Experiments and observations on the Crescent water at Harrogate / by Thomas Garnett.

EXPERIMENTS

AND

OBSERVATIONS

ON THE

CRESCENT WATER

AT

Harrogate.

BY

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(1791.)

PRICE ONE SHILLING AND SIXPENCE.

TO

THOMAS PERCIVAL, M.D.

F.R.S. & A.S. *Lond.* F.R.S. & R.M.S. *Edin.*
MEMBER OF THE ROYAL SOCIETY OF MEDICINE
AT PARIS; OF THE ROYAL SOCIETY OF
AGRICULTURE AT LYONS,
AND OF THE
AMERICAN PHILOSOPHICAL SOCIETY AT
PHILADELPHIA, &c. &c. &c.

A MAN ON WHOM MY PRAISES CAN
CONFER NO HONOR.

ON ACCOUNT OF NUMEROUS
OBLIGATIONS,

AND AS A SMALL TOKEN OF ESTEEM

FOR A CHARACTER

SO DESERVEDLY RESPECTED,

THIS ESSAY IS INSCRIBED,

BY

The Author.

Harrogate,
May 1st, 1791.

Dr Gregory

with respectful compliments

from

his obedient servant

The Author.

Experiments and Obſervations, &c.

THE medicinal ſprings at Harrogate in Yorkſhire, have long been in high repute, and much reſorted to; and, as Dr. Short obſerves,* this place may juſtly challenge Britain, and perhaps all Europe, for the great number and variety of its mineral waters. Nothing can ſpeak more highly in praiſe of thoſe waters, than the great numbers of patients whoſe diſeaſes have long reſiſted the power of medicine, but which have been cured here. In places where there is only one

* Hiſtory of Mineral Waters, page 237.

mineral water, that water may be highly proper in certain complaints; but it is perfectly obvious, even to thoſe not much converſant in medicine, that, ſince diſeaſes are ſo very different, and often directly oppoſite in their nature, it is impoſſible for one remedy to cure all; nay, it is equally evident, that if a remedy is found to be of ſervice in any particular diſeaſe, it muſt be prejudicial in complaints of an oppoſite nature.

The number and variety of mineral waters at Harrogate, however, is ſuch, as to afford relief in a great variety of diſeaſes. Thoſe commonly called the *ſulphur wells*, are perhaps more generally uſeful than any other at this place; yet they ought not to be uſed indiſcriminately; and there are many valetudinarians to whom a free uſe of the ſulphur water is hurtful: I mean thoſe whoſe habits are relaxed, and ſyſtems weakened, particularly where the powers of digeſtion are much impaired. Though a ſmall quan-

tity

tity of the ſulphur water, may in theſe caſes produce no bad effects, yet a free and liberal uſe of it, by increaſing the debility already preſent, is very prejudicial. Such patients generally find more relief from a continued uſe of the chalybeate waters for a conſiderable length of time.

On the contrary, in diſeaſes of an inflammatory nature, where a plethoric or too vigorous a ſtate of the ſyſtem exiſts, the chalybeates by acting as tonics, and conſequently increaſing that ſtate of the body on which the diſeaſe depends, muſt be hurtful: here we may hope for the beſt effects from a judicious uſe of the ſulphur water, and experience ſhows us that this hope is not ill grounded: for this water, by its cooling, purgative quality, has a tendency to diminiſh the inflammatory, or plethoric ſtate of the body on which the diſeaſe depends.

I ſhall ſay nothing here, of thoſe cutaneous eruptions which ſo often yield to

a judicious uſe of the ſulphur water, externally and internally applied, after they have baffled the efforts of medicine; as I intend ſoon to lay before the public, a general treatiſe on the Harrogate waters, in which I ſhall be much more particular than is poſſible in this ſhort eſſay.

It has often been wiſhed by practitioners, that we were poſſeſſed of a mineral water, of a middle nature; that is, one which was impregnated with iron, and yet contained a ſmall quantity of purgative ſalt. Such a water might naturally be expected to produce good effects in dyſpeptic complaints, or diſeaſes of indigeſtion, where, at the ſame time that iron produces good effects as a tonic, it is neceſſary to keep the bowels open, or at leaſt to prevent coſtiveneſs.

Of this nature is the water lately diſcovered in the gardens belonging to the Creſcent, at Low Harrogate, and which, from its ſituation, has obtained the name of *Crescent Water*. For though it may be

be imagined that the ſame effects might be produced by the alternate uſe of the ſimple chalybeate, and ſulphur waters; yet it is highly probable that theſe different waters, mixed and combined in different proportions, by the chemiſtry of nature, may be better calculated to anſwer the purpoſe. To this conjecture we are led by the following curious fact, of the truth of which I have frequently aſſured myſelf, but which, I confeſs, I cannot explain in a ſatisfactory manner. When the ſimple chalybeate waters at High-Harrogate, are mixed with the ſulphur water at Low-Harrogate, a decompoſition ſoon takes place: the mixture aſſumes a blackiſh tinge; the iron is precipitated, and perhaps ſome other change is produced. The ſame effect follows from a mixture of the Creſcent with the ſulphur water. But though the Creſcent contains all the principles of the ſulphur water, viz. the ſalt and ſulphureous gas, together with the principles of the chalybeates at High-Harrogate, yet it holds them all perfectly in ſolution.

It is, from hence, very probable, that if the ſulphur and chalybeate waters are uſed together, or as they generally are, the ſulphur water in the morning and the chalybeate ſoon after, they will decompoſe each other in the body; the iron will be precipitated; and in that form, the ſmall quantity which was diſſolved in a glaſs of the water will produce no ſenſible effect, for a very large quantity of the calx of iron may be taken without inconvenience; though the iron which is minutely diſſolved in the water, notwithſtanding its ſmall quantity, may, and evidently does produce good effects as a tonic. In caſes therefore, where good effects are to be expected from the union of chalybeate, and ſaline, as well as ſulphureous principles, it is evident that a water which holds all theſe in ſolution, muſt be a deſirable acquiſition to Harrogate. Of this nature, the Creſcent water will from the following analyſis appear to be.

It is remarkable that the greateſt and moſt uſeful diſcoveries have ſeldom been the reſult of philoſophical inveſtigation, but merely of chance; for we have frequent inſtances of ignorant people, ſtumbling as it were, upon diſcoveries, which the philoſopher has in vain attempted. This has been the caſe with many of the mineral waters, as well as ſeveral valuable medicines; chance having diſcovered virtues in them, which the philoſopher never dreamed of. This does not now, however, apply ſo accurately to mineral waters; for, from the preſent improved ſtate of chemiſtry, we are able to aſcertain, with a great deal of nicety, the principles contained in them; and from analogy, we can, in ſome meaſure, foretell their medicinal effects to be the ſame with other waters of the ſame nature.

The diſcovery of the Creſcent water, was indeed owing to chance; and ſoon after it was diſcovered, ſome chemical experiments were made to aſcertain its nature, but

but I have never ſeen any attempt to analyze it accurately: this induced me to make the following experiments, which are ſubmitted with diffidence to the inſpection of the public. Every one who is acquainted with chemiſtry, muſt be ſenſible of the difficulty of the undertaking, the analyſis of mineral waters, being, with great reaſon, looked upon as the moſt difficult part of chemiſtry: but I have undertaken the taſk with the greater confidence from the reflection that thoſe who are beſt acquainted with the ſubject, will be the moſt ready to pardon any error or inaccuracy I may have committed in the following pages.

The Creſcent water was diſcovered in the year 1783, by the proprietor. He had occaſion to dig for freſh water, in a field, ſince converted into a garden; but, contrary to his expectations, the water which he met with was ſo far from being pure, that it reſembled that at the ſulphur wells both in taſte and ſmell. It was not however,

taken any notice of, but the well was filled up again a few weeks after it was opened. It happened however, that a perſon, who had uſed the other waters at Harrogate without ſucceſs, had been induced to try the Creſcent, while it was open, without the knowledge of the proprietor, and received much benefit from it. The next year he returned to Harrogate, and inquired for the well; upon being told that it was filled up, he prevailed upon the proprietor to open it again: in a little time a pump was put down, and ſince then it has been gradually advancing in reputation. The ſtone ciſtern or trough into which the water falls from the pump, is covered with a brown cruſt, evidently occaſioned by the depoſition of the iron and calcareous earth which this water contains.

