

Memoir concerning the acidulous, gaseous, bicarbonated, sodaic waters of Vals (Ardèche) / by Dr. Tourrette.

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MEMOIR

CONCERNING

THE ACIDULOUS, GASEOUS, BICARBONATED,
SODAIC.

WATERS OF VALS

(ARDÈCHE)

By Dr. TOURRETTE.



PARIS.

PRINTED BY E. BRIERE,

257, RUE SAINT-HONORÉ.

1866.

The Waters of Vals can be obtained of :

Messrs. E. GALLAIS & Co., 27, Margaret street,
Regent street.

— W. BEST & Sons, 22, Henrietta street,
Cavendish square.

— COVERDALE & Co., 11, London street,
City.

And of all respectable Chemists in the Kingdom.

MEMOIR

CONCERNING THE ACIDULOUS, GASEOUS, BICARBONATED, SODAIC

WATERS OF VALS

(ARDÈCHE)

By Dr. **TOURRETTE.**

ANALYSIS BY MR. O. HENRY, A FELLOW OF THE IMPERIAL
ACADEMY OF MEDICINE.

In the remarkable treatise in which Mr. O. Henry sets forth his opinion on the mineral waters of Vals, the learned academician expresses himself thus:—

The thermal station of Vals, department of the Ardèche, is, it is known, rich in springs of acidulous, bicarbonated, sodaic and chalky mineral waters, the most of them well known for some time back, and justly appreciated by medical practitioners.

Requested to make a new chymical analysis on the springs, the waters of which are exported in considerable quantities, there were forwarded to me 15 litres of each, taken out at the right time, as certified by the mayor of Vals, with some information concerning the actual state of the waters, their delivery, etc., etc., as well as pieces of the different rocks taken on the ground from which they spring out.

The samples came in good condition. They were at once subjected to analysis.

CHYMICAL ANALYSIS.

The springs St. Jean, Précieuse, Magdeleine, Désirée and Rigollette come out of ground of a granitic nature or micaceous schist. The last four offer a very great resemblance in their chymical composition, which by their vicinity is easily understood, and which also is seen in the other known springs. In that manner their mineralizing substances are especially : *soles carbonic acid and alkaline bicarbonates* associated to *sodium, chlorides, sulfates, silicates*, and some terreous salts (*carbonates, phosphates, etc.*); there are found a little *iron* and traces of *iodides, lithine, arsenic or arsenicate*, and a very small proportion of *organic substances*.

The reactives and the qualifying trials which always precede the definitive analysis or the experiments which lead thereto have enabled us to come to the following results in the water of those springs:—

1° The blue paper of Turnsol was reddened promptly; but exposed to the air or to the heat, it recovered its first colour.

2° After an ebullition which only caused a slight agitation in the liquid, the water is strongly *alkaline* and immediately restores the blue color of reddened Turnsol; it shows that same alkalinity on the Curcuma, Dahlia, red cabbage, papers, etc., etc.

3° Acids thrown in the water produce a strong effervescence and after some time silicious gelatiniform flakes.

4° Ammoniacal chloride of barium brings forth a large quantity of white precipitate which dissolves itself again almost entirely by the addition of pure chlorhydric acid.

5° The very acid azotate of silver shows in it much chloride.

6° Potash and pure soda only occasions slight deposits.

7° Ammoniac only causes in it a slight disturbance.

8° The oxalate of ammoniac, a little lime.

9° The phosphate of soda occasions a slight precipitate, which, by the addition of ammoniac, increases very sensibly.

10° The pure tonic acid, the yellow and red ferraquates of potash do not show considerably the iron. It is only in some residues in deposit that that metal is found with some arsenical parts.

11° The other principles of *iodine*, *lithine*, potash, and phosphate have only been recognized in the produces of concentrated waters and by special researches made apart on several litres of liquid.

The water of those springs is perfectly clear; in the vases there can only be seen a depot hardly sensible and flaky; when the bottles are uncorked, there escape from the water some bubbles of carbonic gas, but without any sulphydric smell, even from the spring *Désirée*, which sends forth, it is said, that smell at its point of emergence; and as it is seen in other alkaline bicarbonated waters, the taste of the water from the springs *Désirée*, *Précieuse*, *Magdeleine* and *Rigolette* is analogous, slightly acidulated, then rather agreeably alkaliescent, without real stypticity.

