The Sulphur Springs
of Béarn et Bigorre.

Francis Leonard Brown
MB. C.M. (1890)
The Sulphur Springs
of Biscaroz and Piperré.

In looking at a Map of France on which the Mineral Watering Places are distinctly marked, there will be seen to be thickly scattered along the Southern Frontier from the Atlantic to the Mediterranean. The Springs which rise in the Pyrenean Valley include all the most important "Sodium Sulphate" waters in France.

Being in the District last summer I was able to visit the Western group viz. Eaux Bonnes, Eaux Chaudes, Angélus, Contauts, St. Sauveur + Barèges + to study the applications of their waters. I have also examined most of the local + the general (French) literature + topographical literature in order to discover what - if any - rational explanation there is of the action of the waters and to know the generally accepted indications for and contraindications against sending patients to one or other of these Springs - which are still held in high esteem by the majority of the Medical profession in this Country.
Physical and Chemical Characters.

These waters all rise out of primitive rock (granite) in transition schists. At their point of emergence they are colorless, feel pasty, are grayish, and have a slight smell of sulphurous hydrogen (in some this is hardly perceptible). They contain a varying amount of white flocculent matter. If allowed to stand for a few minutes, bubbles of nitrogen collect on the sides of the glass.

Their temperature varies from 52° F. (source: Fonts de Eaux Brunes) to 120° F. (Martinsar of Lucentot), most being over 90°. All are slightly alkaline in reaction.

The chemical composition of the principal springs in each spa is shown in the appended table. The figures are taken from Filhol's work "Recherches sur les Eaux Minérales des Pyrénées," though not the most recent, his analyses are still considered the most trustworthy and have the advantage of having been made by a university partner.

The chemical peculiarity of these waters is not shown by the table, viz. their instability. This consists essentially in an oxidation of the sodium sulphide when the water becomes exposed to the air, but owing to the numerous salts present, the reactions are very
complicated. Eventually the sulphide disappears completely, the greater part being replaced by sulphite + sulphate of soda while the remainder escapes as sulphuretted hydrogen. The water is then described as “degenerated.” This degeneration takes place very rapidly in some springs, slowly in others.

The organic matter found in these sulphur springs is partly dissolved, partly suspended. The former, according to Filled, consists of impurities the water has carried along with it on its downward passage through the earth’s crust. The latter known as “sulphurous” examined under the microscope is seen to consist of a homogeneous jelly like substance with numerous filaments entangled in it, bacteria + crystals (of sulphur). Various algae have been differentiated in these springs and it seems not improbable that part at least of the dissolved organic matter in the water comes from their growth in the depths of the earth. It is known that these algae can grow at a temperature above 120° F.

Action of the waters
1. hot springs fall into three
2. classes viz a) those of German balneological writers
3. b) those of French authorities on thermal balneotheria.
and (c) those of local writers and practitioners in the district.

(a) Braun and Liechtenstein would classify the Pyrenean Sulphur Springs with "indifferent thermal" owing to their feeble mineralisation & maintain that any special action is due to their height above the sea level and to the high temperature of the waters.

(b) Durant-Parhel holds that of all mineral waters, the Sodium Sulphate ones have the most definite action & indications & that this action is a general stimulaton of all the bodily functions, most marked where there is pathological change so that there is a tendency for a chronic to pass into an acute state. Campardon says: "The first effect of sulphur waters absorbed by the digestive tract or skin is to produce a lively general excitation..."

(c) The opinion of the Medical profession on the spot is that some of the springs have a sedative and others an exciting action.

The action of the sedative sulphur springs does not seem to differ in any respect from that of the "indifferent thermals" and the indications for sending patients to one or the other class are to a large extent identical or governed chiefly by considerations of climate & altitude, such springs are St. Sauveur...
and 24. certain of the Cauterets Springs & Eaux Chaudes.

The exciting action of the others, especially of Eaux Bonnes (Source Vieille) & Bariges, is found to give rise to more or less constitutional disturbance. This when carried to excess is what is known as "thernal fever". It shows itself as a general malaise often accompanied by headache & sleeplessness. The pulse becomes more frequent & arterial tension rises. The throat feels dry & there is often well marked congestion of the pharyngeal mucous membrane. If haemorrhoids are present they tend to become active slight constipation is the rule, but diarrhoea occurs sometimes where the digestion is weak. At the same time any chronic inflammation assumes a more acute type; this is well seen in various forms of ulcers at Bariges & in pulmonary diseases at Eaux Bonnes.