I ſhall firſt give the general characters, and phyſical properties of the Creſcent water, and then proceed to the experiments, which were made in the ſummer of 1790.

The Creſcent water when firſt taken from the pump, and poured from one glaſs into another, ſparkles conſiderably, and emits numerous bubbles of air, which attach themſelves to the inner ſurface of the glaſs.

It is not perfectly tranſparent, but more or leſs turbid at different times ; in general it has a whitiſh cloudy appearance.

The taſte is ſaline, and rather vapid, imparting a certain ſmoothneſs to the palate ;* it is much more pleaſant than the ſulphur water : a chalybeate taſte is alſo very perceptible.

It has an evident ſulphureous ſmell, or hepatic odour, though not near ſo ſtrong as that emitted by the ſulphur water.

By

* This water ſeems much more ſtrongly impregnated with fixed air in winter than in ſummer : I have found the taſte quite acidulous, and very briſk, ſeveral times this laſt winter.

By means of a very good hydrometer, the ſpecific gravity of this water was found to be to that of diſtilled water as 1020 to 1000, the temperature of both being 60 degrees.

On the 19th of Auguſt, 1790, I compared the temperature of the Creſcent water with that of the atmoſphere, and ſeveral other ſprings, and found the reſult to be as follows:

	Of Farenheit.
Temperature of the Creſcent Water,	52°
——— the pump in the yard	55°
——— the drinking ſulphur well	54°
——— the well next the drinking well	57°
——— the loweſt ſulphur well	56°
——— St. Magnus's well	51°
——— the atmoſphere	60°

Hence, it appears, that the Creſcent water is colder than any of the other mineral waters at Low-Harrogate, and nearly as cold as that ſpring commonly called, (though perhaps improperly) St. Mungo's

or

or St. Magnus's Well,* which is very pure water, and an excellent cold bath; though from what caprice I cannot tell, it has of late, been very much neglected.

EXPERIMENT I.

On mixing a few drops of *tincture of galls* with the Creſcent water, it ſoon aſſumes a fine purple tinge, which, by ſtanding, grows darker, inclining to a black or duſky green. If the water on which this experiment is made, is expoſed to the air, it entirely loſes its dark colour; a variegated pellicle is ſeen on the ſurface, and in a few days, a brown precipitate falls to the bottom of the glaſs.

EXPERIMENT II.

On mixing a few drops of the *Pruſſian alkali* with a glaſs of the Creſcent water, a beautiful dark green was inſtantly produced;

* The cold bath at Copgrove is moſt probably the well formerly dedicated to St. Mungo or Mongah. Vide Hargrove's Hiſtory of Knareſbro', p. 139.

duced; and when the mixture had ſtood about half an hour, a fine blue precipitate fell to the bottom.

Both theſe experiments were repeated with water which had been expoſed for twenty four hours to the air, in a glaſs, and alſo with water which had been ſlightly boiled; but neither tincture of galls, nor Pruſſian alkali produced any change upon it in this ſtate.

From theſe experiments, it is evident that the Creſcent water is a chalybeate, or contains iron. Both the tincture of galls and Pruſſian alkali are very delicate teſts for diſcovering the preſence of this metal, particularly the latter, which diſcovers the moſt minute portion of iron imaginable. From the experiments with the water which had been expoſed to the air, and that which had been boiled, it appears that the iron is held in ſolution by a very volatile principle, and which is eaſily diſſipated. This is alſo evident from

from the purple colour produced by the tincture of galls: for if the iron is held in ſolution by the vitriolic or marine acid, the colour produced by tincture of galls, is always a blue, inclining to black.

EXPERIMENT III.

A piece of paper, on which characters were written with a pen dipped in a ſolution of *ſaccharum ſaturni*, being placed over a glaſs, nearly filled with the water juſt drawn from the pump, the characters in about five minutes, became viſible, and of a brown colour, but not near ſo dark as when ſuch a paper is held over the ſulphur water.

From this experiment, it is evident, that this water is impregnated with hepatic, or ſulphureous air, though not in the ſame quantity as the ſulphur water.

EXPERIMENT IV.

When paper tinged by ſaturated tincture of *turnſole*, was dipped into a glaſs of this

this water taken freſh from the pump, its colour was evidently changed from purple to red; but no ſuch change was produced when ſuch a paper was dipped into water which had been expoſed for ſix hours to the air in an open glaſs.

From this experiment, we may conclude, that this water is impregnated with an acid, ſince acids change the colour of paper tinged by tincture of turnſole to a red. From the experiment with water which had been expoſed to the air, it is evident that the acid with which it is impregnated, is of a volatile nature, and eſcapes upon expoſure to the air.

EXPERIMENT V.

When *ſalited terra ponderoſa* is dropped into the water, white clouds are ſoon diſcovered; and after the mixture has ſtood ſome time, a ſmall quantity of white ſediment falls to the bottom of the glaſs.

This

This experiment ſhows that the Creſcent water contains vitriolic acid. For the ſalited terra ponderoſa diſcovers the ſmalleſt portion of that acid, with whatever ſubſtance it is combined; becauſe the vitriolic acid has a greater attraction for the terra ponderoſa than for any other ſubſtance, except phlogiſton; and ſeparates it from all the other acids, forming with it a *ſpathum ponderoſum*, which is ſcarcely at all ſoluble in water.

EXPERIMENT VI.

A few drops of an aqueous ſolution of *acid of ſugar* being mixed with a glaſs of the Creſcent water, the mixture became turbid, and a white precipitate fell to the bottom of the glaſs.

This experiment ſhows that the Creſcent water contains lime or calcareous earth; for the acid of ſugar inſtantly diſcovers the moſt minute particle of lime, with whatever acid it is united. This

acid

acid attracts lime with such force that it expells even the vitriolic acid itself, and all other acids hitherto known; and forms with it a salt very difficult of solution, which therefore falls to the bottom in the form of a white powder.*

EXPERIMENT VII.

A little of the solution of silver in the nitrous acid, being dropped into a glass of the Crescent water, just taken from the pump, the mixture immediately became turbid, and a white sediment fell to the bottom.

EXPERIMENT VIII.

Lime water being mixed with the Crescent water, renders it turbid, and a precipitate in a little time falls to the bottom.

* Bergman's Essays, Vol. I. p. 239.—also Essay on the acid of sugar.

EXPERIMENT IX.

When the Creſcent water was boiled with an equal quantity of new milk, it did not curdle it.

EXPERIMENT X.

The Creſcent water will not diſſolve ſoap, but curdles it.

I next endeavoured to aſcertain the nature of the permanent vapours contained in this water. But as I had found, from repeated trials, all the methods for collecting theſe volatile principles, recommended by authors, very inconvenient; I was in hopes that I could improve upon them; and after ſeveral attempts, I think I have hit upon a method of obtaining, and ſecuring the volatile contents of waters, with eaſe, and ſufficient accuracy. I took the hint from the peruſal of a complex machine, deſcribed by M. Bergman, but which, I have found from experience, will not anſwer the

the purpoſe. The firſt attempt I made of this kind, I have related in a treatiſe which I publiſhed laſt year;* but this was by no means ſo convenient as I could wiſh. I afterwards made uſe of the ſimple veſſel delineated on the annexed plate, which I found by much the moſt convenient of any which I have ſeen, and which I ſhall here take the liberty to deſcribe, as it may be uſeful to others who are engaged in ſimilar purſuits.

