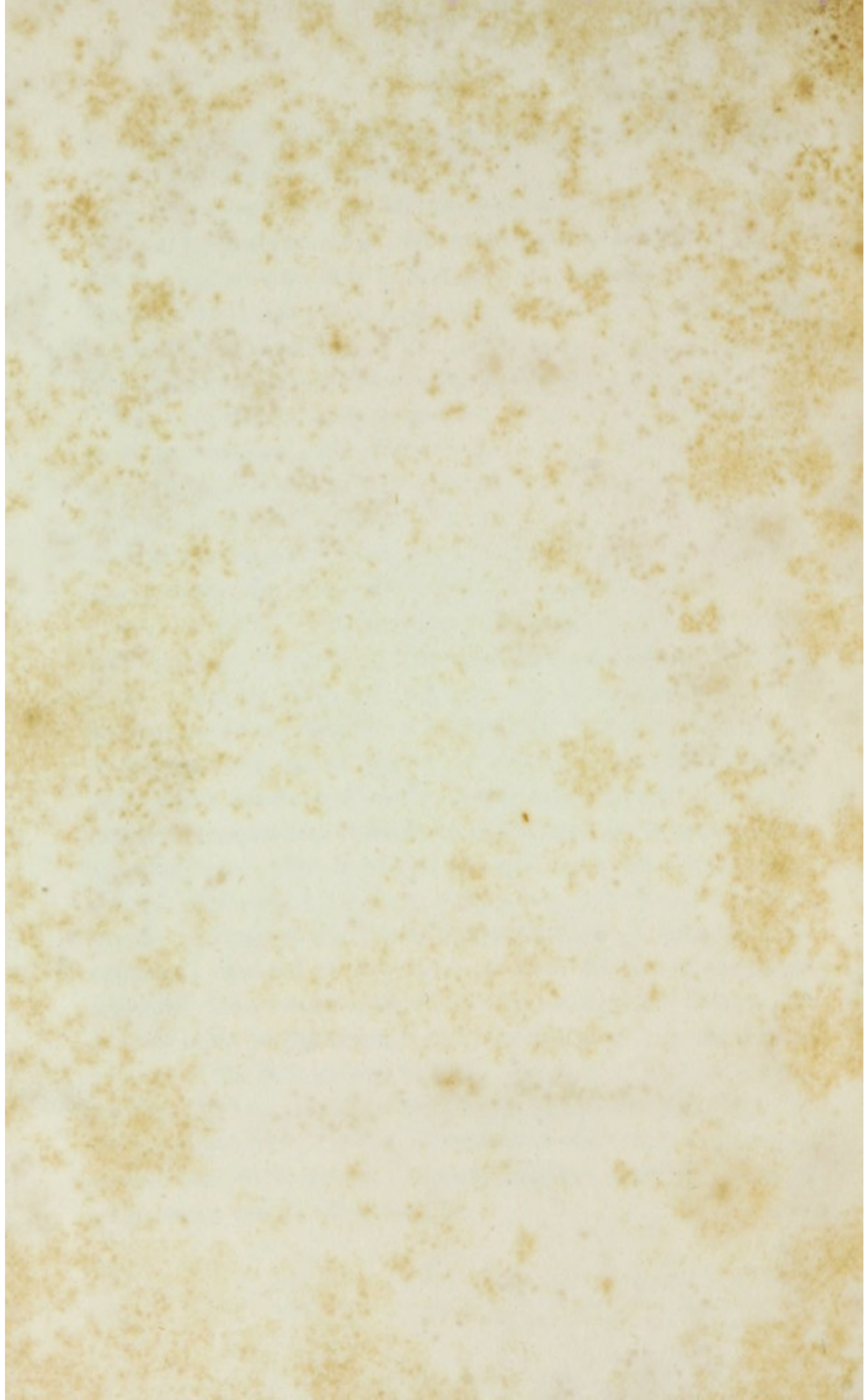
\* The hot bath at 92 deg. Far. prolonged for 25 minutes, increases the pulse 12 beats in a minute ; at 103 deg. it increases the pulse 38 beats in a minute, in 20 minutes. The animal heat is increased in a bath at 92 deg., two deg. ; and in one of 103 degrees, five minutes.

of plethora, or where there exists a strong tendency to a determination of blood to the head.

The tepid bath may be said to commence at 80 degrees Far., and rise to 92 degrees Far., where the hot bath commences. Its use is attended with very little danger, in ordinary cases. It is the safest and most valuable, particularly in autumn, winter, and spring, and for *invalids*. The immersion may continue from fifteen minutes to an hour, according to circumstances.

The cold shower bath, at the low temperature of 45 degrees to 48 degrees Far., (that of the Avon water,) is an agent capable of producing very powerful effects on the whole system; and great injury may result from prolonging the immersion too long, or from resorting to it when, from a weak constitution, or unusual susceptibility, the vital powers are too languid to admit the necessary reaction. The intention to be fulfilled in the use of this bath, is to produce a glow of warmth of the whole surface of the body; or, what is termed *reaction*: this implies, not merely an increase of the production of animal heat, but a sudden effort, within the body, and of the whole arterial system, to overcome the sedative influence of cold suddenly applied; and, also, an increased susceptibility of the body to the impression of its proper stimulus, heat. This bath is of essential use in the cure of many chronic diseases. It may prove injurious, and should not unadvisedly be resorted to, in painful disorders of the head; hydrocephalus; diseases of the chest; in those diseases of the stomach which are attended with a defect in the digestive powers; in chronic pains in the stomach and bowels; in all internal inflammations of the liver, spleen, kidneys, or intestines; in gout, rheumatism, diseases of the joints, scrofula, glandular swellings; in every species of dropsy; in all cutaneous and eruptive diseases; in disorders of the menses; in early infancy; in every period of pregnancy; and in advanced life.







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