An enquiry into the natural history, cehmical properties, and medical virtues, of the rock oil, or green mineral naphtha, of Barbados : particularising the successful experiments ... observations on digestion ... / by C.H. Wilkinson.

AN

ENQUIRY

INTO THE

NATURAL HISTORY, CHEMICAL PROPERTIES, AND MEDICAL VIRTUES,

OF THE

ROCK OIL,

OR

GREEN MINERAL NAPHTHA,

OF

BARBADOS;

PARTICULARISING THE SUCCESSFUL EXPERIMENTS,

WHICH HAVE BEEN MADE

BY PROFESSIONAL GENTLEMEN OF THE FIRST RESPECTABILITY,

AS TO ITS REMEDIAL POWERS IN

LEPROUS, SCORBUTIC, AND OTHER CUTANEOUS ERUPTIONS,
IN BRONCHIAL AND INDOLENT GLANDULAR COMPLAINTS,
DISEASES OF THE HIP AND OTHER JOINTS,
AND IN CHRONIC RHEUMATIC AND
SCROFULOUS AFFECTIONS;

WITH

REMARKS ON ITS EFFECTS ON WORMS IN THE ALIMENTARY CANAL,
AS WELL AS IN OTHER PARTS OF THE BODY.

TO WHICH IS SUBJOINED,

OBSERVATIONS ON DIGESTION,

WITH A

VIEW OF DEMONSTRATING THAT THE SOLVENT AGENT IN THIS
IMPORTANT PROCESS IS THE SUB-CARBONATE OF SODA, UPON
WHICH PRINCIPLE THE CAUSE AND REMEDY OF DYSPEPSIA
ARE MORE SATISFACTORILY EXPLAINED.

BY

C. H. WILKINSON, M.D., BATH,

F.G.S. LONDON,

ASSOCIATE OF THE INSTITUTE OF MEDICINE, PARIS; HONORARY MEMBER OF THE
PHILOSOPHICAL, AGRICULTURAL, AND GEOLOGICAL SOCIETIES OF
PHILADELPHIA, FLORENCE, CORK, MANCHESTER, BATH,
NEWCASTLE, AND PENZANCE, AND OF THE
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TO

J. H. S. PIGOTT, Esq. F.A.S. AND F.G.S.

OF BROCKLEY HALL,

AND LATE HIGH SHERIFF OF THE COUNTY OF SOMERSET,

THIS

ENQUIRY

IS MOST RESPECTFULLY

INSCRIBED,

AS A SMALL TESTIMONY

OF THE SINCERE ESTEEM OF

THE AUTHOR.

Sydney Place, Bath,
Oct. 15, 1830.

NOTES AND ERRATA.

PREFACE, P. 3, L. 14.—*Charlatanery* is only to be construed into an opinion, that the recommendation of the Tar Water was too general, and no ways to be attached to the literary reputation of one who ranks so deservedly high as the learned Bishop.

P. 6. L. 29.—Supposing the height of the atmosphere at Bath to be 45 miles, it is invariably the same, whether the mercury in the barometer be low or high.

P. 9, L. 22.—From the precipitation of Sulphur, is is probable that the Gas is principally sulphureted Hydrogen.

P. 22, L. 17.—Vegetable impressions are particularly found in the pennant stone, and which alternates in stratifications with the coal.

P. 38.—The case of Mr. Wansborough was extracted from that valuable periodical work, the Lancet, to the Author of which professional gentlemen lie under great obligation.

P. 51, in the Note, for gramnivorous, *read* graminivorous.
P. 69, L. 14, for corrhage, *read* cowhage.

PREFACE.

FROM the Historical Account of Barbadoes, it appears, that it was discovered by the Portuguese in their voyage from Brazil. They observed in this, as in many other small islands in the vicinity, a great number of the beards* of the fig tree, and gave them the general name of "Las Barbadas." The island, the subject of our enquiry, retains this appellation, whilst the other islands are designated by different names.

Although the Charaibes had deserted this island, the Portuguese considered it of too little value, to take any possession of it. In 1605, an English ship, bound from London to Surinam, fitted out by Sir Olive Leigh, first fixed up a cross on the spot where James Town† was built, and marked upon the cross, "James, King of England and of this Island;" yet it does not appear, from the account of Edwards, that any settlement was at that time made. Some years afterwards, a merchant ship of Sir William Courteen's, driven by stress of weather into this island, made so favourable a report of it to the then Lord High Treasurer, the Earl of Marlborough, that his

* The wide spreading branches of the Indian fig tree send forth innumerable fibres which resemble in appearance the luxuriant beards then so generally worn.

† Now called Hole Town.

Lordship obtained from King James the first grant of the island to himself and his heirs in perpetuity, and, in 1624, 30 persons were sent to the island, and James Town was built.

If the statement by Rochefort is to be depended upon, relative to the Charaibe Vocabulary, it would appear, by a comparison with the ancient Oriental dialects, that the words had not only their origin in the Old Hemisphere, also would induce a belief that from some vessel being drifted from the African coast, the population of these islands had their commencement.*

The earliest writer, relative to this island, is Mr. Lygon, who visited it in 1657. It is by this author the story of "*Inkle and Yarico*" was first related, and stated to have taken its rise in this island. The earliest planters were accused of decoying into slavery the Indians of the neighbouring continent. Although the conduct of Inkle cannot be defended, yet, it must be admitted, that the real account has been highly embellished both by Addison and the Abbé Raynal. With respect to the more immediate subject of our consideration, Mr. Lygon thus observes, "We find flowing

* It is admitted that the Azores were discovered by the Phenicians, and the Canary Islands by the Carthaginians, and even Columbus in his second expedition to the West Indies, found the stern post of a vessel lying on the shore at Guadaloupe, a proof that some other vessel had been there previous to his voyage. The Charaibees interred their dead in a cowering posture, with the knees to the chin, corresponding to the customs of the East. Rochefort says, that wood in the Charaibe is pronounced *Hue-Hue*, and in the Chaldaic, Oä, *Liani, (his wife)*, in Chaldaic *Liene*, and equal similarity in many other words. V. Rochefort, Histoire des Isles Antelles, 1658.

out of a rock, in one part of the island, an unctuous substance, somewhat like *tarre*, which is thought to have many virtues yet unknown, but is already discovered to be excellent good to stop a flux by drinking it, and for all aches and bruises by anointing."

In the year 1744, the attention of the public was greatly excited by a series of enquiries concerning the virtues of Tar Water, by the celebrated Bishop Berkley; the learned Prelate considered tar water as a panacea, and notices its great effects in diseases inflammatory as well as atonic. Such a general recommendation participates too much of Charlatanery to merit the serious attention of medical men.

During the same period, tar water appears to have been extensively tried in Stephens's Hospital with so little advantage, as to excite a doubt that the statements were the results of party prejudice. To this conclusion we are led from the observations of Mr. Prior,* and some medical men at the same time.

In the year 1748, Dr. Hales, well known for his valuable work on Vegetable Statics, more minutely examined the tar water made after Berkley's process. He evaporated a pint, and the residuum left was a thick, dark, reddish matter, with a very bitter burnt taste. He was the first who observed the great difference between the tar of fir trees, as imported from the Baltic, and that which spon-

* Mr. Prior was not a medical person, but a private gentleman of fortune.

taneously arises from the springs in Barbadoes. Tar water made from the latter natural product, although very efficacious in a variety of cutaneous affections, yet is soft, mild, and no ways disagreeable to the taste. Insects, which are observed in abundance in stagnant water, are no ways affected by this, but are soon destroyed by common tar water; and Dr. Meighan, in his Treatise on the Bareges* Water, recommends the Barbadoes Tar Water to those who cannot visit this watering place.

In the year 1750, the Rev. Griffith Hughes, Rector of St. Lucy's Parish, published a voluminous folio on the Natural History of Barbadoes, and therein describes an oily bituminous exudation issuing from some hills, and confined to two parishes. The best, he observes, is from the Parish of St. Andrews, of a deep olive green, and found very beneficial in paralytic and nervous disorders, and its medicinal qualities are held in the highest repute; and to evince its great diffusive properties, he says, when a horse has been dosed with it, and which is frequently the case, when he begins to be warm upon his journey, the rider will smell the tar very strong.

In the year 1756, Mr. Warner, an eminent surgeon of Guy's Hospital, particularly noticed the superior properties of the Petroleum Barbadense, to that imported from Norway or America. He has given many interesting cases,

* A celebrated watering place in the Pyrennean Department.

evincing its admirable effects as an embrocation in diseases of the larger joints, as well as in many affections of the tendons and ligaments, and warmly recommended to practitioners the employment of the genuine Barbadoes Tar.

In the year 1769, Dr. Hilliary published an interesting work on the Yellow Fever of Barbadoes, and particularly recommends in tetanic* and spasmodic affections, the Petroleum Barbadense as an embrocation, dissolved in rum.

In a letter, dated May 14, 1774, a gentleman well acquainted with these springs, then observes, "I sent by Mr. Cumberbatch, two jugs of the best green tar for you, which I apprehend you intend as a present to Dr. James.† It gives me great pleasure to have it fall under the inspection of so great a man. I believe it to be a most excellent medicine, but we do not sufficiently know its virtues, I have inclosed you the different cases I have seen it used in, and experienced myself, externally employed. We have used it with a warm hand as an embrocation, and internally in chronic coughs, and in complaints proceeding from obstructed perspiration. A few doses invariably bring on a favourable diaphoresis, and its penetrating qualities are so great as to discolour the linen next to the body. In scorbutic and cutaneous affections it has been

* Tetanus is one of the principal causes of mortality amongst negro children.

† Dr. James, the inventor of the Antimonial Fever Powder, well known by his name.

found very serviceable :" and he further particularises a distressing case of a leprous woman, who was deprived of the use of her limbs, as being cured by its use.

At this period, Dr. Kirkland extensively employed an ammoniacal solution of the Barbadoes Tar, in diseases of the hip and other joints, with the greatest success, and was equally so at Bartholomew's Hospital, and the Westminster Infirmary, and in the Medico-Chirurgical Pharmacopœia was introduced the Linimentum Bitumin. Barbadense Ammon. A very interesting communication was made by a Mr. Pigott, in the year 1793, who particularly recommends the olive green oil known by the name of the Pottery.* He minutely describes its effects in a most severe leprous case, which was completely cured in three months by its internal use, and of its equal success in dispersing a schirrous tumour of the breast, from its being applied with a warm hand, in the form of an embrocation, to the part affected, covering it afterwards with a piece of bladder.

In the year 1806, Dr. Pinckard, who was Staff Physician at Barbadoes, particularly describes the springs from whence this valuable material arises ; and both Dr. Ainslie and Dr. Fleming have noticed the admirable effects of the rock oil, as more efficacious than the Cajeput Oil, in all rheumatic affections, and cases of epilepsy, hysteria, and palsy, by rubbing it on the parts more immediately affected, with the hand, in the form

* The different species will be hereafter described.

of a liniment. It has been found internally very beneficial in Ascarides and Tape Worm by injection, and in cutaneous affections may be employed with the greatest advantage in the form of a bath.