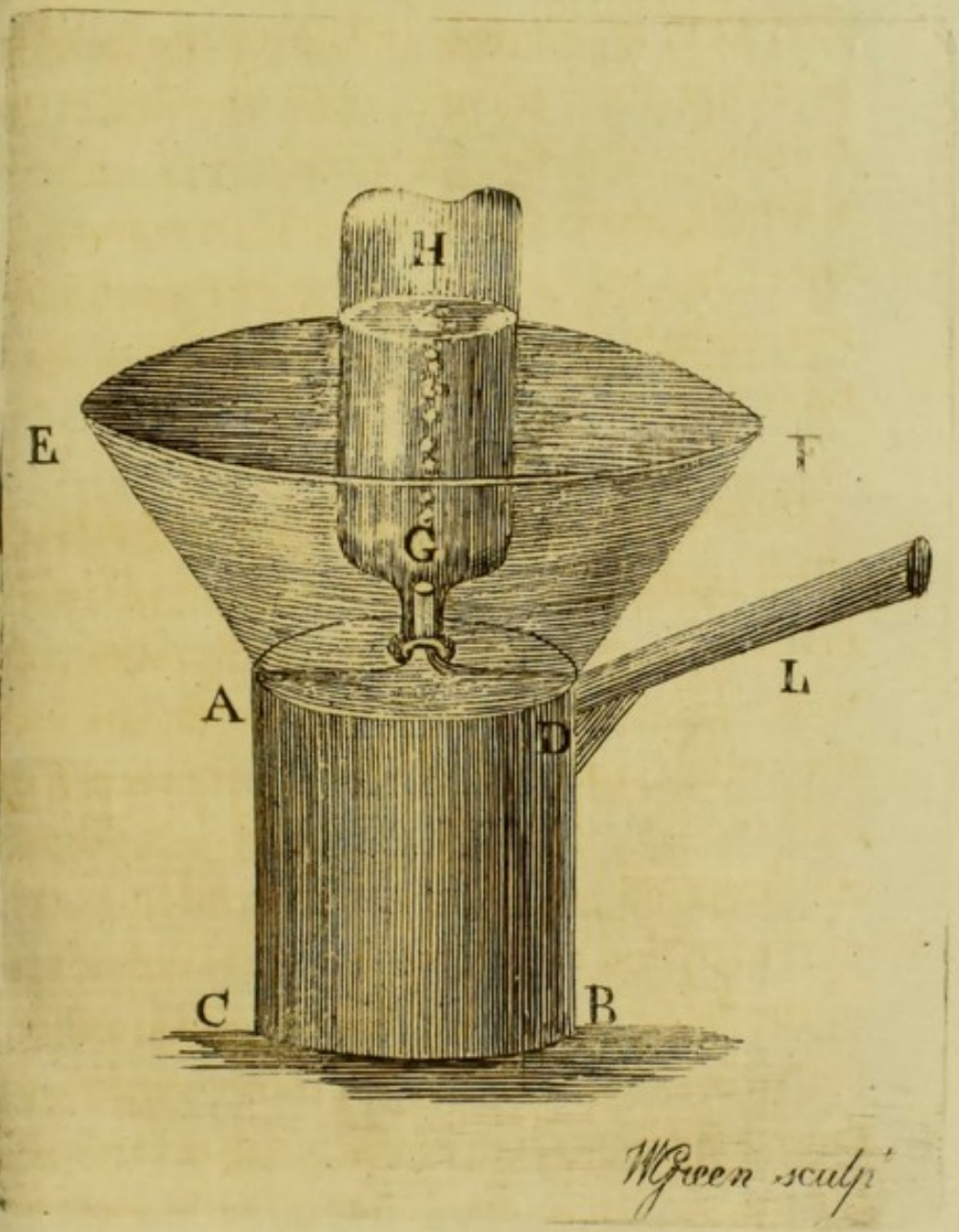
The veſſel E A C B D F is made of tin, and is of one entire piece; the part A C B D is cylindrical, and perfectly cloſed both at the bottom and top, excepting where the tube G, about two inches in length, is inſerted. The cylindrical part holds exactly half a gallon, wine meaſure. To the top of this cylindrical part is ſoldered the ſhelving part E A D F, being the fruſtum of an inverted cone; and the capacity of it is of no conſequence.

When

* See Experiments and Obſervations on the Horley-Green Spaw, p. 18.

When this veſſel is uſed, the cylindrical part A C B D is accurately filled to the top of the tube G, with the mineral water to be examined; the ſhelving part E A D F is likewiſe filled to the height of about four inches, with the ſame or common water. A phial H G, filled with oil, alcohol, or even with common water heated to ſuch a degree that it will not abſorb the air, is inverted over the tube G K.

The veſſel is then placed upon the fire, till it boils gently; all the air, or volatile matters contained in the half gallon of water, which fills the cylindrical part of the veſſel, will be expelled by the heat, and riſe up through the tube G K into the inverted phial, occupying the upper part of it, and diſplacing an equal quantity of the fluid, which will be forced into the ſhelving part. When no more aëriform fluid riſes, the place in the phial, occupied by the air, may be marked with ink, a diamond, or a file. The phial is then to be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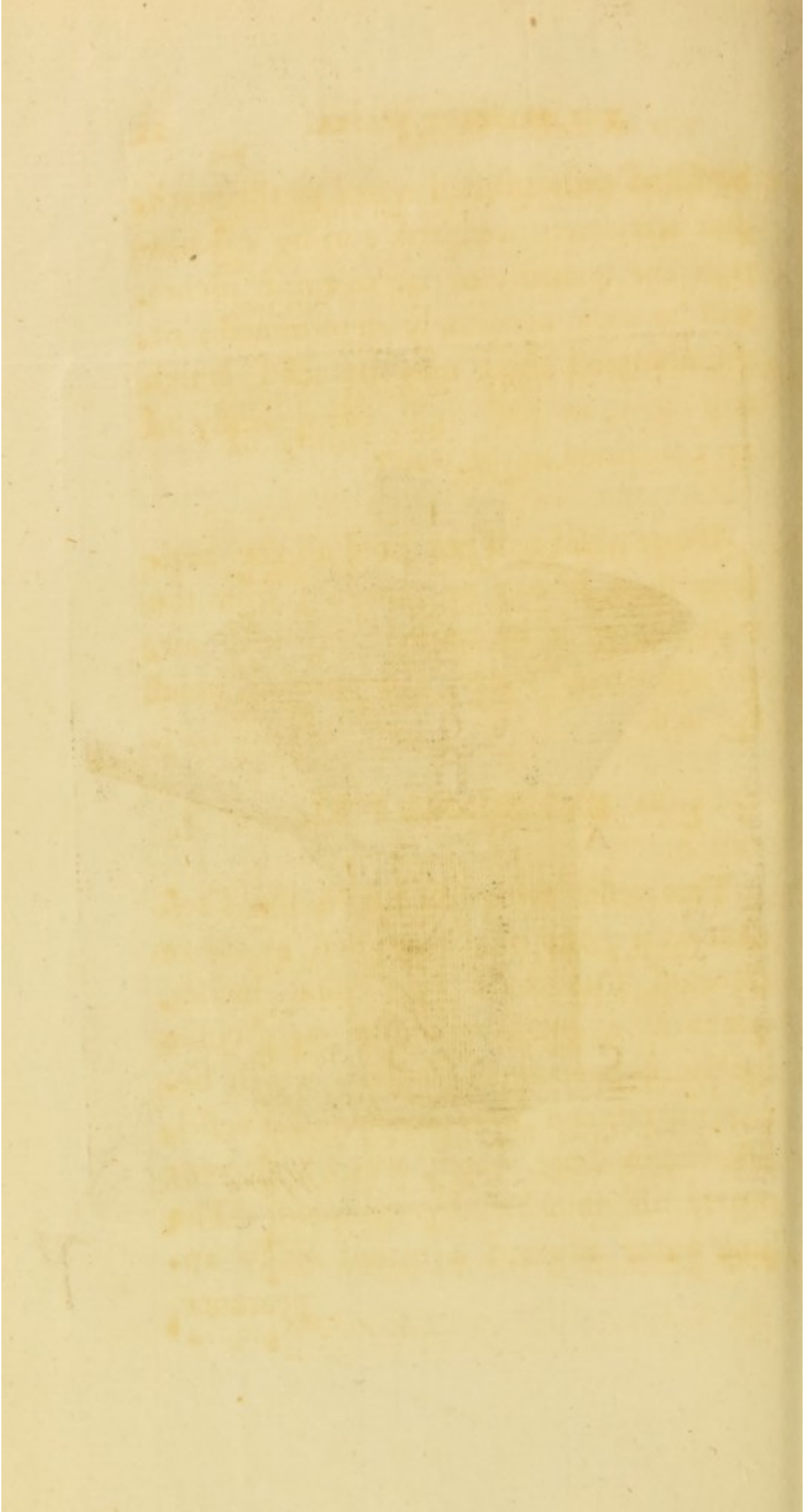

be filled with diſtilled water to the mark, and accurately weighed, and by calculation, the quantity of air in cubic inches, will be very accurately determined; or, a gradulated phial may be uſed, which will ſhow, at firſt ſight, the quantity of air contained in the water.