The water of the spring St. Jean shows the same association of mineral substances as the preceding. Only, the proportion of salts is less and makes of it a water lighter and more advantageous for certain diseases. The chymical nature as well as its analogy with others of the same kind justify the medical properties which it has been known to possess for these many years.

The water of those springs, subjected to the action of the air, allows to escape gaseous bubbles, but there is not produced any sensible precipitate.

When the water is boiled, the carbonic gas escapes abundantly, and the liquid takes a very strong character of alkalinity, leaving to a slight degree a deposit of white powder.

To make this new analysis on the samples sent to me, I have adopted the methods employed in similar cases, sometimes direct, sometimes indirect; appreciating sometimes apart the mineral substances in order to group them afterwards *rationaly* together or singly *directly*. Besides I have used in more than one circumstance, marked liquors, avoiding thereby tedious and very minute weighings. It would be useless to enter here into the detail of extensive proceedings, and useless to describe them; we shall state that these modes are advised by very able chymists.

We shall immediately give the chymical composition of the water from the sodaic springs which we are treating. Further on, we shall speak of a spring of a composition having no analogy with these and forming a special type.

THERMALITY 130 free carbonic acid.	SAINTE-JEAN, 0.425.	RIGOLETTE, 2.095.	PRÉCIEUSE, 2.218.	DÉSIRÉ, 2.145.	MADGDELEINE 2.050.
Bicarbonate of soda. . .	1,480	5,800	5,940	6,040	7,280
— of potash.	0,040	0,263	0,230	0,263	2,255
— of lime.	0,310	0,259	0,630	0,571	0,520
— of magne- sia.	0,120		0,750	0,900	0,672
Bicarbonate of iron and manganesia. . .	0,006	0,024	0,010	0,010	0,029
Chloride of sodium. . .	0,060	1,200	1,080	1,100	0,160
Sulfates of sodium and lime.	0,054	0,220	0,185	0,200	0,235
Silicate and Silica, alumina.	0,080	0,060	0,060	0,058	0,097
Alkaline iodide, arse- nic and lithine. . .	sign	traces	sign	sign	traces
	2,151	7,826	8,885	9,142	9,248

Mr. O. Henry, in his quality of head of the chymical works at the Imperial Academy of Medicine, has analyzed, in the space of thirty years, almost all the springs of mineral waters in France : the learned academician certifies that the waters of Vals offer a scientific interest beyond comparison. Considering which he has followed with the greatest attention the chymical observations communicated to him, at various periods, by the doctors practising at Vals, he has been enabled to convince himself that the effects produced at the springs are in accordance with those which the doctors of several towns of France, especially of Paris, have seen every day in their practice of the town.

This fact is worthy of much attention, as it proves that the waters of Vals do not undergo any alteration by travelling; a great quality, which allows the doctor to prescribe in every place and at all seasons waters which render daily and immense services in practice.

It would be necessary to take a review of the whole nosological index if I was to occupy myself here with all the chronic diseases which have been treated, amended or cured by the use of the waters of Vals; but such is not my intention, it will be sufficient to state the cases in which they are specially employed; those where they present to practitioners a medicine sure and efficacious. In that way I will have fulfilled the desire of my fellow members. There will stop my notice, which will be short and simple.

I have found, in authors who are an authority in medical matters, ideas on the waters of Vals in accordance with the results which I have stated; I am happy to name some of them, they will have all the credit which they are worthy of with the medical body.

In the diseases of the digestive organs, gastralgy, dispepsias, the alkaline mineral water of Vals impregnates to the digestive mucous membrane lasting physiological modifications.

Patissier, a fellow of the Academy of Medicine, traces in a few lines the principal effects:—

“In a healthy-state, he says, the water of Vals, taken as a drink, increases the appetite, renders digestion easier, regulates the alvine evacuations, and sometimes produces a purgative effect; the circulation increases, the skin becomes warmer, there is an unusual feeling of strength and well-being; some glasses of that water are sufficient to render alkaline the sweats and the urine, which naturally are acid.

“It has been observed, that mineral waters, when well borne by the stomach, stimulate its vitality and increase its digestive power. This influence is especially the property of the gaseous, alkaline, sodaic, cold waters of Vals.”

Petrequin and Socquet (medical treatise on mineral waters, a work having obtained a prize from the Academy):—

“The influence which the waters of Vals bear on the digestive organs, as soon as they are made use of, is most remarkable and their effects are so soon felt that it might be said without exaggeration that *they* present something marvellous.