During the present year, a very interesting account of its effects in leprosy has been given by a resident practitioner at Barbadoes. The patient had been the previous year under the care of a London Physician. It was given internally, and applied externally in the form of a warm bath and as a liniment, and, after two or three weeks, the diseased cuticle peeled off, and a healthy white skin appeared underneath.

In consequence of the high duty imposed on the importation of Barbadoes Tar, certain large Chemical Establishments were induced to prepare an imitation, and so far succeeded in the sale, that, for the last 30 years, the general supply has proceeded from these sources; for, during that period, it appears from official returns, that no importation of this article has taken place. Hence a spurious Mineral Tar, greatly different in its quality, andalso inferior in its medicinal properties, has been substituted for the indigenous produce of this Windward Island.*

* Windward Island, &c. The terms, Windward and Leeward, are derived from the Spanish terms, Barlovento and Sostavento—the Caribbean constituting the former class; and the four large islands of Cuba, Jamaica, Hispaniola, and Porto Rico, the latter; but the English appropriate both terms to the Caribbean Islands, only subdividing them according to their situation in the course of the Trade Wind. The Windward Islands terminate with Martinico, and the Leeward commence at Dominica and extend to Porto Rico.

ON THE

NATURAL HISTORY OF BARBADOES.

Barbadoes is situated between the North latitudes 13° 19′ 40″ and 13° 2′ 30″, making the difference of latitude, from the North to the South, 17′ 10″; its longitude West, from Greenwich, being between 59° 42′ and 59° 29′, a difference of longitude of 13′, about 20 miles in length and 14 in breadth.

The great variety of appearances which this island exhibits may principally be attributed to the numerous elevated parts on its surface. From the accurate trigonometrical survey of Capt. Barrallier, it appears that there are forty stations, the highest of which (Mount Hellaby) is 1147.55 feet, and the lowest (Lebine) 155.91 feet above the level of the sea. Mountains are not to be considered as casual elevations, the results of fortuitous circumstances;—they are admirable provisions effected by Divine Wisdom for the support of the animated part of creation. Each mountain is the source of a spring, whose extent is in proportion to the elevation and range of the mountain from whence it emanates. Thus the largest rivers and the most extensive lakes are formed in mountainous districts—as, the river La Plata from the Andes, and the lakes in Switzerland from the Alpine range. The machinery of springs and rivers, and the apparatus that are kept in motion for their duration, through the instrumentality of a system of curiously constructed hills and vallies, arranged for receiving their supply from the dews and rains of Heaven, disperse the same by a thousand never-

failing fountains; thus each mountain may be considered as the *punctum saliens* of one or more springs, which in their descent form gullies, ravines, brooks, and rivers.

From the distribution of the hills and cliffs in the different islands, it has been deduced, that the current at the deluge, in the tropical regions, ran from East to West. In England the distribution is in general from North and West towards South and East. There is no general principle—all are modified by local circumstances.

It does not appear that Barbadoes was inhabited by Europeans, so early as the other islands, which may be partly attributed to its great distance from them, St. Vincent being the nearest, the distance of which is about 100 miles. It is probable that the island was occasionally visited on account of its abundance of turtle and fish; and the Rev. Mr. Hughes says, that many aged persons between 80 and 90, at his time, viz. 1750, stated, as a received tradition, that the Indians occasionally visited it after the English had possession of it. This is further confirmed by the Indian bridge being the line of demarcation, and which gave rise to Bridge Town. In an adjoining clay soil, they dug a reservoir to hold rain water, called the "Indian Pond." With part of that clay they made their earthenware, such as pots and pans, and also with this clay they formed their idols: the head of one, Mr. Hughes states as weighing sixty pounds.*

The soil is represented as a layer of clay reposing on a coralline bed; it is of a spongy nature, and from this cause retaining water, which contributes to the fertility of the soil. It is remarked, that when this broken coralline subsoil is found from ten to fifteen inches below

* Mr. Hughes observes that, the great scarcity of clay in most of the other islands, may account for the many remains of Indian pot-kilns in this island; there have also been dug up many stone batchets and chisels—the scooping ones made of the most substantial inside part of a conch shell, the hardest of green-stone.

the surface, the ground is more productive than when at a greater depth and reposing on a close and compact rock, and particularly in continued dry seasons, such repositories for water must materially counteract the destructive effects of a long, dry, scorching temperature; and as coralline substances are generally charged with animal matter, they therefore constitute a rich fertilizing source.*

The soil on the cliffs is the most favourable for sugar plantations, and is said to be more productive than in the other islands, except the prime lands in St. Kitts;† in colour it is generally black, in the shallow parts of a reddish tinge, and on the hills chalky marl.

When the bed on which the soil reposes consists princi-

* Dr. Maycock (one of his Majesty's Members of Council, and resident Physician for 20 years) informs me that he is preparing for the press, a Botanical Account of Barbadoes. The superior advantages which he has had, from a long residence in the Island, and from his extensive knowledge of this branch of science, a very interesting publication may be soon expected, and render superfluous any observations on this subject; although Dr. M., with that liberality which characterises the man of science, kindly offered me every information I might require.

† The hogshead in Barbadoes weighs 14 cwt.; in the other islands 15 cwt. The richest soil in Demerara from 100 to 150 gallons of juice are required to make a pot of sugar; whilst, on the coral soil of Barbadoes from 48 to 80 will suffice. Edwards says, that the best soil is the deep black earth of Barbadoes. Relative to the sugar cane, it is considered by many writers as having been imported by Columbus, from the Canaries, in his second voyage, and planted in Hispaniola. Although the sugar cane appears to have been known to the ancients, yet we have no account of the construction of any mills for grinding anterior to the 12th century; hence, probably, the granulating process was then discovered. Lebat and others say, that the sugar cane is not an exotic; if so, it may be considered that the process of making sugar was imparted to the natives by the Spaniards and Portuguese. By the account of Columbus's voyage we find he recognised in the West Indies but few plants similar to those found in Europe! Thus the cacao, or chocolate nut, was transplanted from South America to Hispaniola; the hepatic, or Barbadoes aloes, is almost confined to this island, and none is now found in Bermuda, whence it originated; whilst the socotrine is from Socotra, in the East Indies. Ginger is an exotic, and was brought from the East Indies to New Spain by Francis de Mendoza; coffee was brought from Arabia; indigo is indigenous; and cotton grows naturally in Asia, Africa, and America.

pally of broken portions of coral, vegetation is more luxuriant than when the coral is one solid mass. This appears to depend on the retentive power for water being greater in the former than in the latter. The lower part of the hills are more productive than the elevated portions, the soil being deeper from the disintegration of the surrounding hills washed down by the occasional rains; to which may be added, that the rich vallies and gullies have their coralline beds in detached broken masses, whilst, in the more elevated districts, it is one uniform stratum of the calcareous substance. The best soil in Demerara is from eight to ten feet deep, and requires from 100 to 150 gallons of juice to make a pot of sugar (about 10 gallons); whilst, at Barbadoes, on the coral soil, the same quantity will be produced from 50 to 80 gallons of juice. In St. Vincent, 400 gallons of juice, evaporated to 100, will average one-third of a hogshead of sugar, or 5 cwt. Each year one-third of the plantation is left to fallow, which appears to arise from not having manure sufficient. From the present improved state of agriculture in Great Britain, the fallowing system is not adopted. The earthy ingredients which enter into the composition of soils undergo no diminution by the growth of vegetables on their surface. The purposes to which they are subservient are, to give support to the young plant; to be properly retentive of water; neither so firm as to resist the extension of the roots, and which would be the result, if entirely of clay, nor of so little tenacity as sand; not only incapable of affording the adequate support, but the water containing the nutrient matter would percolate so quickly, as not to allow time to the tender fibrils of the root to effect the requisite absorption. Vegetable, as wellas animal life, require for support the recrements of matter which has been previously organised; for the former having no digestive organ as the stomach, which forms the line of distinction between the animal and

vegetable kingdom, the manuring principle must first be resolved into an extractive matter, soluble in water; the nutrient matter, in this state of solution is absorbed by the roots. As soon as the vegetable rises above the surface of the ground, an apparatus is formed, as by leaves, &c. to enable an absorption from the atmosphere, and from this source its future growth is principally regulated. After this period, absorption by the roots is requisite, for the support of vegetable energy, yet very little conducive to its future growth The abstraction of nutrient matter from any soil, by the most abundant crop, bears a very minute proportion to that which exists in the generated vegetable mass; an evident proof that its material accumulation must be principally indebted to another source. These principles have led practical men to reflect on the erroneous and unprofitable system of keeping any land in that state of non-occupation called fallowing. The experienced agriculturist has ascertained, that when the nutrient matter, diffused in any soil at a certain specific depth, has been absorbed, the substitution of another vegetable, whose roots are determined to a different depth, becomes advantageous; hence the principle of the rotation of crops.

In the West Indies, spring commences in May, when the parched savannas begin to change their russet hue. In the middle of this month the first periodical rains take place: these are gentle showers compared to those which generally occur in autumn. To Dr. Hilliary we are indebted for a correct meteorological detail of two years—from the commencement of 1751 to the close of 1753—the average quantity of rain being nearly 70 inches per year, during which period the barometer never varied more than $\frac{1}{10}$ of an inch; the highest range being 29-9, and the lowest not exceeding 29-8.