Several writers on Eaux Bonnes speak of a rise of temperature as a common phenomenon. Dr. André in his "Thése de Paris" (1876) gives details of 9 experiments with transported Eaux Bonnes water, 3 on patients suffering from non-febrile diseases (Copper & Lead poisoning & Anaemia) and 6 on healthy folks. The water was administered internally only. In two of the patients and one of the folks there was no effect; in one patient and five folks there was a distinct
While process about the 3rd and 4th days with a rise of from 2° to 3° F. in temperature.

Other symptoms attributed in monographs on the waters to their special action such as cyanosis, skin eruptions, increased appetite &c are much more probably due to the water being drunk after fasting to prolonged warm baths, to the mountain air, and regular life at the spa.

Skin eruptions however are occasionally met with when no baths have been taken. I saw a case of this last summer where the patient a medical friend of my own suffered from a particular eruption of both thighs just after a course of Leau Rhunes waters, (French spray treatment of the throat only).

The cause of this exciting action of certain Sulphur Springs is by no means clear. Various explanations have been given none of which however account for all the facts. Enquiry is greatly complicated by the possible influence of altitude (pointed out by Braun), by the various temperatures at which the waters are used, by the rivers most in which they are administered, & by the different classes of disease met with at the different stations.

This much seems agreed on. Sedative effects are noted where the waters are degenerated, i.e. contain
sulphite of soda instead of sulphite at the point of application, and this apart from their temperature — are the height of the spa, and such waters are not used for drinking cures as they are apt to give rise to typhoicali; the "Bois" and "Rocher" at Carou-terres are examples. Springs of this class are however even the exception in the group water consideration. Most of them are found in the Eastern Prunies (le Vernet, Aude), and in the Bains de Mexico.

As to the others, viz. waters containing soda and bile; at this point of application the general rule holds good (except for Eaux-Boumes) that the higher the station, the higher the temperature of the water and, especially in baths, the effects are stimulatory and exciting. E.g., at Baris which is just over 4000 ft. and where baths and douche are given at a temperature of 111° F., symptoms of excitation appear in nearly all the patients, so called "real fever" in common, while at St. Sauveur (2500 ft.) with waters of an indifferent temperature, 93° F., sedative effects are the rule.

But as I have said Eaux-Boumes is an exception. It is 2450 ft. high and its climate is practically the same as that of St. Sauveur, the temperature of the "Source Violette" is 91° F. and this in one of the most
active springs in the group. Baths are not usually employed here—most of the patient being phthisical—but when given are found to increase the exciting action of the water taken internally.

Now is the amount of Sodium Sulphate in the water sufficient to account for their stimulating action? E.g. the total solids in a litre of the Source Violette (Frome Bromes) = 0.546 grammes. The maximum dose given is 3 grammes (1600 grammes = about 20 lbs) per diem giving 0.345 grammes or 5.3 grains,

and taking Still's scheme of the elements we get at the potable homoeopathic doses of:

- 0.2 grains of Sodium Sulphate
- 2.4 " Chloride
- 0.25 " Sulphate
- 1.5 " Calcium
- 0.46 " Silicie acid the remaining being organic matter in solution. Besides the above there are traces only of Sulphuretted Hg.

Drops or 17 Volumes in 1000 of Nitrogen per in the water.

The latest theory is that of Dr. Garrigou (11) viz. that certain alkaloids and phorines are found in the waters from the growth of the barium algae and of micro-organisms which he claims to have found.
in Sulphur Springs, that there may be what give rise to symptoms which are out of proportion to the quantity of mineral salts contained by the waters. No definite results have however been published on this subject so far.

The slightly constipating action of the waters has been noticed at other Sulphur wells e.g. Weilbach or Harringgate. It may be due to the Sulphur salt being in small quantities or dilute solution entirely absorbed by the stomach and upper part of the intestines, while the earthy salts & silicates pass on.

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**Climate and Mode of Life**

In deciding what classes of patients are likely to be benefited by a course of waters at any special spa, there are considerations of climate & general mode of life to be taken into account. A few words on these may not be out of place here.