If one phial will not hold all the aëriform fluid, it may be removed from the tube before it be quite filled with air, corked under water, and another phial applied.

EXPERIMENT XI.

This veſſel being filled with the Creſcent water, and phials applied as above directed, I obtained 17,2 cubic inches, which in a gallon would be 34,4 cubic inches of permanent vapour, which being introduced into an inverted veſſel, filled with lime water, was all, or very nearly all abſorbed by agitation. The lime water aſſumed a turbid milky appearance,

pearance, and had evidently a ſulphureous ſmell; whence I conclude, that the air contained in the Creſcent water, conſiſts of fixed and hepatic air, common air being never found either in ſulphureous or chalybeate waters.*

The next thing to be done, was to ſeparate the fixed and hepatic airs from each other, which did not at firſt ſight ſeem very eaſy, as both theſe airs are abſorbed by water; I however attempted it upon the following principle.

When a ſufficient quantity of lime water is mixed with water impregnated with fixed air, the air will be abſorbed by the lime; but when lime-water is mixed with water ſaturated with hepatic air only, no decompoſition will take place. I therefore took a quart of lime-water, and added to it a quantity of quick lime in powder, which was much more than ſufficient to abſorb the quantity of air contained in an equal

* Bergman's Chemical Eſſays, Vol. I. p. 248, & 299.

equal quantity of the Creſcent water, provided it was all fixed air: this I put into the cylindrical part of the veſſel, and added to it a quart of the Creſcent water, which exactly filled it: I then ſtopped the tube G with a cork, and having filled the ſhelving part to the height of about four inches, the mixture was ſuffered to ſtand about half an hour, in which time the fixed air muſt have been all abſorbed from the water: I then applied an inverted phial, as above directed, and placed the apparatus on the fire; when the air had ceaſed to riſe into the inverted phial, the place occupied by it was meaſured, and found to contain 3,4 cubic inches. This air did ſcarce produce any decompoſition when paſſed through lime-water, but impregnated it ſtrongly with an hepatic or ſulphureous ſmell. Since therefore a quart of this water contains 3,4 cubic inches, a gallon of it muſt contain 13,6 cubic inches of hepatic air, which ſubtracted from 34,4 cubic inches, the whole quantity of the air obtained by the

firſt part of the experiment, leaves 20,8, for the quantity of fixed air. It appears then, that a wine gallon of this water contains 20,8 cubic inches of aërial acid, or fixed air, and 13,6 cubic inches of hepatic or ſulphureous air.

EXPERIMENT XII.

I poured a wine gallon of the Creſcent water into a clean tin veſſel, and placed it over a fire; air bubbles ſoon began to riſe, the water grew turbid, and depoſited a browniſh ſediment: it was ſuffered to boil for twenty minutes, before which time it had ceaſed to depoſit any more ſediment.

When the water was cold, I poured off the clear, till it came very near the bottom of the veſſel; I then filtered the remainder, and having dried the filter, I found the weight of the powder left upon it to be $5\frac{1}{10}$ grains.

EX-

EXPERIMENT XIII.

That I might diſcover the nature of this powder, I expoſed it for about a month to the rays of the ſun, having frequently moiſtened it during that time: I then calcined it in a crucible, keeping it in a red heat for near an hour, and upon preſenting a magnet to it, ſeveral particles were evidently attracted; from this I was convinced that it contained iron. In order to ſeparate the iron from the other ſubſtances which might be mixed with it, which are generally calcareous earth and magneſia, I put the powder into a phial, poured upon it a quantity of diſtilled vinegar, and let it ſtand two days, having frequently agitated it in the mean time. The diſtilled vinegar diſſolves the magneſia and lime, but will not act upon iron which has been dephlogiſticated by the rays of the ſun, or by calcination.* I then filtered the liquor, and having dried the powder on the filter, I found the

* Bergman's Phyſical and Chemical Eſſays, Vol. I. p. 160.

weight of it to be exactly two grains ; the vinegar had conſequently diſſolved $3\frac{1}{10}$ grains. This powder which remained on the filter, and which was not ſoluble in the diſtilled vinegar, was evidently iron : when calcined it was attracted by the magnet, and upon diſſolving it in diluted vitriolic acid, the Pruſſian alkali precipitated it in the form of Pruſſian blue.

Hence it is evident that a gallon of the Creſcent water contains two grains of iron, held in ſolution by fixed air.

EXPERIMENT XIV.

The acetous ſolution was next evaporated to dryneſs, and yielded a filamentous ſubſtance, reſembling moſs. This ſubſtance being expoſed to a moiſt air for above a week, was not diliqueſcent, but permanent ; which was a proof of its being acetated lime, for acetated magneſia is diliqueſcent under the ſame circumſtances.* To be more certain of this, it was

* Bergman's Eſſays, Vol. I. p. 161.

was diſſolved in diſtilled water, a little of it was poured into a glaſs, and diluted vitriolic acid added to it, drop by drop. The mixture became in ſome meaſure turbid, and in about an hour, I found a ſubſtance at the bottom in the form of fine flakes, which had an inſipid taſte, and every appearance of ſelenite. Another part of the ſolution was poured into another glaſs, and lime-water mixed with it; but after it had ſtood more than an hour, no decompoſition had taken place, which would have happened if any magneſia had been preſent; lime having a greater affinity for the vinegar than the magneſia has, and conſequently would have ſeparated that earth. To the remainder of this ſolution, a few drops of a ſolution of vegetable alkali were added: the mixture immediately became turbid, and depoſited a copious ſediment, which being collected by filtration, was put into a crucible, and kept in a red heat for more than an hour, and then diſſolved in water. Some of the clear ſolution was poured into the

bend

bend of a glaſs ſyphon, and upon making fixed air paſs through it from my lungs, it immediately became turbid, and white like milk, which convinced me that it was calcareous earth; it was reduced to quick lime by calcination, in which ſtate it was ſoluble in water, but was precipitated from it by fixed air.

From this it is evident that a gallon of the Creſcent water contains $3\frac{1}{10}$ grains of calcareous earth, held in ſolution by the aërial acid.

EXPERIMENT XV.

The gallon of water from which this precipitate (Exp. 12.) had been procured, was evaporated very ſlowly in an earthen veſſel, to dryneſs, and I found at the bottom of the veſſel, a quantity of whitiſh ſalt, the weight of which was 8 dwt. 1 gr.

EXPERIMENT XVI.

In order to ſee what acids this ſalt contained, I evaporated ſome more of the water,

water, and obtained a proportional quantity of ſalt. Upon part of this ſalt, I poured ſome concentrated vitriolic acid; a grey ſmoke was inſtantly produced, with a peculiar ſmell, which I knew to be that of the marine acid. I held a paper moiſtened with water over the ſalt, and the vapour inſtantly ſurrounded it, which was another proof of its being the vapour of the marine acid : * the paper ſoon acquired an acid taſte.

From this experiment it appears that that this ſalt contains the marine acid in its compoſition.

EXPERIMENT XVII.

A little of this ſalt was diſſolved in water, and a few drops of ſalited terra ponderoſa being mixed with it, the mixture ſoon became turbid, and a ſmall quantity of a white precipitate fell to the bottom of the veſſel.

From

* Bergman's Eſſays, Vol. I. p. 167.

From this experiment it is evident that this ſalt contains ſome vitriolic acid in its compoſition.

To determine accurately the nature and quantity of each ſalt which this water might contain, I made the following experiments as directed by M. Bergman in his Phyſical and Chemical Eſſays,* and M. Fourcroy in his Elements of Chemiſtry.†

EXPERIMENT XVIII.