In November, 1, 1755, a remarkable agitation of the sea was observed, an hour after high water: the sea flowed

suddenly, and rose more than two feet higher than the highest spring tides, and in three minutes ebbed to be as much lower than the usual lowest ebb, and then again as high as before, and continued to rise and fall every five minutes. It commenced at 20 minutes after two at noon, slowly diminishing almost in arithmetical progression, after the first four or five impulses, till near seven in the evening. About nine, the return of the usual tide checked the oscillation. These phenomena occurred on the same day that the dreadful earthquake at Lisbon took place. The first alarming shock was felt at Lisbon at 45 minutes after nine in the morning, and the second agitation at 20 minutes after ten. Presuming that they both arose from the same disturbing cause, it becomes easy to calculate the velocity of this movement: the distance between Lisbon and Bridgetown is 3,400 English miles, and the difference of longitude equal to $3\frac{1}{2}$ hours, which, being added to the difference of time of observation, will make it seven hours and a half, or after the rate of nearly $7\frac{1}{2}$ miles each minute. During the whole of this great disturbance the barometer evinced only $\frac{1}{10}$ of an inch in variation. Ever since the period of Galileo and his pupil Torricellius, and the experiments of Paschal, it has been generally supposed that the barometrical variation depends on certain alterations in the weight of the atmospheric mass. We are indebted to R. Saumarez, Esq. of the Circus, Bath, for a series of valuable observations, illustrated by experiments, from which he has rationally deduced, that, under no conditions, is there any variation in the atmospheric column in the same place, and the difference in height of the mercury depends on the change of pressure as to its expansibility, and not as to any positive weight. This opinion is powerfully supported by the meteorological fact above stated, that, in all the variety of atmospheric disturbance at Barbadoes, the variation of the barometer never exceeded $\frac{1}{10}$ of an

inch. In the scale of variation, attached to the barometer employed in our country, "Very Stormy" weather is marked at 28 inches from the level of the mercury in the reservoir, and "Extreme Fair" $30\frac{1}{2}$; it would hence be inferred, that those two numbers would mark the proportionate atmospheric mass under these two conditions, viz. at the period of violent rain, by some unknown cause, $\frac{1}{12}$ of the surrounding air has been abstracted, and has given rise to different theories, which are all found inadequate to the explanation. If the mercurial depression is found to be regulated by the quantity of rain, the variation ought to be greater in the West Indies and those countries where the quantum of rain determined to the earth is more considerable; the reverse is the case. From accurate meteorological observation it appears that the evaporation from any part of the surface of the globe corresponds in bulk to the rain; now, under the Line, where these operations are extensively going on, the barometer evinces little or no change, the variation increases with the latitude: thus, at the Equator, not more than one line, or the 10th of an inch; at Lisbon, $1\frac{1}{4}$; at Paris, $2\frac{1}{2}$; London, $2\frac{3}{4}$; and, at Petersburgh, $3\frac{1}{4}$. From the Tables of Pere Cotte there are some variations depending on local circumstances. The range at Utrecht is equal to that at Abbo in Finland. At Lisle and Brussels, the variations do not exactly correspond; and even in London, the barometers at the East and West end of the City, have frequently varied half an inch. A diurnal variation in the barometer has been observed in different latitudes, at the same corresponding hours, by Don Alzaté, in Mexico; Dr. Balfour, at Calcutta; M. Planer, of Erford; M. Chanvallon, at Martinique; Pictet, at Geneva; and several others, have observed that the mercury falls during the night, and rises between six and ten in the morning. The celebrated Beccaria, in his valuable Letters on Electricity, suggested the probability of electricity

being the agent in the atmosphere, causing all those variations in the pressure of the air, from the expansibility being regulated by the proportionate quantity of the diffusion of this active agent. Thus a partially distended bladder, on being exposed to an increase of temperature, expands, and resists a greater pressure externally, and which is effected by the addition of a principle which contributes nothing by its weight. So, a non-ponderable substance, like electricity, is capable of producing similar effects, without producing any increase in weight.

It has been remarked, by Canton and Reid, that the barometric changes accord with the different electric states of the atmosphere; and upon this supposition we are enabled to explain why the pressure of any quantity of air, however small, shall be a balance to the whole mass. To the demonstration of this opinion, we could adduce many corroborating facts, if our prescribed limits would allow of such an investigation.

We have already noticed, that the principal sources of the mineral oil are in the parish of Saint Andrews. At the foot of Mount Hellaby commences a brook, which flows in a north-easterly direction into the sea. About five hundred yards from its source, there appears a film of naptha, exuding from each side of the hills, through which the brook passes, and hence called by Lygon the Tar River. The water which springs from the south and west side of the hills, and flows to the westward, is not impregnated with the mineral tar. From Mount Hellaby there is a ridge extending to Mount Hall, and a corresponding one extending to Turner's Hall, forming a narrow valley between these two high ridges; and on the declivity on each side of this valley (the property of Mrs. Straghan) the greater portion of this oily matter exudes, and flows into the brook alluded to.

There are detached portions of rock similar to the

loose stones found in beds of rivers in Wales, varying from a few pounds to a ton weight, and which have the character of hard sand stone. These stones have a strong bituminous impregnation, and when out of the water, and acted on by the sun, a continual exudation of tar is the result. These repositories appear to be never exhausted; and it is not easy to conceive how these stones, in their detached state, acquire their supply, unless by supposing the impregnated water penetrating their substance, and, in the process of filtration, the tar is left behind.

Close to the brook, and a little to the north-west of Mount Hall, is the exudation called "Pottery;" so named from being contiguous to the clay employed in the manufactory of pots, utensils, &c. while, on the south east side of the brook, the mineral oil, known by the name of "Moses," is collected.

About 200 yards from this spring there is a stream, from which arises a continued series of bubbles, which, when directed through a tube, is found to be inflammable.

There is, besides, a bubbling fountain in a small glen on the ridge side of Turner's Hall, belonging to Sir H. Fitzherbert, Bart. These inflammable bubbles are carburetted hydrogen, and from this property has been erroneously called a "Boiling Spring."

Besides the afore-mentioned bituminous springs, there are some of the common kind, belonging to different proprietors of the neighbouring estates.

In this district there exists a considerable extent of maiden forest. Agreeably to the laws usually observed in the operations of nature, either in mountainous elevations or lofty growing trees, such as the cedar, the bully, the bay, locust, Spanish ash, and oak, with their wide spreading branches, the great evaporation from their extended surface causes that diminution of temperature, by which the water existing in the form of vapour in the atmosphere

becomes condensed and determined to the earth, either as rains or as intense dews, while the uncovered grounds will be parched and dry. If we suppose with Kirwan, that vapour is a triple combination of electricity, caloric, and water—the cold generated from the evaporation of an extensively elevated foliage—caloric would not only be abstracted, but also the electricity would be removed by the numerous vegetable conductors; for, from meteorological observation it does not appear that cold alone will suffice for the complete condensation of vapour.

The general diminution of temperature, observed on the surface of the earth, is favourable to the very ingenious theory of Cordier. The progressive increase of heat, as we descend below the surface, is now satisfactorily confirmed by examination in different mines; and at the depth, of some miles the earth is probably in a state of incandescence. It is upon this principle we can rationally explain the warm springs of Bath, Carlsbad, Aix, &c. and the operations of volcanoes, than by any other with which I am acquainted. We may thus conceive how, by a slow diminution of temperature of the nucleus of the earth in this heated state, a cooling change on the surface is in the same ratio effected. If our historical accounts are correct, we are to believe that, at the period of William of Malmesbury, vines were cultivated, in 1140, in many parts of England, capable of producing good wine, without the addition of any other material. Abbé Richard has made a similar observation with respect to France, and that even in Iceland, fields, formerly covered with corn, have now a surface of perpetual snow; and Humboldt says, that he found the mean temperature at Quito to be at 54°, and which was stated to be 68° by Bougouer. It must, however, be observed, that from physical causes, the reverse in some parts has taken place. Thus the temperature of many parts of North America has been increased by the

removal of extensive forests, and the drainage of swamps and morasses. The elk, the present inhabitant of the arctic regions, formerly occupied the Hercynian Forest; and probably to the same cause we are to attribute the increase of the warmth of Italy, than at the time of the early Roman Emperors. Thus the younger Pliny could not cultivate, at his Tuscan residence, either the olive or the myrtle, which plants now grow in the greatest luxuriance. Also Virgil notices the common occurrence of the freezing of the Tiber; and Cesar mentions that he found the climate of Britain milder than that of Gaul. Linguet has ascribed the commencement of the colder season in Europe to the time of the earthquake in Lisbon, in 1755. So Humboldt found the temperature of air at Quito had considerably diminished since the great earthquake in 1797.

During warm weather in temperate climates, and in the Torrid Zone, for many months, the evaporation goes on without any rain; and when currents of air blow, during a great part of the year, from one point of the compass, the evaporated water is directed to some other situation; and the cultivated lands are deprived of genial rains or refreshing dews.

To these observations I am anxious to direct the attention of the planter and of the proprietor of lands in such an island as Barbadoes, that, by clothing the hills with trees, he promotes the cultivation of the contiguous grounds, and counteracts the destructive effects of a long continued heated atmosphere.

I have already stated that the sources of this mineral oil, known by the names of Pottery and Moses, arise in different relative situations—the one on the east side of the brook and the other on the west. The origin of Moses is on an elevation, about 40 feet from the brook, and the Pottery about 30 feet. Each has a naturally formed spring

or tank, always full of water, and on its surface the mineral oil is found, forming a bituminous film. By the application of the palm of the hand, the substance adheres to it, and is then scraped off on the edge of any vessel, as a calabash, which is the usual mode of collecting it, and more free from water. The Pottery has a greenish tint, and in some points of view has a rich olive shade. It not only differs materially from any other tar spring in colour, but also in flavour, odour, and mildness. It is this product which has long been the popular remedy employed by the inhabitants with so much advantage in tetanus and cutaneous affections, and also successfully used in chronic pulmonary disorders. The mineral oil, known by the name of Moses, in some respects participates of the characteristic properties of the Pottery, and appears to be intermediate to this and the common tar springs. Contiguous to the Pottery there is a chalybeate spring highly charged with iron, and hence might be imagined that the colour arises from a ferruginous impregnation. This would in no wise account for its superior medicinal properties over the others, as it can be taken internally, without producing any of those nauseating effects resulting from the common mineral tar.

From some specimens I have seen from natural springs in Persia, and the lower parts of Egypt, in no one have I observed the peculiar colour of the Pottery. In no other of the West India islands is any similar natural product found. The asphaltum of Trinidad more corresponds to the munjack of Barbadoes; nor is there any description of a mineral oil thus evolved in the countries of North and South America. It appears to be the result of a combination of circumstances depending on latitude, temperature, materials of the source from whence it arises, &c.

When we take an extensive view of the vegetable kingdom, we find each vegetable has its peculiar situation the most congenial to its growth.

The production of tar from the destructive distillation of wood is of very ancient date. Pliny informs us that tar in his time was obtained by setting fire to billets of old fat pines or firs: the first running was called tar, the latter or thicker substance pitch; but Theophrastus (long anterior to Pliny) is more particular: he tells us, that the Macedonians made huge heaps of the cloven trunks of firs, placing them erect by each other, the heaps about 180 cubits round, and 60 to 100 high, the whole covered by sods of earth. Fire was applied, and, from the smothered combustion, the tar and pitch flowed out in a channel below, and charcoal left behind. Precisely the same mode is now adopted in America and Sweden. Theophrastus remarks that, trees growing in low and shady places do not yield such good tar as those trees which grow in higher and more exposed situations.

From the same trees, if incisions be made after the bark has been stripped, the substance which exudes is called turpentine, the name being derived because at first principally produced from a tree in Syria and the Greek islands, called "Terebinthus," and denominated turpentines of Chios and Cyprus. Venice turpentine is from the Larix or Larch tree, Strasburgh from the Silver Fir, and common turpentine from the Mountain Pine, or Pinus Sylvestris. The exudation consists of the essential oil of turpentine and of resin. By distillation the oil passes over, and the resin, is left behind.

Naptha is found in springs in Persia, on the shores of the Caspian Sea, in Calabria and Sicily. In 1802, so much was discovered in the State of Parma as to suffice to illuminate the streets of Genoa.

When petroleum is found in the vicinity of coal it assumes another character. A well of this kind is at St. Catherine's, near Libberton, to the South of Edinburgh, and also in different parts of Shropshire.