The altitude of the spas under consideration is as follows. Passing from West to East we have:

in Béarn:
- Enaux-Chantès — 2213 ft.
- Enaux-Bennes — 2453 ft.

in Pyrene:
- Argelès — 1476 ft.
- Cauterets — 3056 ft.
- St. Sauveur — 2525 ft.
- Barèges — 4067 ft.
The "thermal season" lasts from the beginning of June till the end of September, but while patients can't safely remain in Arequipa from April till October inclusive it is unendurable to send them to Paracas till the middle of June or to let them stay there after the middle of September, as before the former date the weather is often cold and wet while after the latter it generally breaks and the temperature becomes lowering to the snow of the surrounding mountains. Snow occasionally falls in June and rarely in July. I have known this to occur in the middle of July at Cantaritas 1000 ft. high. The September rains when they come are always cold, falling as snow on the neighbouring heights. Rain falls on an average 1 in 4 days in June, 1 in 6 in the next three months. Thunder storms are tolerably frequent and very violent during the summer months. They are said to average 2 in June and September and 3 in July and August, but this is, I think, an under statement. These are frequent at Paracas owing to its high altitude, as they also are at Cantaritas partly I think owing to the latter being situated in an...
expanded valley, the lower end of which is shut in by high mountains, through which a narrow gorge forms the exit. Angels is quite free from mist which are also very rare in the summer months at the other three stations placed in narrow valleys, from which the cloud may roll but generally one or two hundred feet from the bottom.

From records kept at the Military Hospital at Paris, the mean monthly temperatures are given as:

- June: 62.1°
- July: 61°
- August: 57.2°
- September: 59.8°

In July and August there are a few days on which the maximum temperature registers from 80°-85° F. The evenings and mornings are always cool and at sunset a fresh breeze sets down the valley so that even during a prolonged spell of hot weather patients do not complain of the exhaustion and lassitude felt in the lower town stations, Angels & Baquieras, etc. and even Eaux Brunes & Eaux Chaudes. The mean temperature of Angels is about 6° F higher than that of Paris, & that of the other stations.
in proportion to their height. The prevailing winds in the region are N.E. in fine weather, and W. in broken weather, but high winds are rare in summer except in thunderstorms, when there are local squalls. Aregles is situated in a wide valley—perhaps more than a mile in breadth—running east and west; it is below the level of the pine forests but is surrounded by woods of chestnut and oak. Semur, Charvans, Semur-Bronnes, St. Sauveur, and Canterets are all within the zone of pine trees and all situated in narrow valleys, though that in which Canterets is built is somewhat broader than the others—about ½ mile. Bariges is also situated in a narrow gorge which runs East and West, but it is above the level of vegetation, or rather the mountains surrounding it are so steep that nothing grows on them. This is purely a water-cure spa, no one comes except to undergo a course of treatment, while at the other stations the scenery attracts numerous summer visitors.

Mode of Life. A patient undergoing a cure at one of the Rhumanc Sulphur Springs spends his day somewhat as follows. He is usually
advised to omit his morning cup of coffee so that the waters may be taken on an empty stomach. From 7–9 is the time that this is drunk & a piece of bread is generally eaten after it. If no batters are taken patients are recommended to walk about till breakfast which is at 11 o'clock, if batters are taken they are expected to rest — at Paries they are made to go to bed for a couple of hours after a batte. Breakfast — the ordinary French great "Dijonnaise" lasts about an hour and most physicians do not restrict their patient diet while the waters are being taken a few hours do forbid butter & uncooked fruit (as at most other spas). After 2 o'clock dinning again begins & lasts till 4 or 5; batters, delicacies, &c. also go on during the afternoon. Dinner is at 6:30 or 7 & by 10 o'clock patients are recommended to be in bed. English people soon get accustomed to taking two instead of three full meals a day, though most feel the omission of the morning coffee at first. As to the amount of water drunk, more than 3 glasses (just over a pint) is very seldom given
especially with of the more active and stimulating waters such as Sanoux Bionses where it is the rule in all lung diseases to begin with very small doses \( \frac{1}{4} \) to \( \frac{1}{2} \) a plan per diem. The water is generally taken pure but some doctors make their patients mix equal parts of milk with the water which is supposed to render it more digestible.