(A) The ſalt which was collected from a gallon of the water, and which, as was obſerved before, weighed eight pennyweights and one grain, was put into a phial, and rectified ſpirit poured upon it to the height of about two inches; the phial was then well ſtopped and ſhaken, and after ſtanding twenty hours, it was filtered.

(B) To

* Vol. I. p. 159. † Vol. II. p. 208.

(B) To the reſiduum I then added eight times its weight of cold diſtilled water; the mixture was ſhaken, and after ſtanding about twelve hours, it was filtered; but nothing, or next to nothing was left on the filter.

I next proceeded to examine the ſolution obtained by the rectified ſpirit, which was of a browniſh colour, and had a very bitter taſte. As this ſolution generally conſiſts of lime or magneſia ſalited or nitrated*, to diſcover whether theſe ſalts were preſent, I made the following experiment.

EXPERIMENT XIX.

I took part of the ſalt obtained from the water in Exper. 16, and poured rectified ſpirit upon it, in the ſame manner as upon the ſalt procured from a gallon of the water (Exper. 18. A.) Part of this ſpiritous ſolution was evaporated to dryneſs, and upon pouring upon it ſome concentrated

* Bergman's Eſſays, Vol. I. p. 164.

centrated vitriolic acid, and holding a wet paper over it, it was evident from the peculiar ſmell and grey ſmoke, which attached itſelf to the paper, that this ſalt contained the marine acid in its compoſition. Nitrated ſilver, upon being mixed with a ſolution of this ſalt in water, confirmed this, by the turbid appearance which it occaſioned, and the precipitation which followed.

Into part of the remainder of this ſolution, I dropped ſome ſalited terra ponderoſa; but no change was produced which indicated the preſence of the vitriolic acid.

To determine the quantity of this ſalt, I evaporated the firſt ſpirituous ſolution (Exper. 18. A.) to dryneſs; and found 1 dwt. 21 gr. of a browniſh ſalt which had a very pungent, bitter taſte, and which, on being expoſed to the air a very little time, became diliqueſcent.

The

The next thing to be done, was to diſcover the baſe of this ſalt, for which purpoſe I made the following experiments.

EXPERIMENT XX.

A quantity of this ſalt was diſſolved in water, and an equal quantity of lime water was mixed with it: a decompoſition ſoon took place, and a precipitate in fine flakes like ſnow, fell to the bottom of the veſſel. A little diluted vitriolic acid was mixed with tincture of turnſole, and this precipitate was added by degrees, agitating the mixture frequently, till by the colour I judged that the vitriolic acid was ſaturated with the earth. The ſolution was very tranſparent; it was evaporated almoſt to dryneſs, and on being ſuffered to ſtand two days, a few ſmall cryſtals were obſerved at the bottom of the veſſel, which from their figure and taſte were certainly vitriolated magneſia or Epſom ſalt.

Hence it appears, from the preceding experiments, that the ſalt diſſolved by the rectified ſpirit, was *ſalited magneſia*, and that a wine gallon of the Creſcent water, contains 1 dwt. 21 gr. of this ſalt.

EXPERIMENT XXI.

The ſolution made by cold water (Exper. 18. B.) was next examined; it was evaporated to dryneſs, and was found to weigh 6 dwt. 1 gr. which was three grains ſhort of what it ought to have weighed, ſince the whole quantity of ſalt procured from a gallon of the water, weighed 8 dwt. 1 gr. (Exper. 15.) and the quantity diſſolved by the alcohol being ſubtracted from it, leaves 6 dwt. 4 gr. Whether theſe three grains were loſt in performing the experiments, or whether it might depend upon the ſalt having leſs of the water of cryſtallization, I am at a loſs to determine. This ſalt was re-diſſolved in water, and evaporated by a very gentle heat, till a drop of it being taken out of the veſſel, and let fall upon cold glaſs,

glaſs, ſhowed evident ſigns of cryſtallization; it was then placed in an oven, near a fire for forty-eight hours, and in that time was converted into beautiful cryſtals, which ſeemed all of marine ſalt; but this ſalt having been expoſed to a damp air, for ſome days, became in ſome meaſure moiſt: this circumſtance, together with the experiment with the ſalited terra ponderoſa, (Exper. 17.) ſhowed that a vitriolic ſalt was mixed with it. I therefore diſſolved the ſalt again in water, and added to it a ſolution of the *foſſil* alkali, that the baſis of the marine ſalt might not be precipitated; the mixture after ſtanding ſome time, ſhowed evident marks of a decompoſition, and after it had ſtood ſix hours, a very ſmall quantity of precipitate was found at the bottom of the veſſel. This being carefully collected on a filter, was found to weigh $1\frac{1}{2}$ grains. On pouring diluted marine acid on this earth, it was diſſolved, and precipitated again by lime water, which was a proof of its being magneſia; conſequently

quently the ſalt mixed with the marine ſalt, was vitriolated magneſia, or Epſom ſalt.

To determine the quantity of Epſom ſalt, from which this grain and half of magneſia was precipitated, Mr. Kirwan informs us, that 100 grains of cryſtalized Epſom ſalt contain 23,75 of acid, 19 of earth, and 57,25 of water: hence the quantity of cryſtallized Epſom ſalt from which this magneſia was produced muſt have been very nearly 8 grains. This ſubtracted from 6 dwt. 1 gr. leaves 5 dwt. 17 gr. for the quantity of muriatic or ſea ſalt.

From the preceding experiments, a wine gallon of the Creſcent water appears to contain

	dwt.	gr.
Of aërated iron	0	2
aërated lime	0	$3\frac{1}{10}$
ſalited magneſia	1	21
muriatic or ſea ſalt	5	17
vitriolated magneſia, or Epſom ſalt	0	8

Of

Of aërial fluids

Aërial acid, or fixed air 20,8 cubic inches.
Hepatic, or ſulphureous air 13,6 cubic inches.

Excluſive of a ſmall quantity of aërial acid retained by the iron and lime in the heat of boiling water.

It may, at firſt ſight, appear ſurpriſing that this water ſhould contain magneſia united with the vitriolic and marine acids, and at the ſame time, calcareous earth combined with fixed air; for we might, perhaps, expect, that the calcareous earth, which has a greater affinity for thoſe acids than magneſia has, would ſeparate that earth, and combine with them, and leave the magneſia at liberty to combine with the fixed air. But ſuch examples frequently occur in chemiſtry, and can only be explained by what the chemiſts call double elective attraction, whereby it happens that ſubſtances are often combined differently from the order of ſimple affinities; becauſe the ſums of the attractive forces

forces which hold them in combination, are greater than the ſums of the forces which endeavour to ſeparate them.

To illuſtrate this, let us ſuppoſe, that A is a ſtronger acid and B a weaker, alſo that C is an earth which has a greater attraction for thoſe acids than D has. Suppoſe the attraction between A and C $= x$ and the attraction between A and D which is leſs, $= x - 1$; ſuppoſe that the attraction between B and C which is likewiſe leſs than the attraction between A and C be alſo $= x - 1$ but the attraction between B and D being the leaſt of all, we may ſuppoſe $= x - 3$. Suppoſe next that A is combined with D and C with B, yet there will be no ſeparation, though C has a greater attraction for A than it has for B. for the forces which keep the compounds together will be equal to the ſums of the attractions of A for D and C for B, $= 2x - 2$, but the forces which tend to ſeparate them will be $2x - 3$, which being leſs than the forces by which they are kept together, will produce no effect.

Having

Having finiſhed the account of the analyſis of the Creſcent water, I ſhall proceed to make a few remarks on the diſeaſes in which it has been found uſeful, and alſo on the method of uſing it with the greateſt proſpect of ſucceſs.

Although from the knowledge of the contents of this water, we might from analogy, deduce its virtues in particular diſeaſes, yet this method of reaſoning *a priori*, is by no means ſo certain and ſatisfactory as that which depends on facts and experience. For this reaſon, I ſhould have wiſhed to have confined myſelf entirely to the reſult of experience, but our knowledge of the medicinal virtues of this water is yet in its infancy. It is true, we are in poſſeſſion of ſeveral caſes, in which it has been ſucceſsful, and many more have probably eſcaped the obſervation of medical practitioners; but ſtill it may be preſumed that there have not been ſufficient opportunities of aſcertaining all the virtues of a water ſo lately diſcovered.