When wood is exposed to destructive distillation in close vessels, as in the manufactory of pyroligneous acid, from each ton of wood there averages 100 gallons of liquor, consisting of weak acid, tar, and naptha. In the vessel the acid lies in the middle, naptha at the top, and tar at the bottom. The acid holds in solution a portion of naptha, and when drawn off is an admirable preservative of animal food.

A similar impregnation is observed in the water of the springs yielding the Pottery. It is colourless, and it is used with considerable advantage in cutaneous complaints.

Relative to the vegetable kingdom, it is stated that botanists are acquainted with 44,000 species, whilst the number mentioned by the Greeks, Romans, and Arabians, does not exceed 1400. The trees which grow in the torrid, temperate, and arctic regions, are as the numbers 12, 4, and 1, and the upper limits are, in the Torrid Zone, 10,800 feet; in the Temperate, 6,400; and in the Frigid, 1,600 feet.

Vegetables are to be considered as the first stage of organization, and where the elementary principles are reducible to very few in number, the binary and ternary combinations constitute the various results and great variety of products, which are to be attributed to the different arrangements of the three elementary principles—oxygen, hydrogen, and carbon. In the destructive distillations of wood, as in the production of pyroligneous or acetic acid, there arises carbonic acid, carburetted hydrogen, tar, naptha, the acid above mentioned, and carbon or charcoal left in the retort. Thus, according to the Table of Equivalents, 50 parts of this acid consist of 24 carbon, 24 oxygen, and 2 hydrogen; 22 parts carbonic acid, 6 parts carbon, and 16 oxygen; 8 parts of carburetted hydrogen or coal gas, 6 parts carbon, and 2 hydrogen; naptha, in 41 parts, 36 are carbon and 5 hydrogen; and from the ingenious experiments of Mr. Hatchett, it appears that, by a progressive diminution

of hydrogen, there is a relative proportionate increase of carbon, as to form petroleum, asphaltum, &c. When the distillation is completed, these products, added to the residual charcoal, exactly correspond to the weight of wood employed. The destructive distillation of coal yields, in addition, sulphuret of carbon and of ammonia, but no acetic acid; so that coal consists of the three elements noticed in the vegetable kingdom, and, in addition, sulphur and azote—as, 17 parts of ammonia consist of three parts of hydrogen and 14 azote. All these proportions to be considered as by weight. Although wood yields only the three elements afore mentioned; yet, in many parts, as the sap, grain, &c. albumen and gluten are found, and these contain azote. I am not aware of any experiments where sulphur has been detected, and as acetic acid does not appear to be a constituent part of coal, it leads to a fair supposition of coal not being of vegetable origin.

It has already been noticed, that there is a greater variety of plants within the tropics than in the temperate regions. It is also observed, that the tropical trees, shrubs, and plants, proportionately more abound with essential oil, gums, resins, and balsams. In these latitudes the eye is fascinated with beholding the majestic height and admirable verdure of some, whilst the flowers of others delight us with their profusion of odours, sweets, and varied beauties—the admirable texture of the vegetable tissue on which the specific difference in plants depends. In the same mass of earth, the aloe plant and sugar cane will go through their vegetable life, the one producing a sweet, and the other an extremely bitter juice; and yet from the same medium their principle of action springs. In these latitudes we find the fruits more delicate, and their gums, oils, and balsams more fragrant, and of which a very inadequate idea is to be formed from the productions of hot houses in variable, cold climates, by means of irregular artificial

heat. To how many admirable purposes is the cocoa tree applicable? How magnificent the Palma Maxima, from its height, majestic appearance, and beautiful waving foliage, and the Palma Oleosa, and the Ricinoides, for the valuable oils they give out.

When, from any of those violent operations of nature to which the islands are occasionally subjected, extensive forests sink in the general ruin and are absorbed in those openings of the earth which swallow whole rows of houses with their inhabitants, and the sea, retiring from the submarine forests over which it flowed, would, by subsequent decompositions, become the source of these bituminous springs. We are informed, that on the 31st August, 1675, a terrible earthquake occurred in Jamaica, where the sand in the streets moved in heaps, like the waves of the sea, which receded back nearly a mile, and quickly returned to its former bounds—no house nor tree left standing, except the few that were sheltered by some neighbouring hill or cliff; and in that which occurred 17 years after, a large mountain, not far from Port Morant was swallowed in one of these extensive yawnings of the earth, and the place where it stood is now become a large lake, of about 10 or 12 miles in width. Partial envelopments of trees and canes take place from what is termed sliding ground, when soils of stiff clay reposing on a substratum of rock on the side of any mountain, in rainy seasons, become undermined and carried by the torrents to the vallies below. Some instances of this kind have occurred in Barbadoes, one in St. Andrew's parish, where a large garden, the soil of a potatoe garden, was determined from its original position, and richly covered some land in the vale below. Large pieces of ground planted with canes, plantains, and banana trees, have thus been swept, enriching the lower grounds at the expence of the original proprietor. In the course of ages these processes frequently repeated, would form an ex-

tensive vegetable mass, which, from decomposition, would yield a variety of products, influenced by circumstances, as to temperature and humidity, to which it might be exposed. To those who may have cultivated lands thus situated, it would be adviseable to have trenches cut as near to the substratum as practicable, which, by giving a vent to the undermining rains, would counteract the heaving up of the soil, and any subsequent loss of property. On the 16th November, 1771, a proprietor of 600 acres of excellent corn land was in one night reduced to ruin from a sliding process of this kind, by an eruption of the Solway Moss in the county of Cumberland. The water, which carried it off, insinuated itself between the bed of clay and the moss, in such quantities as to float the mass, and, carried forwards by the current, descending for some miles, was deposited on corn fields to a thickness of 16 feet of unprofitable materials.

Storms and hurricanes, and volcanic agitations are not so frequent as formerly. We are informed by the Abbé Ordinaire, that, on our globe, there are 189 volcanoes, of which 99 are in continents and 90 in islands. In the West Indies, volcanoes are observed to have been at St. Christopher, Nevis, Guadaloupe, Dominique, and St. Vincent. Although Barbadoes appeared to have been agitated at the time the great earthquake at Lisbon took place, no part of the surface evinces any local volcanic operation; and by whatever cause vegetable matter becomes deposited beneath the surface of the earth, changes are effected according to the depth and condition of the materials which envelop them. By some eminent geologists, it is supposed that these changes have been produced by the agency of volcanic energy, and it is probable, that in these examples, where islands and mountains have been rapidly formed, that the elevation is to be attributed to some such active power of nature.

Volcanic action must depend on certain changes in the earth, where caloric is developed in such immense quantities as to produce astonishing expansive powers. When combined with substances capable of assuming a vaporific form, and the phenomena of volcanoes strongly favour the hypothesis, of the interior of the earth being in a high state of incandescence, to which if water by infiltration should be exposed, through those parts of the earth where communications have been formed, clouds of steam and intensely heated matter will be evolved, and hence by the wise distribution of these spiraculæ—these chimnies to the great internal furnace—resistance to equalization is greatly diminished. The materials evolved by volcanoes, when in action, contain very little combustible substance; and by recent accurate investigation, it appears, that eruptions are not accompanied by any active state of inflammation, the lava evolved being fused, and like melted iron, has a great incandescent appearance, which, through the dense white clouds of steam at high temperatures, resemble flame. These operations must contribute to the diminution of internal heat, and may, in some respects, account for the progressive diminution of temperature taking place on the surface of our globe. Let us suppose the nucleus of the earth, in a red heated state, to be 6000 miles in diameter, the crust of the earth above would be a concentric mass about 1000 miles thick, and from what we observe, with respect to cooling bodies, it may be easy to conceive the existence of an interval of space between the solidified mass, and that which may be in a state of liquifaction, and therefore no difficulty in explaining that, when thus enveloped by imperfect conducting media, such an enormous mass should require many thousands of years to part with its store of fire.

When we descend so far below the surface of the earth, that atmospheric changes of temperature produce no effect,

we find, at certain depths, the same uniform heat is preserved. The Cave of the Observatory, at Paris, is 90 feet below the level of the street, and the thermometer corresponds to 53° of Fahrenheit, and formerly adopted as a graduating point. In proportion, as we descend, there is a slow increase of temperature, which all bodies at the same depth acquire.

In the year 1811, I published some analytical researches into the properties of the Bath Waters, with a view of demonstrating that the springs which supply the Kingston Baths, the King's Bath, and Hetling Court, all emanate from the same unknown source, the same temperature, and similar ingredients. I therein stated my opinion, that the warmth was occasioned by the depth at which the spring had passed from its source acquiring the same temperature which the stratum through which it flowed possessed; and when by any interruption to the stratification, the water became determined to the surface, sooner or later, so its heat was regulated. Attributing the warmth to the depth to which the spring descends, is ascribing it to a cause which must remain invariably the same, as long as the same structure in that part of the earth continues. This opinion has subsequently been greatly supported by the experiments of Messrs. Fox and Fourrier, in the deep mines of Cornwall, and who have observed the regular gradations of increased temperature in every successive level examined. Supposing the earth, the instant it constituted a part of the solar system, to have been in a fluid or semi-fluid state, the laws of centrifugal motion would impart the spheroidal form it possesses, and the results of its progressive stages of consolidation would not be incompatible with the formation of rivers and oceans, or the stratification observed by geologists. The phenomena of earthquakes would thus admit of more easy solution.

The coincidence of effect between the considerable dis-

turbance of the sea at Barbadoes and the earthquake in Lisbon, in 1755, has already been remarked. At the same period all the springs and lakes in Britain, and every part of Europe, were violently agitated; the hot springs in Bohemia suddenly ceased to flow for a minute, and then burst forth with prodigious violence, and even induced a subsequent increase of temperature; the hot wells at Bristol were coloured red, and remained for many months unfit for use; even the distant waters of Lake Ontario were violently agitated. So in 1812, the tremendous earthquake in the Caraccas, were followed by an eruption in the island of Saint Vincents, and from a volcano which had not been in action for near a century before.

Governor Raffles, in his History of Java, describes a most extraordinary volcanic eruption which took place in Sumbawa, in April, 1815. All the neighbouring islands, to an extent of a thousand miles, were violently agitated, and clouds of ashes fell, covering a space of 300 miles. The explosions were heard at Sumatra, Ternate, and in Celebes. In 1811, a friend of mine was at St. Michael's when the Island of Sabrina was formed, which, in about a year after, disappeared. Humboldt says, that the whole of the mountainous part of Quito may be considered as one immense volcano of an extent of seven hundred square leagues; and so the Canary Islands appear to be placed on one submarine volcano.

From this concise statement, we may easily conceive how, by the operation of these powers, great changes may be effected on the surface of our globe, and, upon the principle of a concentric crust, the tremblings and agitations extensively felt.

From the ingenious experiments of Dr. Seebeck, of Berlin, on Thermo-magnetism, may we not reasonably suppose that the surprising phenomena of the variation of the compass, and of the variation of a variation, may not be

the result of this condition of the earth, and in some respects agreeably to the theory of the learned Dr. Halley, who conjectured that the earth had a nucleus which, from the laws of motion possessed a different velocity to its envelope ?