Therapeutic applications of the group

French valueological literature abounds in hair splitting classifications of diseases suitable to each spa, as may be well seen in an "Index of the principal diseases of the spas suitable to them" given by Magain. Beaumetz & \\textit{le Bon} in their "Formulaires pratiques de Therapeutique et de Pharmacologie" ("Dain" 1897). Medical practice was even hardly framed such fine directions as would send a patient suffering from chronic rhinitis to a different water cure according as he was of a "sanguine constitution, rheumatic but not gouty, lymphatic or herpetic, excited, with goitre, arthritic, arthritic and academic or syphilitic."
Not practitioners make use of a very limited number of mineral watering places and at the Pyrenean Sulphur springs one sees patients of all constitutions not merely those who are lymphatic or scrophulous or of the so-called "hysterical" character, who are support specially to benefit by these waters. Certain centres and indications are generally admitted, which are - besides all existing states of acute inflammation - valvular heart disease, arteriosclerosis, gout, "cretic" cases of phthisis or any tendency to acute pulmonary disease.

Among the spas themselves there is a great deal of specialisation which is partly the result of fashion e.g. sending phthisical patients to Eaux-Bonnes and cases of chronic pharyngitis and laryngitis to Caunes - though the local physicians at each claim their waters as specially suitable for their own waters, partly to avoid the more or less exciting effects of the waters, patients of a distinctly hypertonic or phthisie constitution being sent by preference to the more stimulating springs. Reputation will best be avoided by taking
up ward conditions systematically and
indicating their most usual distribution to
various stations.

Constitutional Diseases

Syphilis. Patients suffering from constrict:o-
tional syphilis are sent to Canterbury
or Paris - as a rule to the latter place -
more perhaps to recover from the ill effects
of injudicious mercurial + iodide treatment
than from a belief in any specific action of
the waters on the syphilitic virus. The diuretic
+ diaphoretic effects of the waters taken in
= tonically + in hot baths further favour
the elimination of mercurial + iodine salts
which would explain the disappearance of
salivation + iodism under their action and
the fact that a more vigorous specific
treatment can be carried out here without
ill effects appearing than can be done under
an ordinary home regime. To the bracing
mountain air + regular life must probably
be attributed any improvement noted in
syphilitic cachexia, apart from the above.
Syphilitic lesions of the skin disappear during
a course of sulphur waters usually after-
having amount a more acute form.

The Bariyes waters are considered specially efficacious in causing the resorption of gum =
= water if the bones + when necrosis has taken
place the expulsion of sequestra is hastened + facilitated by the treatment.

It is no longer held that a course of sulphur
waters is a touchstone by which the presence
of Syphilitic virus latent in the organism
may be brought to light.

Struma. Till recently it was common in French
medical practice to send strumous children to
Sulphur springs, but now following the German
custom the best authorities recommend strong
Sodium Chloride waters such as those of Salsen
Starn + Priscence. diarrhoea for children who
show no local lesion but are anemic + have
a tubercular family history. It is only patients
generally of an older age of a serofulvous diarrhoea
who show distinct local manifestations of it,
pleural, Pernie or oesons, who are uns
racted by Sulphur waters.

Malarial constitution. This though not a contra-
= indication against a course of Sulphur waters
in Diseases depending on it is apt to interfere
with the treatment, as an intermittent type of fever often recurs during the use of these waters, which must then be interrupted.

**Alimentary System.** The waters of St. Sauveur are recommended by Durand, Tarde, and Dr. Jardin. Bowel movement in cases of severe dyspepsia accompanied by flatulence, but only incidentally to the "indifferent thermal" such as Flahautières. Their action is probably the same.

The only other diseases of the alimentary tract treated at the Ruisseau sulphur spring are those of the large intestine with constipation or diarrhoea depending on some chronic irritation of the colon. Such cases are sent to Contenau where the Manoire de Châtel spring is supposed to be specially efficacious. It is mildly laxative in its action and more easily digested than most of the others. A form of local treatment is also much in vogue for disease of the lower bowel, which consists in giving large enemas of the waters. A pipe ending in an ordinary enema tube is fixed percutaneously in the centre of an ordinary water closet.
seat. The patient sits on this & regulates
the flow of water for himself by a handle.
When he feels uncomfortably full he shifts
on to a discharge seat alongside. This is
repeated 2 or 3 times in succession daily.
It is said to act as a sort of internal
massage of the bowel & to give tone to its
wall. Good results are got in cases of obsti-
inate constipation by this treatment.