When

When we take a view of the preceding analyſis, we are ſtruck with the variety of ſubſtances contained in this water. It contains within itſelf all the principles which are to be found in any of the other waters at this place. It reſembles the waters at High-Harrogate, as containing iron held in ſolution by fixed air; and the ſulphur water at Low-Harrogate, being impregnated with the ſame ſalt, and the ſame aëriform fluid, the heaptic gas. It likewiſe contains a ſalt, which, according to the analyſis of different authors, is not to be found in any other water at Harrogate, viz. the vitriolated magneſia, or Epſom ſalt.

I ſhall firſt conſider the medicinal virtues which each ſubſtance contained in this water, poſſeſſes in its ſeparate ſtate; though I fear that ſuch an account, however circumſtantial it may be, may not convey the proper information concerning the genuine effects of the water, when drank at the pump, ſince the medicinal

effects

effects of a compound are often different from what might be expected from the known qualities of the ingredients. We muſt therefore rely upon experiments for a proper knowledge of the virtues of this water as an aggregate, rather than upon reaſoning on its conſtituent parts; though it is proper, carefully to inveſtigate both.

I ſhall firſt begin with iron.

This metal has long been celebrated, as a tonic, and for that purpoſe has been exhibited under various forms; and it is certainly one of the moſt uſeful remedies that can be employed in diſeaſes proceeding from debility or a laxity of the fibres. The great Boerhaave obſerves that no medicine either animal or vegetable; no diet, no regimen can produce the effects, which are, in theſe caſes, accompliſhed by iron. It is often uſed in its metallic ſtate, and frequently in the form of a calx; in both of which forms, when exhibited in conſiderable quantity, it produces very

great effects as a tonic; but the moſt powerful and efficacious form in which this remedy is ever exhibited, is in a ſaline ſtate, or combined with an acid: yet none of the ſaline preparations agree ſo univerſally with patients, as that, in which this metal frequently exiſts in mineral waters, viz. in the form of aërated iron. This conſtitutes an active ſaline chalybeate, which warms and invigorates the ſyſtem, promotes appetite and digeſtion, and at the ſame time that it acts as a diuretic or diaphoretic, prevents the languor or debility which is often the conſequence of theſe evacuations.

Though the quantity of iron contained in the Creſcent water, is but ſmall, yet we generally find that in caſes of chronic weakneſs, chalybeates in very ſmall doſes, continued for a conſiderable length of time, produce effects which could not be obtained from a more liberal uſe of that metal. In confirmation of this obſervation, I ſhall tranſcribe the following remarks

marks from Dr. Cullen's Lectures on the Materia Medica. "In all cases of laxity and debility, and in obstructions and slowness proceeding from these causes, iron is employed, though other simple astringents might also answer the effect. Here we ought to beware of too sudden an astriction, which might be attended with bad consequences; and therefore, in exhibiting it in these cases, we should give it in small doses, and trust to length of time for a cure; and by this means we shall avoid those inconveniences of which physicians often complain in their preparations of iron. Mineral waters often produce cures which we in vain attempt to perform by the combinations in our shops, even although these waters contain nothing but iron. This is manifestly owing to the weakness of the dose; in proof of which we find that the strongly impregnated waters seldom answer so well as those weak ones we commonly reject." The Crescent water indeed, contains as much iron as can possibly be suspended by the quantity

quantity of fixed air with which it is impregnated; for, acording to M. Bergman, a hundred cubic inches of this air take up only about four grains of iron. *

Having given a ſhort account of the effects of iron, I ſhall next take notice of another active principle with which this water is impregnated. I mean the fixed air; the properties of which have been but little known till lately, though this fluid is almoſt every where preſent.

The quantity of fixed air contained in the Creſcent water, is very conſiderable, and it is this fluid which produces the ſparkling appearance when poured out of one glaſs into another. It is that portion only which is looſely attached, and which can be ſeparated by a gentle heat, which can contribute any active medicinal power to the water. The remainder, which adheres ſo cloſely to the earthy baſis as not to be ſeparated in the heat of boiling water,

* Bergman's Eſſays, Vol. I. p. 220.

ter, nor perhaps by any other means than calcination, or the affuſion of a ſtronger acid, is probably too inert to exert any conſiderable medicinal virtues.

When pure water is impregnated with fixed air, it acquires an exhilarating, and even inebriating quality. It is to this principle that mineral waters are indebted for their agreeable ſmartneſs and poignancy. It contributes much to the activity of the other ingredients, and (as Dr. Fothergill obſerves,) enables them to pervade the remoteſt receſſes of the human frame and ſubdue ſome of the moſt obſtinate diſeaſes. To what other principle in their compoſition, ſays he, can we rationally attribute theſe ſurprizing effects? not ſurely to the water alone, which is incapable of producing them; much leſs to the mere ſolid contents, which either jointly or ſeparately conſidered, are too inactive to exert ſuch extraordinary powers.

Fixed

Fixed air is likewiſe a very powerful antiſeptic, and Dr. Macbride has ſhown that without the extrication of this air, putrefaction cannot take place, and that by immerſing putrid or putreſcent ſubſtances in this air, they are rendered ſweet. Fixed air, when taken into the body, has always, and very juſtly, been eſteemed as a moſt powerful antiſeptic; and with this view it has been exhibited with ſucceſs in the ſcurvy, and in fevers of the putrid type; and when united with water, and other liquors, it exerts conſiderable powers as a corroborant or tonic remedy.

The hepatic air which this water contains, will impart to it the ſame virtues poſſeſſed by the ſulphur waters, in proportion to the degree of impregnation; though in the cure of cutaneous complaints, it muſt certainly give place to the ſulphur wells, which are more powerfully impregnated with this air.

Though

Though the ſalts contained in this water, are too ſmall in quantity to render it proper to be uſed as a purgative, except when drank in very large doſes, yet it operates as a gentle laxative; and I think it highly probable that the ſaline chalybeate principle is alſo aſſiſted in its operation by the purging ſalts contained in this water, which will not only prevent the bad effects which ſometimes attend the uſe of chalybeates as tonics, but will act as a grateful ſtimulus to the ſtomach and inteſtines; will be abſorbed by the lacteals, and being carried by the circulation through the various glands, it will, by gratefully ſtimulating them, promote the ſeveral ſecretions, and particularly by its operation on the kidneys and glands of the ſkin, will promote the diuretic and diaphoretic effects of this water.

I ſhall next ſay a few words concerning the ſenſible effects produced by the Creſcent water, when drank freſh from the pump.

Soon

Soon after a perſon has drank a glaſs of this water containing about half a pint, he feels a pleaſant ſenſation about the ſtomach, with a kind of agreeable warmth over the whole body; his ſpirits are exhilarated, and he finds himſelf more diſpoſed, and better qualified to enter upon ſtudy, buſineſs, or pleaſure. If the water is taken in the forenoon, betwixt breakfaſt and dinner, it generally creates a ſharp appetite, and the perſon eats his dinner with greater pleaſure than when he does not drink this water. When it is drank in a morning, and pretty briſk exerciſe uſed, it acts very powerfully as a diuretic; though when the weather is warm, or the body warmly cloathed, it is more apt to increaſe perſpiration.

From the above mentioned effects, which I have myſelf frequently experienced, and learned from others who have drank it under my direction, it appears that this water acts as a tonic, diuretic, and often as a diaphoretic: it operates

rates as a very gentle ſtimulus, and conſtitutes a mild, but active medical compound, well calculated to ſtrengthen the ſtomach, and promote digeſtion; to cleanſe the firſt paſſages, to purify the chyle and lymph, and clear the whole glandular ſyſtem. By uniting with the bile, and other alimentary fluids, in its paſſage through the inteſtines, it ſtimulates the glands diſperſed upon the ſurface of the inteſtinal canal, to pour out their contents; by which it in ſome meaſure deterges the canals of the liver, ſpleen, pancreas, and other viſcera, and removes obſtructions in them. It likewiſe ſtimulates the lacteal or abſorbent veſſels, which are diſtributed upon the coats of the inteſtines, and by innumerable mouths, take up the nutritious part of our food, and convey it to the blood, and makes them perform their functions more vigorouſly.