When we reflect on the results of that tremendous volcanic operation described by Sir S. Raffles, where forty villages, and numerous plantations of cotton, indigo, and coffee, were swallowed up in the bowels of the earth, we cannot be surprised at the extensive masses of vegetable matter discovered at considerable depths below the earth's surface, or the beds of the ocean, with its submarine forests, elevated by the agency of a similar power above its water level.

In the vicinity of Bath, I have seen under the blue lyas (a blue limestone) portions of wood undergoing different changes ; that part which had not been under much pressure retained its ligneous character, the next portion resembled the surturbrand of Iceland, or the Bovey Coal of Devonshire, and the extreme part had exactly the character of jet, and admitted of a beautiful polish. In the heath where Bovey coal is found, are numerous stumps and roots of trees, so that the coal appears to be the broken trunks and branches, which, by slow and gradual change from their vegetable character, are converted to that of jet or asphaltum. These changes appear to have resulted from the combined effects of water and pressure, without any agency of heat, the bituminous matter being retained. As Bovey coal yields by analysis more than 10 per cent. of bitumen, vegetable matter, deprived of life, and exposed to the action of water alone, a gradual change takes place, blackens and assumes a charred appearance. By such a process, the roots and stalks of vegetables, on heaths and morasses, are converted into turf; when deeper in the earth than a slight pressure operates, the roots and fibres become

less distinct, the vegetable is resolved into a black extractive substance, and then called peat. When more extensive masses are immerged at greater depths than surturbrand, Bovey coal, &c. are found. All these substances, by analysis, yield those results which correspond to the elementtary constituent parts of vegetables.

With respect to coal, the formations are so distinct, that they are always found in the same relative geological situation: not so the former class. Thus the position of Bovey coal may be considered as accidental, and its sandy intermixture arises from the disintegration of granite in its vicinity. Coal is found in a basin reposing on limestone, and never observed either on primitive or transition rocks, and, in the analysis yields very different results. The vegetable appearance of the coal at Dudley has been advanced as a decisive proof of the vegetable origin of coal. Frequently we observe, in the schist above the coal, extensive vegetable impressions; yet no geologist has inferred from this, that the schist is also indebted to the same organic source. The sulphur evolved by its destructive distillation principally arises from the pyritical matter with which it is always more or less intermixed. From what source arise the constituent parts of ammonia cannot so easily be explained. In all the analyses of coal, by different mineralogists, the imperfect mode recommended by Kirwan appears to have been generally adopted, viz. by the deflagration of coal and the nitrate of potass in a crucible, and thus determining the proportion of carbon, and erroneously concluding that the residuum is bitumen and earthy ashes. The Bishop of Llandaff, by his experiments, though anterior to Kirwan, has more correctly concluded that the coal of Whitehaven, which he examined, is a combination of charcoal, bitumen, sulphur with earth, and metallic matter. Thus Beudant, one of the most eminent mineralogists of the present day, on the analysis of Houille, or Charbon de Terre, thus notices the

composition :—" Carbone, avec 30 à 40 pour cent de bitume dans les meilleurs qualités, et 3 à 5 de résidu terreux lorsque la matière est complétement brûlée." Also, by all writers on mineralogy and geology, peat, turf, surturbrand, Bovey coal, the piligno of the Italians, the mineralized schistous leaves of Iceland, and the common or fossile coal (Carbo Fossilis) have all been generalized as being of vegetable origin, assuming their various characters according to the different conditions of water, temperature, and pressure.

It appears surprising, that some attention has not been paid to the results of those analyses which are conducted on a large scale, such as in establishments for the manufactory of gas, and of the pyroligneous acid. In all the play of combinations of the constituent parts of the substances enumerated, excepting coal, we invariably find them resulting from binary or ternary arrangements of the three elementary principles, viz.—carbon, oxygen, and hydrogen. We find no sulphur, no pyritical matter, no traces of nitrogen, all which are found in great abundance in common coal. Turf and peat are found on the granite beds of Greenland and Iceland, and on the tertiary beds of France and England; and M. Hericart de Thury describes some of these deposits in Dauphiny at 1,100 French fathoms above the level of the sea. The celebrated botanist, Decandolle, observed, that in Holland the turf is the result of sea weeds, and, in elevated districts, principally arises from the leaves of trees. Most of these are of recent formation. Wood, which has been worked, and tools of iron, have been found in the turbary.

Coal invariably reposes on the carboniferous limestone and on old red sand stone, and with the carboniferous strata the iron ores are associated, and the millstone grit and shale, old red sandstone, and the carboniferous or mountain limestone, constitute, with the coal measure, a series of

associated rock formations. Coal measures do not form one indefinite confused mass; we observe regular alternations of sandstone, slate, clay, and coal. My learned friend, Dr. Mac Culloch, in his valuable paper in the 2nd volume of the Geological Transactions, has introduced many observations and experiments, with a view to illustrate the origin of coal and its formation from vegetable matter. It is with the greatest diffidence that I venture to submit to the public any opinion contrary to this able chemist and mineralogist. My principal argument rests on the results of my experiments not exhibiting the same chemical products as the lignites, &c.

It must be admitted that, in coal fields, we observe representations of the trunks and stems of arundinaceous plants, also some participating of the palmaceous and others of the coniferous plants and leaves of the order "Filices;" and my late learned friend, Steinhauer, supposed he had discovered tubular acini or leaves in some of the calamites and portions of the Phytolithus Notatus. In all that I have seen, I have never observed any satisfactory ligneous characters; nor is it easy to conceive that, in such extensive imaginary woody masses, the vegetable part should be so effectually removed, and in lieu thereof earthy materials substituted, excepting a very thin tunic of carbonised matter, which rather increases the difficulty attending the hypothesis of the whole mass being a cast corresing in size to the supposed vegetable.

When to these observations I add the circumstances of the universal existence of sulphur and of ammonia, in the destructive distillation of coal, I am induced to conclude that the coal formations have not their origin from vegetable matter.

Ligneous substances, or wood, are susceptible of three changes.

1. By a long-continued action of water, every soluble

part of the vegetable will be removed, and only the skeleton, which is the carbon, left. In these cases the form of the vegetable is so well preserved, that its order and genus are frequently capable of being determined.

Pyritical nodules generally contain 53.3 per cent. sulphur, being persulphurets; after exposure to heat they are converted into sulphurets, containing 36.3 per cent. sulphur, and in this state of combination are susceptible of magnetic influence.

The long-continued application of water to pyritical sand produces a similar effect, and to this we may attribute the magnetic iron in the sand found on the banks of the River Avon, deposited there from the washing down of hills, some miles above Bath; which sand has been appropriated to the elevation of the lower part of Bath, particularly the beds of the King's Bath, and by some erroneously supposed to have been there determined by the agency of the spring. Nuts and bones are also occasionally found. In some excavations I lately made in Abbey Street, for the foundation of the Kingston Pump Room, which is situated direct on the old Roman springs, I came into the original marsh which formerly covered the lower part of Bath, and found it replete with decomposed rushes, many portions of the hazel, and numerous unbroken nuts.

2. By water and pressure, when vegetable matter is imbedded in any earthy mass, which subsequently becomes consolidated, the greater part of the oxygen becomes evolved, leaving the other ingredients in their binary combinations, which are presented to us under the form of lignite, jet, &c.; and, if under pressure, without consolidation, then takes on the character of peat.

3d. When the depth is considerable, as in the case of the elevation of submarine forests, or fissures of the earth formed by volcanic agency, then the vegetable matter which

may thus be embowelled becomes amenable to the influence of caloric, and the resulting effects will be the production of carburetted hydrogen gas, and the distillation of naptha and petroleum.

I presume it is to the last operation the production of the mineral oil and inflammable gas is to be ascribed; although decomposition by water will effect an evolution of carburetted hydrogen, as is evident from agitating the bed of an old pond, charged with vegetable matter, bubbles of air are disengaged and which are inflammable. I know not of any instance of such a substance as the mineral oil being given out without an increased temperature.

The appearance as to Bovey coal would rather favour the agency of water. The situation of the heath field in which the Bovey coal lies is surrounded by the range of hills that are at the feet of Dartmoor and Haldon, and probably derived from trees which, in various distant ages, have been washed down by torrents from neighbouring hills on which these alternating beds of clay have, from time to time, been deposited. The coal is of different shades, from a dark colour to a black, the latter being more bituminous; the thickness of strata from one foot and a half to four feet, and in pieces about three or four feet in length. It has been noticed by Mr. Pering that, about one hundred yards from the pits, just on a level with the heath field, that there are numerous stumps of enormous large trees, resembling the Pinus Sylvestris, or Scotch Fir, with evident marks of the ax, but not of the saw.

This progressive state of carbonization has been observed at Loch Neagh, in Ireland, Altorf, in Franconia, &c., and in a great variety of formations in the London clay, oolites, and lyas; although we may infer that both fire and water are competent to produce the bituminization

of wood. The subject produced is not coal; and when naptha or petroleum is evolved, fire appears to have been the active agent.

These preliminary observations will lead us to an investigation of the chemical properties of the different bituminous products.

ON THE

CHEMICAL CHARACTERS OF THE MINERAL OILS OF BARBADOES.

ALTHOUGH I have observed that vegetable matter appears to consist of an arrangement of three elementary substances, viz: oxygen, hydrogen, and carbon, yet occasionally we find other substances, as potash, soda, and earthy bodies, and more than thirty products besides the vegetable acids and the lately-discovered vegetable alkalies, which constitute such an important part of the more active medico vegetables so abundantly existing in the tropical regions.

Relative to vegetable analysis, we are indebted to the elegant apparatus of Gay Lussac and Thenard. By an exposure to heat of chorate of potassa, with dry vegetable matter, the oxygen of the chlorate unites with the carbon and hydrogen of the vegetable matter, the resulting formations of carbonic acid and water determine their respective proportions, and the azote is evolved in an uncombined state; lately, these celebrated chemists have substituted the peroxide of copper to guard against any error which might arise from the formation of nitric acid. To organic analyses, Dr. Ure has paid great attention. From the results of his experiments, it appears that gum arabic, Cannel coal, and indigo contain azote. The last substance, viz. indigo, he states as consisting of carbon 16 atoms hydrogen 6, oxygen 2, and azote 1. From the Dr.'s table it does not appear that he detected azote in any other coal; this no ways

accords with the results of coal gas products. I have superintended the construction of the gas establishments at Bath, Swansea, and Carmarthen; whatever coal was employed, considerable proportions of ammoniacal liquor are evolved. In London, it is stated that a chaldron of coals averages 200lbs. of ammoniacal liquor, principally carbonate and sulphate, and requiring about 23 lbs. of sulphuric acid of S. G. 1.84 for saturation, as 100 parts of sulphuric acid of this density contains 81.54 of dry acid—therefore the above proportion will be equivalent to 18.75 of dry acid, competent to saturate 9.75 of ammonia—but ammonia consists of 3 atoms hydrogen and 14 azote, so that the weight of azote in this product is 8 lbs., besides what exists in the state of a sulphate.