“From the first day they are taken, they very often occasion a considerable increase of appetite. The patient who for a long time

had no idea of hunger, feels quite surprised to feel that want to a great extent, and is still more astonished to be enabled to satisfy it with impunity, thanks to the action so full of energy of those beneficent waters. Under their influence in fact the stomach seems to act on the alimentary substances with a new activity; the digestion formerly difficult, laborious, takes place thereafter with a facility almost marvellous. At the same time the intestinal evacuations become more regular and take place more freely; often even a diarrhœa more or less abundant succeeds during two or three days to an obstinate costiveness."

Dupasquier, professor of chymistry at the apothecaries school at Lyons.

Doctor Ruelle, to whom a long practice at the waters of Vals had given a great authority, has stated precisely the cases where he considered the use of those waters as being most efficacious and even of a sure success.

"The therapeutic action of the waters of Vals he says, shows itself in a *formal* manner in cases of gastro-intestinal diseases which have the following symptoms: At one time, an invincible disgust for food; at other times, an increase more troublesome inasmuch that the patients cannot give themselves up to it with impunity, slow digestion, laborious, accompanied with acid belchings, vomiting, abominable flatulencies, a sentiment of uneasiness which coming from the epigastric region, seems, in some way, to go through the whole economical system; an habitual melancholic sadness; lastly an excessive nervous irritability; these affections are known by some as chronic gastritis, by others as gastralgies, gastrodynies, enteralgies, hypocondries, etc., etc. I have treated with success a great many patients suffering under those complaints generally exempt from any feverish movement."

If the outline which we have traced to ourselves allowed it, we should find the same ideas in all the authors who have occupied themselves with medical hydrology.

The remedy which will fulfil in the best way the indication of strengthening digestion will be the best in chronic diseases, and it will enable things to be done with such a remedy which would not have been expected.

That remedy, to which Sydenham, one of the most learned doc-

tors that England ever produced promised unexpected results, is to be found, I beg to certify in the prudent use of the waters of Vals.

The waters of Vals have a sharp taste which pleases. Rich in carbonic acid gas, they give agreeable belchings, their ingestion in the stomach does not produce any irritation at the throat. From the first day they are made use of, they show a stimulating or sedative effect, according to the state of the patient. In fact, with one, digestion will be slow, he will feel laziness in the stomach, no appetite, but *with no pain*. With another, on the contrary, digestion will be accompanied with pain, eructations, nausea, etc., etc.

Those states, so opposite one to another, are equally cured in making use of the waters of Vals.

In the majority of cases, when especially it is requisite to restore the functions of the digestive tube, patients will do well to begin by the waters of St. Jean. That water taken in a pure state, or at table with the ordinary drink, opens the appetite, facilitates digestion, and, under its beneficial influence, the reconstruction of the organ soon takes place.

It has been daily observed that the waters of St. Jean give results which cannot be more satisfactory, in all the diseases of the digestive organs tributary to alkaline medicines.

If the patient who has taken the water of St. Jean during 12 or 15 days does not feel a marked improvement, he must be prescribed to take the waters of the spring "Précieuse." It is rare that, after a month or six weeks, a great improvement does not take place, often even an entire relief.

DISEASES OF THE LIVER.

Hepatalgy, according to Messrs. Longet, Trousseau, has its seat in the lower part of the liver, and appears to develop itself under the influence of the pneumo-gastric nerves. This disease can easily be confounded with hepatic colic, but as far as the treatment of these two affections by the waters of Vals is concerned, that difficulty of diagnostic is unimportant, these two affections being tributary to the same medicine.

In the obstruction of the liver with or without icterus, whether they have or not succeeded to an acute hepatitis; in the simple hepatic colic, that is to say in an *obstruction* of the choledochus

canal following the inflammation of the walls of that canal, or else recognizing for cause the presence of one or several calculi, the waters of Vals are remarkably efficacious.

The chronic liver complaints, as well as those of all the other organs, are *functional*, that is to say without any appreciable material or organic hurt, that is to say with an alteration of substance. In general, it is in the functional wounds that the waters of Vals are most successful.

If there remain any traces of irritation in the liver and towards the digestive organs, the water of St. Jean is the most appropriate; if, on the contrary, the phlegmasic state is entirely extinct, the springs containing more minerals, — Précieuse, Magdeleine, — will succeed far better, and will be employed preferably. It will be the same in cases of swellings often enormous in the secretory organ of the bile, in considerable splenites, etc., etc.