The diſeaſes in which this water has been found uſeful, or in which we may

expect it to be beneficial, are almoſt all of the *chronic* kind, by which is meant thoſe diſeaſes which have been of long ſtanding, and in which there is not *immediate* imminent danger: by this term they are diſtinguiſhed from inflammations, fevers, &c. in which the ſick are generally confined to their beds, and the diſeaſe terminates in the courſe of a few days, either favourably or unfavourably; theſe laſt are called *acute* diſeaſes: and in theſe we cannot expect much benefit from mineral waters, even if the patients could have recourſe to them.

The diſeaſes in which mineral waters are found beneficial, require their uſe for a conſiderable time, and we have frequent inſtances of patients who might have been cured by them, who have gone away becauſe they found no benefit from drinking them a few days: but patients ought not to be diſſatisfied if they receive no great benefit from the water in the ſpace of a week or a fortnight; for, where diſeaſes have

have continued a long time, it would be folly to expect that they could be eaſily and ſpeedily removed.

The diſeaſes in which we may expect to find the Creſcent water uſeful, may with propriety be divided into the three following heads.*

1ſt. Thoſe in which the ſtomach is principally affected.

2d. Thoſe of the inteſtines, and other abdominal viſcera.

3d. Thoſe of the lymphatic ſyſtem.

1. Thoſe diſeaſes in which the ſtomach is principally affected, are ſickneſs, vomiting, heart-burn, acid eructations, ſpaſmodic pains in the ſtomach, indigeſtion, and loſs of appetite. In caſes of gout, particularly in that ſpecies called the *atonic*, where the

* This diviſion was ſuggeſted by the peruſal of Dr. Fothergill's Inquiry concerning the Cheltenham Water, from which, I received much information and entertainment.

the ſyſtem has been weakened by frequent and ſevere attacks of that diſorder, we may expect benefit from the Creſcent water, when drank in a proper manner. I have placed the atonic gout among thoſe diſeaſes in which the ſtomach is principally affected; for though in this diſeaſe, the whole habit is generally very much debilitated, yet the ſtomach is commonly more diſordered than any other organ.

2. The diſeaſes of the inteſtines and other abdominal viſcera, in which the Creſcent water may be uſed with advantage, are colic, or ſpaſmodic pains in the bowels, flatulency, hypochondriac affections and habitual coſtiveneſs which generally accompanies that diſorder; jaundice, whether from a ſpaſmodic affection of the biliary ducts, or from gall ſtones; ſtone and gravel; piles.

3. The diſeaſes of the lymphatic ſyſtem, in which this water may be expected to be uſeful, are ſchirrus affections of diffe-

rent

rent glands; ſcrophula; rickets; ſcald head; leproſy; venereal complaints of long ſtanding, eſpecially thoſe accompanied with cutaneous eruptions.

Several of the above mentioned diſeaſes have yielded to the uſe of the Creſcent water, but many of them are of ſo obſtinate a nature, that much depends upon beginning with the water early, and perſevering for a ſufficient length of time.

DIRECTIONS

CONCERNING THE USE OF THE CRESCENT WATER.

As in many complaints in which the Creſcent water is recommended, particularly thoſe of the nervous kind, its efficacy is very much promoted by various concomitant circumſtances, ſuch as chearful and agreeable company, and exerciſe in the open air; this points out the ſummer as the moſt proper time for drinking it, becauſe theſe concomitants cannot be enjoyed in winter, in an equal degree: it may however, in caſes of neceſſity, be drank at any ſeaſon, though perhaps not with equal advantage. The beſt times for drinking it, are, before breakfaſt, betwixt breakfaſt and dinner, and in the evening; the uſual doſe is from half a pint to a pint, or from one to two glaſſes; though, at firſt, one glaſs will ſometimes be found too large a doſe, and produce ſickneſs, and a ſenſe of weight and oppreſſion in the ſtomach; for which reaſon,

it

it will be always prudent to begin with half a glaſs; and if that doſe is found to agree, it may be gradually increaſed to one or two glaſſes. As part of the bore of the pump always contains a little water, which has remained ſince the laſt time of pumping, and conſequently will have loſt part of its fixed air, and depoſited ſome of its iron; it will be proper to pump once or twice into the ciſtern, before you receive it into the glaſs.

It is common to direct the ſulphur water to be uſed in the morning before breakfaſt, and that of the Creſcent before dinner; I am, however, unwilling to ſubſcribe to this mode, till I am perfectly convinced that the chalybeate principle of the Creſcent is not injured by the ſulphur water. In the former part of this treatiſe, I mentioned an experiment which may be made by any perſon: When the Creſcent water is mixed with that from the ſulphur wells, the mixture becomes turbid, and of a blackiſh hue; and if it

is

is ſuffered to ſtand for ſome time, a black precipitate falls to the bottom of the veſſel, and the ſuperincumbent liquor does not ſhow any marks of its containing iron, on mixing it with tincture of galls or Pruſſian alkali. From this, it is obvious, that the iron is precipitated from the Creſcent by the ſulphur water. The virtues of this chalybeate depend upon its ſaline ſtate, or the iron being diſſolved by fixed air; but this ſtate is deſtroyed by the ſulphur water, and the quantity of iron which is precipitated in the form of a calx, is too ſmall to produce any ſenſible effect. Whenever therefore, it is neceſſary to uſe the ſulphur water, I would adviſe the omiſſion of the Creſcent water for that day. Where the Creſcent water is not ſufficient to prevent coſtiveneſs, one or two of Rufus's pills, or a little *lenitive electuary* may be taken at bedtime; or a ſmall quantity of Harrogate, or Epſom ſalt may be diſſolved in a glaſs of the water.

Theſe

Theſe obſervations are likewiſe applicable, and perhaps in a greater degree to the uſe of the chalybeates at High-Harrogate along with the ſulphur water.

DIET AND REGIMEN.

A circumſtance that ſurprized me, when I came firſt to Harrogate, was the uſe of tea, at the ſame time that patients were drinking the chalybeate waters. Many, for inſtance, breakfaſt on tea, and in an hour or two afterwards, drink the Creſcent water, or the chalybeates at High Harrogate. None of the faculty, to the beſt of my knowledge, have noticed the impropriety of this part of the diet of perſons who are drinking chalybeate waters; but a ſimple experiment muſt convince every one of it. If a little of the infuſion of tea is mixed with the Creſcent water, or any other chalybeate, the mixture aſſumes a purple colour, inclining to black, nearly as much as when tincture of galls is mixed with theſe waters. When the mixture is ſuffered to ſtand for ſome time, the iron

is all precipitated in the form of a black powder, and neither tincture of galls, nor the Pruſſian alkali, produce any effects upon the ſuperincumbent liquor. The ſame will undoubtedly take place in the ſtomach and firſt paſſages, if a chalybeate water is drank within an hour or two after tea. Since therefore, the ſmall quantity of iron which is contained by the aërated chalybeate waters, owes its efficacy to its ſaline ſtate, or union with, and ſaturation by the aërial acid; tea by precipitating it from this ſolvent, muſt deſtroy its effects.

From hence it muſt be obvious, that independent of the impropriety of tea, to thoſe who labour under nervous complaints, and diſorders of the ſtomach, which almoſt every one will be ready to allow, it muſt be highly improper during the uſe of chalybeate waters. I would therefore adviſe thoſe who are drinking the Creſcent water, to breakfaſt either on chocolate or cocoa, inſtead of tea. Thoſe with

with whom milk is found to agree, will find no bad effects from the uſe of it along with this water.

With regard to dinner, I would, in general, adviſe thoſe who drink this water, not to indulge too freely the keen appetite which it commonly promotes. We are all acquainted with a maxim, which, if it was practiſed as univerſally as it is acknowledged, would be productive of the happieſt effects, viz. always to riſe from table with ſome remains of appetite. By this means the ſtomach would not be cloyed, but would eaſily digeſt its contents, which it cannot do when it is overloaded. Any kind of freſh animal food that will agree with the patient may be eaten with moderation; but the tables at Harrogate are frequently crowded with ſo many luxuries, that it is often difficult to reſiſt the temptation of taſting ſeveral diſhes.