Chemists generally consider naptha as the only fluid substance formed by a binary combination of carbon and hydrogen; Dr. Henry says it is a combination of 6 atoms carbon, and 5 atoms of hydrogen—therefore its equivalent number is 41—viz., that forty-one pounds of naptha are formed by the combination of 36 lbs. of carbon, and 5 pounds of hydrogen. Dr. Thomson, with the peroxide of copper, found 3 per cent. deficiency, and which he concluded to be azote; and Dr. Ure deduced from his analysis that oxygen constituted one portion of it. This discrepancy is considered to arise from some water in the petroleum from the naptha he distilled.

With respect to its general character, the pottery more resembles naptha than any other bituminous substance, it is specifically heavier than naptha—naptha being .859, and the pottery is .94, and boils at 204—its capacity of heat is so low that even at this temperature the hand, by immersion, will not be materially injured.

The diminished capacity is not peculiar to this substance, both animal and vegetable oils, tar, asphaltum, &c. possess the same property; an important practical advan-

tage arises when its external application is required. At a little below the boiling point of water, the part affected may be safely rubbed with the mineral oil, and more advantageously from its increased temperature. It is no ways so limpid as naptha, nor so thick and adhesive as tar.

Half an ounce of the pottery and the same quantity of the mineral oil, known by the name of Moses, were well intermixed with a quart of water, frequently agitated, and at the expiration of twelve hours filtered; the filtered solution was perfectly clear, and from the evaporation of a pint, a residuum weighing 18 grains was left, similar to what had been observed by Dr. Hales. A correspondent or similar experiment, made with common tar, left a darker coloured sediment, and more bitter as to taste, and which weighed 26½ grains. The difference in flavour is very considerable: the former has a pleasant aromatic odour, and this, in proportion to the excess of the pottery.

A wine-glass of the filtered solution of common tar leaves a disagreeable greasy taste in the mouth, and induces a mawkish sensation almost amounting to nausea; whilst the same quantity of the pottery solution is aromatic, no ways disagreeable to the taste or the stomach, and the resulting effects rather cordial and more permanent.

Æther and aq. ammonia readily unite with the Barbadoes tar, and the pure alkalies form an emulsion with it and water, and no ways unpleasant to the taste: the common tar separates and has a darker tint.

In the distillation of the spurious and the Barbadoes tar, the latter yielded more naptha, and left a very small residuum; what came over did not retain the rich dark olive green which characterises the pottery; to what cause may be attributed this peculiar colour, I have not yet satisfactorily ascertained. I have already noticed the existence of a chalybeate spring highly charged with iron, contiguous to the pottery, and hence it might be reasonably suspected that

the colour arises from some ferruginous impregnation; all my examinations have not evinced any such metallic combination.

The specific gravity of naptha is 857, estimating water at 1000, petroleum 878; maltha varies from 1450 to 2060, and asphaltum from 1070 to 1650; the pottery tar 920.

From the above, it appears that the pottery is specifically heavier than either naptha or petroleum: upon this statement very little dependence can be placed, for, from the mode which is adopted for the collection of this mineral oil, it is always entangled, more or less, with water; at its source, most probably, it has more the character of pure naptha, as in the latitude of Barbadoes the more volatile portion has been evaporated by the degree of heat to which it has been exposed.

The excellent experiments of Mr. Faraday most satisfactorily demonstrate many distinctive properties between the green tar and the spurious tar, although analysis resolves the Barbadoes oil into carbon and hydrogen, yet there is reason to suppose some other principles which elude chemical investigation. From the description of the varieties of naptha given to us by Wallerius, as natural productions, they are reducible to seven:—

1. White naptha.
2. Red naptha.
3. Green or dark naptha.
4. Petroleum mixed with earth.
5. Petroleum exuding from stones.
6. Petroleum floating on water.
7. Mineral pitch or maltha.

Different napthas are found in Italy in the neighbourhood of Modena, and at Monte Ciaro, twelve leagues from Placenza, and in several other parts of Italy; also in Sicily; in France, at the village of Gabian, in Languedoc, and in Alsace; at Neufchatel, in Switzerland; in Scotland; at Ragu-

sa in Greece; Samosata, the capital of Commagene, in Syria, and in several places in Persia and India.

It is stated that at Monte Festino, near Modena, all the bitumens from the lightest naptha down to mineral pitch, are found in the same spot. I had not the opportunity when at Modena of visiting Monte Festino, yet I have frequently seen the naptha which is employed by many persons at Modena, Mantua, and Genoa, to burn in lamps, and we are informed that it is extensively used for a similar purpose in India and Persia. Lehman says that the poor inhabitants of Persia mix naptha with earth, which burns briskly, and evolves a thick and disagreeable smoke.

I have had specimens of naptha from Persia and Italy; I have not as yet seen any with the dark green tinge of the pottery, and with a similar corresponding flavour; I have not as yet had an opportunity of making a series of comparative experiments with these different bituminous productions in a medical point of view.

ON THE

MEDICAL PROPERTIES OF THE BARBADOES MINERAL OIL.

Although petroleum has been long employed, externally, in diseases of the skin and muscular debility, it is particularly noticed, in the London Pharmacopœia, that Barbadoes Tar has been rarely used, from the difficulty of obtaining it genuine. The superiority of this product of Barbadoes, to the tar imported from the Baltic, has been most satisfactorily demonstrated by the Rev. Dr. Hales, Dr. Kirkland, and Mr. Warner, Surgeon, of Guy's Hospital; and at that period the genuine article could be procured. When Lord Dundonald introduced to the public tar from coals, at a very moderate price, this was substituted for the genuine tar; so that, for the last thirty years, none has been imported, and its excellent medicinal virtues have, of late, only been locally known at Barbadoes. We are indebted to the benevolent exertions of the proprietor of the springs for making such arrangements as to enable the public to be supplied with these valuable products. He has liberally distributed a quantity he lately imported, to different professional gentlemen, in order to ascertain whether there existed such difference from the tar commonly employed, as to render it any ways interesting in a medical point of view. The results, in numerous instances, have been so uniformly gratifying, that he has considered it an imperative duty to have the produce of the springs con-

veyed to this country, in order to have it properly arranged, either for external or internal purposes.

In the Preface, some observations have already been made on the advantages to be derived from the external application of Barbadoes Tar, in that most distressing cutaneous affliction, the Leprosy. Dr. Hilliary has given us an excellent description of this distressing complaint in his valuable work on the Diseases of Barbadoes. In warm climates it assumes a character of great constitutional disease, highly offensive; tubercles and ulcers evincing a general putrescent decomposition, under which nature at last sinks. In the colder latitudes of England, &c. the Lepra assumes a milder form, more of the character of a local disease of the skin, unaccompanied by any constitutional disturbance. From Barbadoes, we have many satisfactory statements of the beneficial effects of the mineral oil or tar in this melancholy disease. One virulent case of a female, who had been thus afflicted for fourteen or fifteen years, the happiest effects were experienced from its internal exhibition, commencing with two table spoonfuls in the course of the day, and progressively increasing the dose to three or four times the quantity; sometimes alone; more frequently in water acidulated with vitriolic acid, or dissolved in rum: the period did not exceed three months. Within the last year, an interesting case has been described by a respectable practitioner in that island, of a cure being effected by its means; the individual having, some time before his return to Barbadoes, been under the superintendance of an eminent practitioner in London, without any beneficial results.

When internally taken, after a few days, the odour is imparted to all the excretions, perspiration is promoted, the secretions by the kidneys is increased, and both accompanied by a strong aromatic smell of the tar. Probably to

this may be attributed its good effects in cutaneous affections, from its internal administration; and hence may be presumed to be beneficial in affections connected with the lymphatic system.

Nearly eighty years since, the medicinal qualities of this bituminous exudation, in cutaneous eruptions, were noticed by the Rev. Mr. Hughes, in his Natural History of the Island of Barbadoes. He therein mentions what he terms its penetrating nature with respect to the horse. When dosed with it, if soon after exercised, the odour of the tar becomes very perceptible to the rider. Turpentine, and many other vegetable products, impart their characteristic smells to the urinary secretions, but none of them appear to be so generally diffused through the system as the tar; and hence its internal exhibition may advantageously co-operate with its local external application in glandular complaints or cutaneous affections.

In the Tinea Capitis, or those scurfy eruptions of the head, more particularly observable in children, the Unguentum Picis, combined with mercury, has been long employed. I have lately substituted an ammoniacal solution of the Barbadoes Tar, with the greatest advantage; and from the result of trials made by different practitioners in this city, we feel justified in recommending its employment in all herpetic and impetiginous complaints. As there might be some objection to its being used in the form it is brought into this country, as the surface of the body cannot be kept in that cleansed condition which is so important in all cutaneous affections, its ammoniacal combination forming a saponaceous liniment, would not only prevent that inconvenience, but the good effects, also, would be increased by the agency of the alkali.

With respect to its employment in the itch, I have not heard of any trial having been made with this material; and indeed, as we are in possession of an active and expe-

ditious remedy in the sulphur vapour baths, when these can be employed, it is unnecessary to have recourse to doubtful means.*

The cases recorded by Dr. Kirkland and Mr. Warner, on the specific property of the Barbadoes Tar, in morbid affections of the joints, in indolent tumours, and in injuries of tendons and ligaments, merit the attention of every practitioner. They made comparative experiments between this natural product and that imported from Norway or America, and, from the results, they energetically recommended to practitioners, to be particular as to their employment of the genuine Barbadoes Tar.

We cannot more strongly corroborate the above opinion, than by a case sent to us by a highly respectable practitioner in this city, a Mr. J. Seale, surgeon, and which cannot be better given, than by his own communication.

"A young lady, aged 18, residing at Weston, near Bath, some time in December, 1828, fell over a stone, and considerably bruised her knee, and slightly abraded the skin. The sore soon healed, and she experienced no further inconvenience for more than a fortnight,when the knee commenced swelling, and continued gradually to increase.

"In April, 1829, she consulted me. The knee at this time being very hot and painful, it was cupped, leeched, and poulticed for a fortnight, the inflammation partly subsided, after which it was kept wet with cold lotions for nearly a week, a large blister was applied, and kept open for some time. The knee being not in the least reduced by these means, adhesive plaster was firmly strapped round it, and kept well bandaged. During the time she wore the adhesive plaster, she was capable of walking without pain. This plan having been pursued, without

* Persons desirous of employing Sulphur Vapour Baths, in this City, will obtain every advantage by application to Messrs. Moody and Bell, at Kingston House, close to the Kingston Pump Room.

any reduction in the size of the knee, I was induced, from the recommendation of a friend, to try the Barbadoes Tar. She commenced by rubbing well in, a table spoonful, night and morning, and wearing a piece of brown paper, well smeared with the tar. She has pursued this plan for nearly a month, and, I feel much pleasure in stating, with the most *decided advantage*. The knee is much reduced in size, and she can walk firmly without pain, except in coming down stairs, when she experiences a weakness. She is still continuing the tar.—*July*, 1829."