Respiratory System. The great majority
of patients at Argeles, Constantes & Eaux
Boumes are suffering from some affection of
this system. As regards Argeles all that
need to be said is that it has only recently
acquired a bathing establishment; the water
is brought from a spring some 8 miles distant
& artificially heated; more stress is laid upon
pure hydrostatis than at the other spas.
Considerations of lower altitude & a more
equable & winter climate would chiefly
weigh in sending a given patient here rather
than to one of the better known spas. The
bathing establishment though small is very
complete & has all the most recent fittings
for applying the water locally.
Cases of Chronic Rhinitis + Pharyngitis are far more usually benefited by a course of the waters at the above mentioned spas. They should be sent to Cauterets as a rule unless bathing is for any reason contraindicated when Causs Brunns might be chosen instead. Owing to the lack of water at the latter the arrangements for baths + douche are imperfect. According to Dr. Bouyer of Cauterets - cases where atrophic changes have taken place in the mucous membrane do less well than more recent ones with abundant secretion. Very good results are got with young strumous patients with enlarged tonsils + glands and hypertrophy of the nasal + pharyngeal mucous membrane. The number of priests, lawyers + public singers seems at Cauterets in the season shows in what high degree that spa is held for Chronic Laryngitis.

Bronchitis. The belief that Sulphur waters have an elective action on the lungs is still generally held in France, in spite of the very small amount of Sulphur which from the amount drunk can be expected by them. Be this as it may the "Source Vieille" + the "Ralliere" (at Causs Brunns + Cauterets respectively) are "par excellence" the
springs to which patients liable to attacks of winter bronchitis are directed, unless there is some concurrent contraindication, such as faint, irritable heart or a tendency to neurasthenia when the in different thermal baths are preferred.

Plutonis. Eaux Plutonis has long had a wide spread reputation for the cure of plutonis. It is at least unlikely that the waters have any specific action in this disease, but from the numerous cases recorded in the special literature of the spa, it cannot be doubted that many patients do improve under the treatment carried out there, which consists in drinking only. Though the administration of this, or any other mineral water, have no direct toxic effect on the tubercle Bacillus, it may act usefully in curing accompanying Bronchitis, to give the pulmonary lesion a better chance of healing. While to the pure mountain air credit must also be given for general improvement in the patient’s condition.

There has been much discussion as to whether the Eaux Plutonis waters favour haemoptysis in Plutonis. Pidoux at one time
"inspector of the waters" admitted that they had considerably diminished the number of consumptives sent there.

Only cases of "malignant" pleurisy in lung - pleural patients are directed to Laux Bonnes, it being found that where there is marked fibrous reaction to the disease, the treatment is not only useless but does harm. The stage to which the disease has progressed matters less - good results are yet even in advanced cases so long as no intestinal complication is present. Parapneal ulceration is by no means considered a contraindication of the spot but patients suffering from it are treated with the utmost caution. The rule with them is to begin with very small doses - an ounce or so at a time - and increase this gradually if no intolerance is shown. Up to 2 or 3 planes per diem at the most.

There seems no reason why similar cases of pleurisy should not go to Laux Bonnes for which indeed they are claimed by the local physicians. But medical fashion has fixed on Laux Bonnes and the majority are still sent.
Locomotory System

Chronic Rheumatism - being treated with
more or less success at all hot springs the
Rheumatic ones get their share of cases like
the rest. The mineral waters, viz., those of
Leurs Chaudes, St. Sauveur, and the "Teja"
= water". Carthon springs are usually
chosen. But unless the tonic effects of
mountain air are specially desired, patients
from the South West of France suffering
from Chronic Rheumatism in its various forms
are as a rule directed to the hot mineral-
baths of Tar (Landes 1300' above sea-level) or
to Baghélas - St. Pignon (Hauts Pyrénées
1800 ft) which are claimed among the in-
different thermal.

Barèges has an old standing reputation
for the cure of diseases of the bones and joints,
including strumous and syphilitic affections
as well as those following traumatism
such as Artistic cases of hydranthrosis, or the
body treated from shot wounds etc. There is
a military hospital here with nearly 300
beds. This being full during the whole season
add to the overcrowding of the baths which
in such as as to make it difficult for patients always to get theirs at convenient hours. This is a distinct disadvantage in sending patients to Bariges. The use of the waters in which the "piscine" bathe and hot douche followed by rest in bed, which induces profuse perspiration, plays a chief part in favour the elimination of recovered portions of bone as well as that of bullets or other foreign bodies lodged in the tissues. Doubtless similar results would be got by similar treatment at Ceneteres or Eaux Rennes, but the scarcity of water at the latter and the distance in the former which is a large village make this impracticable. At Bariges the bath house is within two or three hundred yards of all the hotels and lodging so that

+Not a swimming bath as at Ceneteres, being too small - about 13 ft. x 7 ft. - the patient sit around on the steps.