This success will also take place, if there exists an abdominal plethory more or less marked. In fact, the waters being freely alkaline are an excellent hepatic remedy, and it is not without reason, as observed very judiciously by Messrs. Petrequin and Socquet, that practical experience gives them the quality of chologues. Physiology teaches us that almost all alkaline waters taken as drinks go through the liver. It is now well known, after the eminent experiments of Panizza and those of Mr. Chatin, that the absorption of soluble salts, taken as a drink, takes place, at least for the most part, by the veins of the stomach and the teres intestine, which, meeting with the radicles of the vena porta, transmit to the liver the totality of the blood which they contain and of the substances which have been introduced into it. Also one of the first effects of the water of those springs St. Jean, Précieuse, Magdeleine, taken as a drink ought to be and really is an action bearing directly on the liver, as it would be difficult to admit that the quantity of water and mineral substances going through that organ in a short space of time, would remain without any influence on the formation of bile.

GALL STONES.

The hepatic calculous colic is one of the complaints in which the waters of Vals can be the most surely employed. A complete cure

is often the result of one or several thermal seasons. At all events, it is extremely rare not to obtain a diminution in the accidents.

The gall stones do not affect any special place either for their formation or for their sojourn; they have been found in every part of the bilious apparatus, from the radicles of the hepatic canal to the choledoc canal and in the intestine. However, the vesicle is the place of preference for the calculi, and it is in that pocket that they are found the oftener and in the greatest quantity.

The existence of gall stones, after Professor Trousseau, is far more common than is generally supposed. So, every time that a patient, of more than 40 years old, complains, without any known cause, of cramps in the stomach, there is reason to suspect in him the presence of gall stones in the bilious vessels. If at the same time there is pain in the right hypocondre radiating towards the shoulder and the epigastrium, if there comes on vomiting not bilious, you may judge thereby that a gall stone is engaged in the choledoc canal and 99 times out of 100, the urine will, the next day, confirm the diagnostic by its yellowish colour.

Every doctor practising knows the means, which, in the greatest number of cases, are sufficient to dissipate the painful state produced by the sojourn of the gall stones in the bilious canals. But evidently that is only a palliative. The curing treatment ought to have another object: That of preventing the formation of new gall stones.

We do not know any curative medicine for the bilious gall stones more efficacious than that of the waters of the springs Précieuse or Magdeleine of Vals.

However, we think we ought here to make a distinction. Certain bilious gall stones being formed, at least to a great extent, of cholesterine which is neither saponifiable, nor assailable by alkalis, the patients might see their hepatic crises renewed as long as there remains some old gall stone to be expelled. The waters of Vals might even provoke those crises, in urging the bilious canals to throw of the concretions which they hold, or in rendering the same canals freer, by the cure of the phlogose of their intern membrane. Their curative effect, in these cases, will be to modify the secretion of the bile, to facilitate its running off, to bring it to its normal state, and to prevent in that manner the formation of

new gall stones, which is a very important point in that species of complaints. Therefore the waters of Vals are rather prophylactic than curative in that species of gall stones; they are at the same time curative and prophylactic in the following species: The coloring matter of the bile dissolved in an alkaline liquor, is precipitated by acids. It is known that some drops of acid added to bile divide it, at the end of some hours, from the cholesterin and fatty acids. After that, it is asked if we could not explain by an acid reaction that the bile has experienced, the depot of a small quantity either of coloring matter, or of fatty matter, and, finally, the beginning of the formation of the gall stones. Moreover, once the bilious gall stones expelled, it is well to follow during some time, the alkaline treatment, in order to prevent the formation of new ones.

DIABÈTES.

Let the liver be the secreting organ of the sugar (Cl. Bernard); let it be the collecting organ (Mialhe); let the sugar be produced by a pathologic modification of the digestion and the absorption of feculents (Bouchardat); by the uneasiness of the respiratory phenomena, which brings on an incomplete combustion of the glucose (Alvora Regnosa); let it be the gout in the blood (Marchal de Calvi); it is now incontestably acquired to science that the waters of Vals possess an action, if not always curative, at least very remarkable in this complaint.

Those troubled with diabetes feel, in a short time a very great relief, if especially they take the waters in sufficient quantity. Here, they need not be afraid of drinking plentifully of them.

Under the influence of our waters, the sugar disappears little by little, then entirely from the urine. The thirst diminishes, the sight comes back as usual, the general strength returns, the costiveness gives way at the beginning to bilious stools, then regular and normal; the calm succeeds to the uneasiness, the sleep to the inability of sleeping. These facts are certain, they have been mentioned by the patients and by the doctors.