It does not appear, from any trial of this, as an embrocation, that any good effects have been experienced, but in cases after inflammation had been subdued, or where an indolent or defective action existed. In any rigidity, the result of gout or chronic rheumatism, the tar has been employed with considerable advantage. In scrofulous tumours and glandular enlargements, the ammoniacal embrocation would probably produce beneficial results. In tetanic affections, Dr. Hilliary particularises its excellent effect as an embrocation, composed of three ounces of tar in half a pint of rum. Dr. Ainslie says, that the Tamool doctors, in the East Indies, order rock oil (which resembles Barbadoes Tar), as an external remedy in rheumatic complaints, as also in cases of epilepsy, hysteria, and palsy. It is rubbed on the part with the hand, in the form of a liniment; and in chronic rheumatism, Dr. Fleming declares he can, from his own experience, recommend it as an efficacious remedy. For more minute particulars, the reader is referred to his Catalogue of India Plants, p. 56.

The Barbadoes Tar forms an emulsion no ways disagreeable, either with the yolk of an egg, mucilage, or pure kali; and in this form has been employed in chronic coughs, particularly that species which is frequently observed in advanced life. A Physician to one of the Hospitals in this city, assured me, in this species of cough he had invariably

succeeded when other modes had failed. In hooping cough, it is probable it would be very beneficial, and, particularly, by combining the ammoniacal embrocation along the spine, rubbing it in as warm as the hand can support the heat. As to the curative effects of Barbadoes Tar, in the form of vapour, in pertussis, there is an excellent paper of Mr. Wansborough, Surgeon, of Fulham, in the London Medical Repository.

"A fine healthy child, twelve months old, was attacked with violent symptoms of pertussis. The paroxysms were so severe as to threaten suffocation. The disease had existed nearly six weeks when I was called upon to attend. Inflammation of the lungs had supervened. The child refused the breast, and was exceedingly restless and uneasy from dyspnœa. I ordered the warm bath, and three leeches to the scrobiculus cordis, purged her briskly, and ultimately continued with antimonials and expectorants. In the course of twenty-four hours from my first visit, a considerable amendment was observed, the urgency of the symptoms being very much abated. A blister to the chest closed the active measures; and three days after, the inflammatory diathesis completely subsided. The paroxysms of the cough, nevertheless, were still violent, though the frequency of them declined with the concomitant symptoms. In short, the little patient appeared likely to conquer this formidable foe; when, unfortunately, she was accidentally exposed to a current of air, which gave her cold, and increased the cough violently during that night. I again saw her on the following morning; and, unwilling to have recourse to the former measures for her relief, I determined on applying the vapour of tar, the absence of inflammatory symptoms warranting the application. Her breathing was short and oppressed, but the difficulty appeared to arise more from accumulation of mucus in the bronchiæ than irritation. My idea was to bring the remedy in contact with the part or parts affected, and thereby expedite the effect. If, therefore, the remedy were likely to prove beneficial, the fact would be proved and illustrated by ocular demonstration. I decompo-

sed a portion of Petroleum Barbadense, by dipping into it a red hot iron ; the end of the common poker answered the purpose conveniently. The child was held over the vapour as it arose, observing not to let her inhale it until sufficiently diluted by a due portion of *atmospheric* air. My little patient no sooner inhaled this gaseous compound, than she exhibited manifest signs of relief. Instead of avoiding the volume of vapour as it arose from the vessel, which I feared would be the case, she willingly inhaled it, and suffered the tar to be placed almost under her nostrils. The effect was conspicuous, in relieving the pressure under which the little sufferer laboured : expectoration was promoted, and rendered nearly free from effort, by this remedy. In short, after six exhibitions of the vapour, the cough almost ceased ; and without the aid of any auxiliary the child perfectly recovered.

I feel satisfied that I am indebted to the efficacy of *carburetted hydrogen* and *oxygen* for the recovery of this case, and I have happily experienced the heartfelt satisfaction of preserving, by the same means, from threatened destruction, *my own child*, an infant three months old. Accidental exposure to cold produced catarrh ; the breathing was short and difficult, attended with sensible accumulation in the air tubes of the lungs, which the child was unable to expectorate. These symptoms increased rapidly. There did not exist any other excitement than the difficulty of respiration. The distress of the infant excited feelings in my breast which can only be appreciated by a parent. I had already lost one child from pertussis, in which the vapour of tar was *never thought of ;* another fell a victim to hydrocephalus from metastasis ; and this last appeared hastening to form an addition to the number. From her birth she was delicate—smaller, considerably, than the generality of infants at her age.—Leeches were inadmissible ; not only because of the absence of active inflammation, but also from the apprehension of depleting the already debilitated system. Emetics and expectorants were unavailing ; the former, equally objectionable with leeches.—Blisters were inadmissible, from the addition thereby of irritation to the system. Under these conflicting circumstances, my

distress of mind may be easily conceived. I was led to the adoption of the warm bath; but the agitation it occasioned obliged me to relinquish all thought of a repetition, At length, worn with fatigue and suffering, at the end of three days, the poor little sufferer *refused the breast* in the morning; and I then concluded the termination of her distress by a fatal issue would, ere long, arrive. At this crisis, I had recourse to *tar vapour*, as mentioned in the former case. I applied it at a distance, whilst the child lay in the mother's arms. Breathing quick and short, with frequent interruption from what appeared to be accumulation in the bronchiæ. The little creature seemed revived the instant she inhaled the vapour, and made an effort to cough! Delighted at the effect, I placed the vessel nearer to her nostrils, and continued the fume for about three minutes, when a cough intervened, followed by an immediate vomiting of viscid phlegm and mucus, that nearly suffocated her. The quantity evacuated from the lungs and stomach saturated two handkerchiefs. Complete exhaustion, for about a minute, succeeded this operation; and, to my inexpressible joy, the little patient took the breast heartily afterwards, and sunk into a sound sleep, which lasted two hours: she awoke refreshed, and considerably relieved. Encouraged by this unexpected and happy success, I continued the application of the vapour for a week, twice in the day; when, from the decided remission of symptoms, I ceased the further use of it. The first six applications were succeeded, each time, by a copious expectoration, which always ended in the abatement of the previous symptoms.

"About a month ago, my little girl again took cold, when the difficulty of breathing returned, attended by wheezing and cough. Recourse was again had to the same remedy, which procured relief the first time it was applied, by producing sickness, and a copious expectoration of phlegm and mucus. The second application was not so successful; symptoms of an inflammatory type supervening, with fever. The child being now six months old, and considerably mended in constitution, I exhibited antimonials, and applied a blister to the chest. The febrile symptoms remitted, and an amendment followed. The

support which the mother had afforded now declined, both in quantity and quality; and we were necessitated to adopt another source of nourishment, but through the same medium, viz. the breast. Change of air, at the same time, has, in conjunction with her nourishment, happily restored the infant to our anxious hopes. After the subsidence of the inflammatory action, the vapour was applied three or four times, and with confirmed success. The child is now perfectly well, and is gaining flesh.

"Master Alfred Wallis, three months since, manifested symptoms of asthma. His father hearing me often make mention of the success I had experienced in the application of the vapour in pneumonic affections, requested I would try it with the boy. He was unwilling that any active measures should be resorted to, the child having so recently recovered from phthisis. The state of the little patient was as follows; his breathing oppressed; cough frequent and violent, *without any* expectoration; each paroxysm produced suffusion of the eyes, and florid countenance. The idiosyncracy of system (hydrocephalic) led me to apprehend encephalic congestion. His rest was much disturbed by the cough. Upon placing the hand between the shoulders, and on the chest, the wheezing was very sensibly felt; and the child seemed to breathe, so to speak, as through a sieve; such was the accumulation of mucus in the air tubes of the lungs. Desirous of affording the vapour a fair experiment in this case, it being more closely allied to the class of pulmonary affections, in which it appeared most unqeuivocally applicable, I commenced the trial; and my patient inhaled the vapour, diluted as in the two former experiments, from the 14th of August to the 23d of September, regularly; then every other day, and finally ceased on the 28th of October. The first eight or ten inhalations produced powerful action of the lungs; and the quantity of mucus expectorated exceeded belief; and it gradually subsided, whilst the pulmonary viscera seemed to expand, under the influence of the new atmosphere. My little patient came *voluntarily*, during the whole period, as he used to say, "to get rid of the phlegm." It is remarkable that the child gained flesh whilst under treatment. Not a single medicament

of any description was exhibited to him, as I was determined to witness the unassisted effects of the vapour. He is now quite well; and when he has any "wheezing," as he terms it, a dose of tar vapour sends it away. By the by, he has had but *one* dose since he left off his regular attendance.

"Upon the whole then, it may, I presume, be inferred from the cases here adduced, that the efficacy of carburetted hydrogen, produced in the manner I have detailed, possesses decided advantages in chronic and in recent cases of pulmonic affections, before the accession of active inflammatory symptoms. In the few cases that have come under my observation, wherein I have applied it, *immediate* relief and ultimate benefit have accrued to the patient. The only instance of failure I have experienced, was in the second attack of my own child: there, I candidly confess, my former success rendered me blind to the existence of active symptoms, until I perceived them increased by the stimulating nature of the application. Yet, after the inflammatory action was removed, the effect of the vapour was certainly efficacious: so that, it appears, in cases where the lungs are under the influence of an inflammatory diathesis, the exhibition of this remedy is improper; but in chronic pulmonary affections, and also subsequent to the existence of increased arterial action, I have no doubt of the superior efficacy of this gaseous compound. I will not presume to enter into any thing like a rationale of its qualities—that I leave to abler pens than mine: I would only offer *facts*, with such comments merely as arise from a due consideration of the importance of the subject; feeling, as I do, that many children may be yet saved from premature death, by the adoption of this simple yet powerful remedy, even by the parents themselves. Should I be so fortunate as to stimulate, by my humble efforts, one individual to a successful application of the *vapour of Barbadoes Tar*, my object will be attained.

"The mode of administering the vapour I adopted in the case of Master Wallis and my own child, which I have since found exceedingly applicable to infants, is simply this: A vessel of tin, resembling a coffee pot, contains the tar: the size is imma-

terial; twelve inches by four will suffice for the generality of cases: a conical tube issuing from the top; a corresponding opening on the opposite side, to allow a draft, that the vapour may ascend. The iron is what may obtained at any ironmonger's: laundresses use it for what they term the *Italian Iron.* This heater being attached to a firm iron rod, terminating in a wooden handle, is altogether eighteen inches in length. The cover or lid of the pot is made to slide on this rod; so that when the heater is made hot, upon being immersed into the tar, the cover fits on, and prevents any escape of vapour. The tube of the pot is then kept to the nostril, at the proper distance, that the vapour may be inspired.

"Care must be taken that the heater be not red hot, in which case ignition of the gases, attended by an explosion, will happen, and may be of serious consequence. This happened once with me: I therefore caution those who use the remedy, to observe the degree of heat ere the heater be immersed in the tar: neglect of this observance on my part occasioned ignition, and burnt the eye-lashes and eyebrows of my little patient Wallis.