# The "Eaux Des Arquehaisades" to which Henry III of Navarre and his wounded Knights resorted after the battle of Pavia were the Eaux Rennes waters.
patients can be conveyed home rapidly in sedan chairs after their bath or douche.

It is claimed by the Parisian physicians that, in strangulated hernia of the knee and hip, a timely course of the waters will often save the patient from surgical interference and that better results are got there than by the immobilisation methods both locally or especially in the patient’s general health. The alternative “hydromedical” treatment of white swelling in France is by sodium chloride waters. But the results of this in the Military Hospital at Bourboune (Hauteréme) were unfavourable & the army medical authorities no longer allow these cases of tubercular arthritis to be sent there. The principal cause of contraindications against sending patients with white swelling to Paris is a hectic fever + tubercular disease of the lungs.

Reproductive system

For the treatment of uterine affections St. Sauveur holds the first place in the group under consideration. Prolonged baths (15 min to an hour) at a temperature of 93°F, vaginal + rectal irrigation + abdominal...
Touches along with drinking are employed. Hysterical and lymphatic patients suffering from chronic endometritis, uterine neuralgia, or cervical catarrh from the majority of the cases treated here. The effects of the waters are sedative & do not give rise to convulsive attacks (cf. "indifferent" thermales). If a stimulating treatment is desired patients are sent to take baths at Lugo, a village ¾ of a mile off, to which a Bariges spring (Barzun) has been brought some 5 miles in pipes. Similar affections are also treated at the "Petit St. Sauveur" spring at Cauterets and also at Lacs Chaudes, where the waters are said to be specially effective in inducing retarded menstrua-

Nervous system. The stimulating effects of the Bariges & Cauterets waters are found useful in paralysis due to peripheral causes, such as rheumatism, lead poisoning and in progressive muscular atrophy.

In diseases dependent on a central, especially a cerebral lesion, treatment by sulphur waters is contraindicated.
Skin Diseases. For the cure of ostinate affections of the skin, the "Degenerated" Sulphur Springs of the Eastern Pyrenees - Ax, Brettez, or Baguerins de Luchon are generally preferred at present to the more exciting Western pumps.

When there is a tendency to acute exacerbatious stimulating sulphur waters are apt to aggravate the condition & are contraindicated. Only tepid forms should therefore be directed to them.

Good results are got at Baries & Contes in Psoriasis. Acne. Dry forms of Eczema (not gout) are generally in cases depending on a syphilitic or strumous constitution, but the therapeutic application of these waters to skin diseases holds a very secondary place now a days.
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<td>traces</td>
<td>-</td>
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<td>0.0350</td>
<td>0.6121</td>
<td>72°F</td>
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<tr>
<td>Lacs Chaudes</td>
<td>Bandor</td>
<td>0.0087</td>
<td>0.1150</td>
<td>0.0420</td>
<td>0.1030</td>
<td>-</td>
<td>0.0050</td>
<td>-</td>
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<tr>
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<td>Clt.</td>
<td>0.0090</td>
<td>0.0991</td>
<td>-</td>
<td>-</td>
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<td>Angels (+)</td>
<td>0.0232</td>
<td>0.3810</td>
<td>-</td>
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<td>0.0125</td>
<td>0.0381</td>
<td>0.533</td>
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</tr>
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</table>

(Decimals of a gramme per litre)

* Alkalinity represented as H₂SO₄.

† Prof. William's analysis 1890.
(3) Fillol l.c. p. 174.
(5) Turand-Tardel l.c. p. 610
(6) Diardian Beaumetz l.c. p. 314.

* The article is by Dr. Campardon.
+ Out of 6 cases detailed with spirometry 5 show in- creased arterial tension.


124 - 131. (Discussion on "hydro-mineral treatment of veins and articular tendons")
[23] Durand-Fardel l.c. p. 141 / Labirome
"Histoire des Fontaines de Cantalact" Pan
(Cazaux) p. 147. / Grimaud l.c. pp 103 seq.