The waters of the springs *Précieuse* or *Désirée* are sufficient to paralyse, to cause the disappearance of a disease considered lately as incurable and always mortal. And even when the first cause

could not completely be explained; when there would be a necessity of continuing the use of our waters, one must conclude that the cessation of morbid accidents, the return of the strength, the well-being obtained by means of a gaseous water as agreeable as the seltz, ought to be considered as a benefit. At Vals resides for the last thirty years a diabetic patient who is a proof not to be objected against that patients can live many years when they make use of our waters.

DISEASES OF THE URINARY APPARATUS.

Gravel consists in the accumulation of sand forming small pieces more or less rounded of different sizes. The volume of those pieces vary between the size of a needle's head and that of a small pea.

1° The sand is a pulverizing concretion extremely small which decomposes itself;

2° The gravel is of a size a little larger, but agreeing with the diameter and the degree of possible strengthening of the natural organs. As to volume, the smallest are comparable to peas, the middle size done to cherry stones, the largest to small beans; they are generally of a spherical or oval form;

3° There is given the name of calculus to the concretions, whose size, not being in accordance with that of the urethra canal, can only come out of the bladder by a surgical intervention, that is to say by the operation.

There are two kinds of gravel:

1° The uric gravel or red gravel, taking place with urine which has an acid reaction;

2° The phosphatic gravel or white gravel, existing in urine with an alkaline reaction.

The waters of Vals are paramount in the first, and advised against in the second.

(It is nearly three centuries that the waters of Vals are known as having the gift of curing the gravel.)

In 1609, Ch. Expilly, president at the court de Grenoble, was cured of the gravel, under which disease he had been suffering for ten years.

In 1657, A. Fabre, an eminent physician who has left on the waters of Vals a remarkable work, wrote : “In cases of calculus, “gravel or nephritic, the waters of Vals do more in ten days than “all other remedies will do in six or ten years.”

In 1705, Nodier declares having obtained the most surprizing effects in the calculous diseases.

Without going back so far and holding to every day experience, we do not think that effects as advantageous could be obtained at Vichy, Contrexéville as at Vals, in the lithic complaints.

Can the waters of Vals cure the uric gravel without its returning?

When a calculus is lodged in one of the loins, it is expelled by the use of the waters of the springs Précieuse and Désirée, and falls in the bladder, from where it is expelled when of a size to come out of the urethra canal. Then, when the loin is clear, the waters of those two springs act on the blood, modify its composition, prevents the formation of uric acid; therefore there is an action purely vital and not a simple chymical dissolution of the principles of gravel in the loin.

I am ignorant as to what substance the waters of Vals owe their effect widely different from the crisis which is brought on by the waters of Vichy on parties afflicted with gravel; whatever there might be, I repeat it, the going out of the gravel takes place without too much effort, without labour, and as soon as use is made of the Précieuse or Désirée.

VESICAL CATARRH.

To obtain a favourable result in the complaint, it is necessary for the catarrh to be in a *muquous state* or the secreting vessels open. (In those cases, under the influence of our waters, one generally sees the secretions soon getting less abundant, modifying themselves gradually and soon returning to their normal state, at the same time as the desire to water is getting less and less abundant.)

It is by the water of the spring Saint-Jean that it is necessary to begin the treatment of vesical catarrh, and by the water of the spring Rigolette that it is necessary to end it.

In the contraction of the bladder, in incontinency, in the retention of urine, the water of those sources has always given me the best results.

CHLOROSE.

This word brings up almost involuntary to the mind of the physician the idea of ferruginous medicine. Indeed, if the chlorose predominates the pathology of the woman, on another side the iron predominates the therapeutic of the chlorose; but alone, it does not always cure. No disease is so apt to come on again; and if the good results obtained by the iron are not kept up by a necessary dietetic, they will soon disappear to make place to new chlorotic accidents.

It is evident that, under the influence of the Martials, the proportion of the red bubbles is seen to increase, the hematose to become more active, and the chlorotic accidents decrease. Every indication which will have for object and for result the regeneration of the bubbles will become in that way apt in curing the chlorose.

That is what is obtained by the waters of the springs *Saint-Jean* and *Rigolette* of Vals.

It must be said also, write Messrs. Trousseau and Pidoux, as it is a truth that is understood in getting old in practice, that iron, after having rapidly amended the most serious accidents of chlorose, becomes sometimes all at once powerless, leaves us thereafter in presence of a disease which it generally seems to dominate with so much facility.