The beſt rule is that given us by Dr. Armſtrong.

When

When dinner comes, amid the various feaſt,
That crowns your genial board, where every gueſt,
Or grave, or gay, is happy and at home,
And none e'er ſighed for the mind's elbow room;
I warn you ſtill to make your chief repaſt
On one plain diſh, and trifle with the reſt.
A DAY, *an Epiſtle from Germany.*

Moſt of the diſeaſes in which this water is of uſe, require a generous temperance, rather than a ſevere abſtinence: a glaſs of generous wine may be drank after dinner; but the patient ſhould be very cautious not to indulge himſelf too much, nor take this adviſe as a licence to gratify a ſtrong and depraved habit, or inclination. The ſpirits are never thus artificially raiſed, but when the ſtimulant effect of wine is over, they ſink proportionally, and the next day the hypochondriac finds his anxious cares and the gloomy ſtate of his mind redoubled.

I would by no means object to the uſe of ſummer fruits, either before or after dinner, provided they are perfectly ripe, and eaten ſparingly.

If

If ſuppers are to be allowed, they ſhould be taken early, and of the lighteſt kind, and vegetable food is preferable to animal. Nothing, in my opinion, contributes ſo much to the production of the various diſorders of the ſtomach, as full ſuppers. The evening is by no means the proper time to take much nouriſhment; for, as I have obſerved in another treatiſe, the powers of the ſyſtem, and particularly of the ſtomach, are almoſt exhauſted, and the food will be but half digeſted. Beſides the addition of freſh chyle to the blood, together with the ſtimulus of food acting on the ſtomach, always prevents ſleep, or renders it diſturbed. And inſtead of having our worn out ſpirits recruited, by what is very emphatically called by Shakeſpeare the "chief nouriſher in life's feaſt," and riſing in the morning freſh and vigorous, we become heavy and ſtupid, and find the whole nervous ſyſtem relaxed.

EX-

EXERCISE.

Nothing contributes ſo much to the preſervation or reſtoration of health, as exerciſe in the open air. The moſt proper time for taking it is in the morning, before breakfaſt, or between breakfaſt and dinner, the body being then more alert, and the mind more chearful, and better diſpoſed to enjoy the pleaſures of a ride or walk. Though the ſoil at Harrogate, is as yet in a barren ſtate, owing to its having been lately incloſed, yet it is in the center of rural beauties. There are many delightful ſcenes at no great diſtance, which frequently induce the company at Harrogate to viſit them. But theſe are ſo fully treated of by Mr. Hargrove, in his Hiſtory of Knareſbrough and Harrogate, as to ſuperſede the mention even of their names, in this eſſay.

A walk or ride before dinner will greatly contribute to the ſalutary effects of the water; the patient generally returns with

a keen appetite, and the ſtomach is enabled to perform its functions properly. Exerciſe after a full meal, generally diſturbs digeſtion, and cauſes painful ſenſations in the ſtomach and bowels, with ſickneſs and heart-burn, &c. It is ſcarcely neceſſary to obſerve that the exerciſe ought always at firſt to be moderate, and never ſo great as to occaſion much fatigue.

In order that thoſe who are drinking this water, may receive all poſſible benefit from it, it is not only neceſſary that every kind of exceſs be avoided, but the mind ought to be kept in a ſtate of tranquility, or agreeably amuſed. All anxious cares, thoughts of domeſtic affairs, and concern about buſineſs, muſt for a while be diſmiſſed, and every ſource of grief or melancholy, as much as poſſible prevented. To this the ſociability of the company at Harrogate, and its various amuſements will very much contribute.

The

The Creſcent water has ſometimes been uſed as a warm bath; but I cannot ſee what ſuperior efficacy it can have over the ſulphur water in this reſpect; the chalybeate principle is depoſited on its being heated, and it contains leſs ſalt and ſulphureous gas than the other. Beſides, in many of the diſeaſes in which this water is uſeful, the warm bath is improper; as it generally relaxes the patient, already too much debilitated. The effects of this water may however be very much promoted by the cold bath, where there is nothing to forbid its uſe. I ſhall here repeat the obſervations which I made on the uſe of this remedy in another treatiſe, and which I think highly neceſſary to be attended to. In all caſes where the cold bath is uſed as a remedy, the patient ſhould plunge into it, and come out immediately; his body ought then to be exceedingly well rubbed with woollen or linen cloths, and he ſhould cloathe himſelf as ſoon as poſſible.

I have been favoured with a number of caſes in which the Creſcent water has been found uſeful in relieving ſeveral obſtinate diſeaſes which had reſiſted the uſe of other remedies. But I do not think it neceſſary to inſert them here, eſpecially as the greateſt part of them have already been publiſhed; they were drawn up by an eminent phyſician, and inſerted in the Leeds Intelligencer, and have ſince been ſeparately printed. The only caſes I ſhall notice are the following, which were communicated to me by my friend Mr. Jaques, a very intelligent ſurgeon and apothecary, who attends Harrogate, and has had frequent opportunities of obſerving the good effects of the Creſcent water.

CASE I.

A married lady between fifty and ſixty years of age, of a nervous habit, came to Harrogate in July, 1790. Her complaints were pain of the ſtomach, nauſea, and other ſymptoms of indigeſtion; ſeveral

of her family had been afflicted with the gout, but ſhe never had the leaſt ſymptom of it. She was adviſed to drink a glaſs of the Creſcent water firſt thing in the morning, another about an hour after, the ſame doſe at eleven o'clock A. M. and again at four o'clock P. M. Before ſhe had continued its uſe in this manner for a week, the pain of the ſtomach and ſymptoms of indigeſtion left her, and ſhe was attacked with a pain and ſwelling of her hand, which continued while ſhe remained at Harrogate, which was about a month; her general health being much better.

CASE II.

A. B. of K. between fifty and ſixty years of age, for a number of years had at times been afflicted with lowneſs of ſpirits, pain and foreneſs of the ſtomach, want of appetite, and reſtleſs nights. A variety of medicines had been uſed without effect, particularly the bark, aromatics, bitters,

bitters, and other nervous medicines, ſuch as the volatile alkali, fœtid gums, &c.

In the month of April ſhe was adviſed to drink the Creſcent water to the extent of three glaſſes in the day; viz. one before breakfaſt, another at eleven o'clock, and another at three o'clock. She found relief in about a week, and after drinking the water a fortnight, thought herſelf much better. If ſhe omitted the water, even for a day, the complaints returned, but on having recourſe to it again, ſhe always found immediate relief. After uſing it about three weeks ſhe got quite well, and has ſince enjoyed a good ſtate of health.

CASE III.

Mr. R. aged ſixty-five. In the month of April 1790, came to Harrogate. His ſkin was full of hard tumors, which diſcharged an ichorous kind of matter, and his blood oozed out at ſeveral places; in ſhort

ſhort he ſeemed to be in a ſtate of univerſal putrefaction. He was adviſed to drink the Creſcent water, which he did very conſtantly, only drinking a little of the ſulphur water now and then to prevent coſtiveneſs. In about two months he was aſtoniſhingly better; the ulcers healed, his ſtrength, (which had been greatly impaired,) returned, and he became, as it were, another man.

CASE IV.

Mrs. C. aged thirty five. Had for a conſiderable time complained of general weakneſs and want of appetite, and was very much emaciated. She had tried a variety of medicines, but without any permanent relief. In the month of March, 1790, ſhe was adviſed to drink about half a glaſs of the Creſcent water, three or four times a day, and to increaſe it to a whole glaſs. She found relief from it in a few days, and has ſince continued in a pretty good ſtate of health.

Mr.

Mr. Jaques adds, that he has found this water of the greateſt uſe, where the ſtomach was weak and relaxed, and the appetite bad, and alſo in bilious complaints; in all ſuch caſes, he recommends it with the greateſt confidence, and is ſeldom diſappointed.

THE END.