What is wanting in the organism, it is not the iron which it is easy to introduce in a sufficient quantity by the food, it is the faculty of assimilating it; there is the point which renders so often powerless every ferruginous medicine.

This faculty of assimilating belongs in a high degree to the waters of Vals. The reader will recall to his memory that iron united to magnesia is here associated with lime bicarbonate which is a strong aid to the martial medicament, and that the other substances which mineralize the waters are highly digestive, they contribute to the assimilating of the martial principles.

Dupasquier has been enabled to write: "The influence which the

waters of Vals have on the digestive organs, when once they have been made use of, is most remarkable, and their effects are so quickly seen that it might be said without exaggerating, that they show something marvellous.”

Putting aside the chlorotic state, the waters of Vals will agree more especially if it is necessary to modify the vitality of the genito-urinary organs, if the chlorose is accompanied with gravel, vesical or uterine catarrh, leucorrhœa, inflammation of the womb, liver, etc. In virtue of their character of ferruginous alkaline water, these waters have the tonic and astringent power appertaining to the ferruginous principle. As such, they interest more especially the sanguine principles, of which they stimulate the functions impregnating an impulsion useful to the hemathose (ANGLADA, tome 5).

To the preceding attributions, the acidulated alkaline ferruginous waters ought to join other medicinal qualities, of which the addition of the bicarbonate of soda will be the main spring.— They will thereby be more apt to operate the revolution of the visceral stoppages to react on the inflammations of the liver, of the mesentery, to repress certain dyspepsias or certain diseases of the urinary channel. (PETREQUIN and SOCQUET, page 544.)

Nothing could be said better nor be more affirmative!

Well! It is because the iron and the magnesia which are contained in the waters of the springs St. Jean and Rigolette are united with the other substances which distinguish them, that they have such a remarkable action in the cases of chlorose, of anemy, of nevrosies in one word, on the different spasmodic, vaporous or nevralgic phenomena, so various and so unsettled in chlorotic patients.

It is thanks to that chymical composition, on which I cannot call too much the attention of my fellow-practitioners, that the waters of Vals ought to be bracing and strengthening.

The practitioner who would only consult the comparative quantity of bicarbonate of soda contained in the waters of Vals and those of Vichy, without taking into account the remarkable differences which exist on the other salts, would not understand the effects that are obtained in practice.

The disastrous effects of the absence of ferruginous salts in sodaic water is generally to be seen in manufactured gaseous waters. Let us here offer a word or two in explanation.

Science has already proved that manufactured gaseous waters are only a base imitation of sodaic natural waters. Those of our coadjutors who are really careful of the health of their patients are far from applauding the use of this dangerous product, which only meets with encouragement from the ignorant and the vulgar.

In effect, in all artificial waters the gas only exists in a state of interposition, or rather in a forced sequestration. On the contrary, in the gaseous waters of the Vals the gas is combined; there is union and non-repulsion.

“It is well known that chemistry is as powerless to dissolve carbonic acid in water, as it is powerless to dissolve sulphur in the same liquid. It is Nature alone which possesses this secret.”

A bottle of artificial gaseous water, once uncorked, loses all its properties in about THREE MINUTES, in a temperature of 25 degrees of Centigrade, while a bottle of gaseous water of the Vals, at the same temperature, will emit its bubbles of gas for a space of TWELVE HOURS! Our readers will admit that there is a great distance between THREE MINUTES and TWELVE HOURS! Now with the waters of the Vals, the acid once set free accompanies and aids the digestion, until it is fully accomplished.

We can only assimilate artificial gaseous water to a STEAM BOILER which has just EXPLODED. On the contrary, the natural gaseous water of the Vals is a STEAM BOILER WHICH PERFORMS ITS REGULAR MARCH.

This complication is to be feared especially when the complaint which ought to be treated by alkalines is united with an anemic chorotic state, etc., etc. In those cases, it is necessary to speak thus, that the de-obstructing, opening action of an alkaline water, deprived of ferric salts, should produce itself on a fixed day, as under the influence of an usage, even less prolonged, there will follow a great weakness of the digestive organs, the assimilation becomes null. The patient is shut up in a vicious circle. The more the use of alkalines is indicated, the less they are to be employed. The richness of the tonic and strengthening principles in an alkaline water is therefore paramount, as thanks to the association of ferro-inorganic salts and calcic magnesium with the sodic element, its action is modified to a great extent. Under the influence of tonic substances, the organs of the digestive vessels come back to their

usual strength with astonishing rapidity, and the more use is made of a water bi-carbonate rich in ferruginous salts, the more use can be made of it.

It is there one of the principal advantages which the waters of Vals have over the fictitious gaseous waters.

To resume, and as far as concerned the ferro-manganic principles, this advantage is considerable, for the great physiological aphorism must not be lost sight of *corpora non agunt nisi soluta*; then, in the waters which we are treating, it is only due to the great abundance of carbonic acid that the iron and the manganesia are dissolved in such an energetic manner as to prevent their precipitating and becoming without object, either before or a short time after the taking of the mineral water in the stomach.

Such is the cause, already mentioned so often, for which there is not seen in the patients who make use of the waters of Vals, that stomach weakness, that loss of strength, those nauseas, that wan aspect of the skin and of the muqueous parts, which oblige pretty frequently the giving up of the use of the sodic-bicarbonated waters containing in a high degree a proportion of alkaline salts. And it is not to be believed that those serious inconveniences of the alkaline waters might always be nor are always corrected by additions of tonic principles foreign to the water; as it is here the case to recall the remark, made for some time back by eminent practitioners, that the natural produces, the medicinal produces as others, are what they are; they act by the entire parts of their composition, and when something is wanting to their whole, it is very difficult, if not impossible, to add anything to them. It is thus that the explanation can take place, as we shall say hereafter, why natural medicines possessing a very small quantity of principles which we suppose, which ought even to be supposed as active, cure diseases which had been rebellious to larger doses of the same principle given on artificial combinations.

These remarks lead us to the study of a very extraordinary spring.

SPRING FERRO-ARSENICAL OF DOMINIQUE.

Sulfuric acid free.		1.33
Silicic acid.	} Iron sesquioxide.	0.44
Arsenicate.		
Phosphate		
Sulfate.		
— of lime.		
Chloride of sodium.		
Organic matters.		

In a passage of his eminent treatise, Mr. O. Henry expresses himself thus :—

“ Although by the analysis, we have found ferric salts which
“ we bring here, in order to prove that originally they exist thus
“ in the water dissolved by means of acid (it is known however
“ that arsenicate of iron is not decomposed by sulphuric acid
“ weakened, and here, it is acid at the one thousandth part; it
“ ought not to be otherwise, and silicate of iron ought to be in the
“ same case), it is still necessary to have some experiments, in
“ order to definitively state the fact as well as to put in precisely
“ the arsenic, of which the proportion obtained, at a single trial,
“ has been equal to 0,0031 for 1,000 of water. To resume, it is
“ seen that the analysis of the spring *Dominique* requires still some
“ new researches to be definitive. After the researches, however,
“ the study of that water appears to us most interesting in a chy-
“ mical point of view, and seems to us to be worthy of a serious
“ study.”

To the preceding chymical observations of the eminent reporter of the Academy of Medicine, we ought to add a therapeutic remark, viz, that it is very possible that that very singular presence of free sulphuric acid, in a water possessing salts with less energical acids, and which ought to lose their combinations by that powerful acid, that the presence of that acid, we say, comes in for something, and perhaps for a great deal, in the action of the water *St. Dominique*. There would be in that manner the object of a most interesting study, as every thing is at the highest point interesting in the spring we are treating of.

With the therapeutic knowledge we possess since the treatises of Fowler, of Biett, of Mr. Boudin and several other therapeutic practitioners, there can already be foreseen the important applications of the *Dominique*.

The intermitting fevers and paludean cachexy are only one of the numerous applications of that spring: every cachexy, every affection having for consequence a chronic weakness more or less felt, every affection having for cause a falling off whatsoever, skin diseases, scrofula, syphilis, etc., etc., have been successfully treated by the water which we are examining.

The water of the *Dominique* is clear. Experience has shown that

it possessed the precious faculty of being exported, without feeling the least alteration. It is agreeable to drink, sweet to the taste with a slight sentiment of acidity. Women, children have a liking for this water.

We have seen by the analysis that it contains a surplus of sulphuric acid. This gives a true limonade the proportions of which are equal to one gramme per litre, viz, twenty drops, a heavy dose rarely gone beyond by the formula.

The spring *Dominique* contains about three thousand parts of arsenicate per litre of water. Mr. Boudin has often given as much as eight times that dose, but it is here that we must recall to memory that one point is the officinal produce, and another the natural produce, and the power of the therapeutic action of the mineral waters would be the source of great danger, if, instead of containing three thousand parts of arsenicate per litre, the *Dominique* contained twenty five thousand parts.

We confess that we would be afraid of prescribing a glass. But with the water as it stands, an experience of two centuries has shown that, in numerous applications, patients labouring under rebellious intermitting fevers, having the mark of the most persistent paludean diathesis and who had, vainly, taken, for a long time, very large doses of arsenical acid, were cured in several weeks by the use of the water of the *Dominique*.

But, we repeat it, the intermitting fevers and paludean cachexy are only a part, one of the numerous applications of the water of that spring; every cachexy, every complaint that has for consequence a chronic weakness more or less felt, every complaint that has for cause a wasting whatsoever, will be amended, if not cured in employing that water.

The chlorose, anemy, skin diseases, scrofula, syphilis, and also diseases of the breast, will be happily influenced, by the curing water of the *Dominique* and more especially in cases where Fowler's liquor or Trousseau's fumigations are recommended.

In a general manner we lay down as a principle that the action of the *Dominique* is complex: on the sanguine and respiratory system it is soothing; it is strengthening and invigorating. It is an antifebrile and an antiperiodical medicine; lastly, it possesses

the great advantage over quinine, that of being a curative remedy against periodical fevers.

In foreign lands, far off, doctors and patients agree to order and take the water of *Dominique* for every case where quinquina and quinine are to be given. This reputation is justly acquired.

It is necessary that the chymical composition of the spring *Dominique* be always before the mind of the reader in order that he may judge of the various and many effects that are borne out by the experience of two centuries and a half. In that manner the arsenic, the sulphur, the phosphorus, the iron in its state of iodium or sulphate joined to the sulphate of lime, the chloride of sodium, and most probably the presence of sulphur of calcium coming out of the dissolution of the sulphate of lime, amply explains the remarkable effects of that water in the chronic diseases of the respiratory organs, simple or granulous pharyngitis, chronic laryngitis, aphony, pulmonary catarrh, pulmonary inflammation, slow consumption, are, it is known, tributary to the waters of the Pyrénées.

Let us observe that the renowned springs of the Eaux-Bonnes, of Labassère, of Saint-Sauveur, are principally mineralised by sulphates, chlorides, and acids which we find in the waters of the *Dominique*. Also in presence of a composition so strange as the one presented by the chymical analysis of that spring, there will not be too much surprise at the clinic results obtained.

The *Dominique* contains arsenic at the dose of three thousand parts per litre; for eight glasses of water, there is obtained a dose representing six thousand parts per day, a large quantity if we take into account the results worthy of attention that science indicates by the use of the arsenical waters of Plombières, of Luxeuil, which contain hardly a thousandth part.

Every one will remember the splendid experiments made by the illustrious Thenard on the waters of Mont-Dore, the day on which he found arsenic.

The virtue of those waters on pulmonary diseases was explained. The arsenic in the springs of Mont-Dore hardly contain a dose of one thousandth part. It will be sufficient for us to state that the water of the *Dominique* is of a richness three times more important,

The action of the most celebrated waters of the Pyrénées on the diseases of the respiratory organs is too well known to require to be quoted here ; we shall confine ourselves to recalling the attention of observers on this fact that the water of the *Dominique* contains in a remarkable degree the substances which all the therapeutic practitioners agree to consider as being the most active in the springs of the Eaux-Bonnes, of Labassère, of Saint-Sauveur, etc., etc. That is to say the sulfates, the chlorides, and the acids which distinguish the mineral part of those much-valued waters.

To resume, experience has shown, that is to say, aided by clinic observations, in accordance with chymical composition, that the water of the *Dominique* has the same properties as the arsenical waters of Plombières, Luxeuil, Mont-Dore, etc., etc., as well as those of the sulphurous waters of Labassère, Saint-Sauveur, Eaux-Bonnes and others, which on the spot or forwarded render such useful services to the medical art.

CONCLUSION.

It evidently follows from this treatise that the waters of Vals ought to give, and give, without any doubt, more favourable results than all the other known alkaline waters on account of the variety of their mineral parts and of the large quantity of gas which they contain, allowing them to be transported afar off and to be kept quite pure during entire years.

It has been observed that with those waters there is not to be feared that hyposthenisation so dreadful in the employment of alkaline waters not very ferruginous nor carbonic.

The waters of Vals are really the standard bicarbonated sodaic waters.