"I would observe, that the exhibition of the vapour never produced vomiting, whenever I have applied it, unless the bronchiæ were loaded with mucus; and in either case, viz. whether there existed mucus or not, the remedy invariably operated as an anodyne, producing sleep."

Mr. Wansbrough very properly observes, that the vapour should not be employed when inflammatory action exists: in this process it is the naptha which is volatilized, and not any decomposition of the tar into its constituent atoms of carbon and hydrogen; the vapour acts as a stimulus, and its action is very different from carburetted hydrogen.*

The influence of the Barbadoes Tar, in the form of

* It being of great importance that the Barbadoes Tar, in its vaporific form, should be judiciously employed, Messrs. Moody and Bell, Kingston House, Bath, Surgeons' Instrument Makers, have constructed an Apparatus for this purpose, and superintend its use.

vapours, applied to the lungs, having thus been demonstrated by the well described cases of Mr. Wansbrough, in the *London Medical Repository*, I shall conclude by submitting some opinions on the principle of digestion, and those diseases depending on this important function being imperfectly performed.

I have been informed, by very respectable authority, that the Pottery acts as a gentle aperient; if so, its prudent combination with soda would constitute a medicine which might be advantageously employed in dyspeptic affections. I need not observe the injuries to the constitution from a too frequent recourse to active aperients; that fluid which lines the intestines, to guard and protect them from the stimulus of their contents, if removed, great and serious constitutional disturbances are the results. Agreeably to Mr. Abernethy's sentiments the *succus intestinalis* is necessary for the perfect chylification of our food. A pint of warm water with a table spoonful of the Pottery mineral oil as an injection would empty the lower part of the canal, and the smaller intestines, where the principle of chylification is confined this important process would not be disturbed, whilst their peristaltic motion would become sympathetically increased.*

The principle of digestion is so intimately connected with the condition of the stomach and alimentary canal, and no constitutional disease can take place without these participating in the morbid action, that every enquiry which may lead to a more perfect knowledge of this important process merits the serious attention of every practitioner—these motives have induced me to give an epitome of the interesting experiments of some of the continental physiologists in which I have been personally engaged.

* This convenient mode of relief is not so much practised in this country as on the Continent. Every family ought to be in possession of an apparatus for this purpose; excellently constructed injecting apparatus, without valves, and therefore not liable to be out of repair, are manufactured by Messrs. Moody and Bell Surgeons' Instrument Makers, Kingston House, Bath.

ON THE

PRINCIPLE OF DIGESTION.

To Mr. Abernethy the public are greatly indebted for his valuable observations on the important function of digestion, and for most satisfactorily demonstrating the great sympathetic connexion between the stomach and all other parts of the animal frame; in every morbid affection our greatest attention should be primarily directed to the condition of this important viscus.

This eminent physiologist considers all food taken into the stomach as amenable to three changes, viz. digestion in the stomach, chylification in the small intestines, and the third process in the large. When the food is converted into a viscid, transparent substance, it is called chyme. Mr. A. observes, that when the gastric fluid acts imperfectly, gaseous fluids are extricated from the animal matter; and if indigested matter pass into the intestines, no chyle is produced, and, probably, chemical changes are taking place during its passage. Athough this celebrated anatomist considers the succus gastricus to be the principal agent by which digestion is performed; yet, he states as his opinion, that the intestines secrete a fluid, which he terms *succus intestinalis*, and which governs and regulates the process of chylification, co-operating with the bile and pancreatic liquor. All healthy secretions, poured into the alimentary canal are colourless; they are tinged by the bile, when this secretion is interrupted, as frequently results from the irritation of teething in children, then the fæces are white. When the stomach is overcharged vege-

table food ferments and becomes acid, animal food rancid and putrid, the chyle deteriorated, the blood impure, and all the secretions unhealthy: enormous repletion oppresses the vascular system; hence, in proportion to the debility of the stomach, food ought to be diminished in quantity, and that selected which is the most nutritious and best adapted to the feelings of this important organ.

This epitome of Mr. Abernethy's doctrine points out the great advantages which are to be derived from an examination of the principles of the gastric fluid, in order to ascertain whether the process of digestion is the result of any chemical action. In this point of view Mr. A. does not appear to have contemplated the subject, but to refer the whole to the agency of living action. That the secretions from the internal surface of the stomach are produced by a vital principle, no doubts can be entertained. From recent experiments, it appears probable, that the effects of these secretions on the nutrient part of our food are chemical solution.

About six years since Dr. Prout informed me, that he was then engaged in a series of experiments relative to digestion; and he was then induced to believe, that the hydrochloric acid he discovered in the gastric fluid is the solvent employed by nature.

He subsequently illustrated this opinion by a series of well conducted and elegant experiments. A few months after this period, I visited Geneva, where I passed the winter in that seat of science. I had the pleasure of being particularly acquainted with Dr. Prevost, who at that time was directing great attention to the subject of digestion; and as the range of the organ subservient to this important process is more extensive in ruminating animals, than in those possessing only a single stomach, it was to these his attention was particularly directed. "*Les ruminans, par la division de leur estomac en quartre parties distinctes, offrent un grand avantage pour apprécier les changemens successifs qu'éprouvent les végétaux dont ils se nourissent: le*

mouton est le sujet dont nous avons fait-choix pour cet essai."

After the food is masticated and impregnated with saliva, it is determined by the œsophagus into the paunch or great stomach, the internal surface of this reservoir is furnished with a number of papillæ formed by the mammilated tunic. They are covered with an epidermis which is easily detached in shreds. This stomach has a free communication with the second division, called in French *le bonnet*, from its resemblance to this article of dress, and is placed on the right side of the œsophagus. Its mammilated lining presents very projecting channelled folds, which surround polygons, whose areas are thick set with small papillæ. In this stomach the food is less solid, and from this it is taken by different portions into the mouth, and there it undergoes the process of rumination, until it is formed into a paste, which passes by the œsophagus into the third division, called *le feuillet*, from its foliated structure, resembling the leaves of a book, by means of a groove directed from the cardiac opening of the large or first stomach to the superior orifice of the feuillet. The contents of both these stomachs are similar; the mass has an alkaline taste derived from the soda of the salivary fluids, and of the secretions of the two stomachs; the liquid part obtained by pressure was boiled in order to separate the albumen, and slowly evaporated to dryness to avoid burning the extract; the mass infused in hot water, the coagulated albumen is not redissolved. Upon slowly evaporating the filtered liquor, there appeared a pellicle of jelly; this, when completely dried, had a vitreous and semi-transparent fracture, and all the chemical properties of jelly, as being insoluble in alcohol or æther; soluble in cold water, but more so in hot. From a series of well conducted experiments, it appears that the nutrient part of vegetable matter consists of albumen and jelly, and from five kilogrammes and a quarter were produced 16.78 grammes of dried jelly and 27.52 of dried albumen.*

* Kilogramme is equal to 2.68lb. troy; gramme ditto 15.43 grains troy.

The third stomach or feuillet has its cavity filled by numerous folds of the mammilated membrane, and by which the mass is compressed; the liquid part which is separated flows into the fourth stomach, called by the French *la caillette*, from its property of curdling milk; the three former stomachs constituting the variety of tripes; and from the fourth rennet is formed; situated as the others on the right side of the first stomach, and communicates inferiorly with the duodenum by an opening corresponding to the pylorus of single stomach animals; inferiorly it is lined by a very delicate mucous membrane, and has large valves disposed in a longitudinal direction. The liquid determined from the third stomach into the fourth undergoes a great change from an alkaline to an acid taste; a white opaline flaky matter is precipitated on the valves, adhering to them like a false membrane. This precipitation is chyme; globulous, and almost pure albumen, neither soluble in cold or boiling water; in the latter it hardens; very soluble in alkalies, but insoluble in alcohol or the mineral acids. The pressed mass passes from the third stomach into the fourth, and with the chyme enters the duodenum; and where the latter comes into contact with the alkaline secretions of the liver and of the pancreas, by this admixture the chyme is converted into a globulous emulsion and then assumes the name of chyle, the globules of which correspond in form and size to the red globules of blood. From this statement it appears that the soda of the saliva, and in the secretions of the first and second stomachs, detach the albumen and jelly from the general mass. The third stomach acts mechanically as a press, whilst, in the fourth, hydrochloric acid is secreted, and which, uniting with the soda, occasions the precipitation of the albumen. In animals with a single stomach, it appears to be the middle portion where the acid is secreted. The structure of this part is different from either the pyloric or cardiac portions; and Dr. Prevost ascertained that the emptied stomach of a rabbit, after being

frequently washed with a solution of soda, in order to neutralise any remaining acid, that a piece of linen, coloured blue by a vegetable infusion, after six hours' contact became reddened principally in that part which was in contact with the middle portion of the stomach. In order to ascertain if the secretion of the acid is any ways influenced by the division of the eighth pair of nerves, the linen was discoloured, but not so much as in the former. He hence concludes that the processes of digestion are purely chemical, in which the principle of vitality has no immediate concern, and that they may be artificially imitated by means of fluids resembling the secretions, viz. the soda and acid.

The soda is the agent to which the gastric fluid owes its solvent powers, which powers so much embarrassed and astonished Spallanzani.

The albuminous globules, whose reunion form chyme, are precipitated by the hydrochloric acid, which is a secretion of the fourth stomach in ruminating animals, and the middle region of the stomach of those vertebrated species where this viscus is not subdivided.

The muscular structure of the Æsophagus in ruminating animals is admirably calculated for that tortuous motion observed in the throat whilst chewing the cud; and if the cow or the sheep should, by misfortune, drop the cud out of the mouth, it is stated by observing agriculturists that the animal cannot raise a fresh portion into the mouth by its own natural power, the descent into the third stomach of that portion which has been a second time masticated, is necessary to the elevation of any mass from the second stomach, and which may be compared to those wells which have two buckets, the descent of the one is necessary for the ascent of the other. The animal is remarked to pine, to lose its appetite, in consequence of the digestive process being thus interrupted, and in most cases it is found necessary to kill the animal. In Switzerland, attempts have been

made to substitute an artificial cud, made of boiled potatoes and sugar; but, I believe, without success. Upon this interesting physiological principle, I have conversed with many eminent graziers, and who all concur in opinion that the greatest attention is paid to prevent the dropping of the cud; and when the animal no longer takes his usual food, and reposes on the ground for the purpose of rumination, he is killed, to prevent any further destruction.*

When chyme has been intermixed with the biliary and pancreatic secretions, and highly magnified, there appears round each globule a greenish areola, which, by gently drying, assumes a reddish tint. May we not attribute to the liver a three-fold action? A secretion of soda to convert the chyme into chyle; imparting the colouring rudiment to the globular particles; and, thirdly, acting as a stimulus to the intestines, and producing that peristaltic motion so necessary for the passage of its contents.

Nature, simple in all her operations, employs the fewest principles to effect all her admirable ends; albumen and soda constitute the greater part of the animal solids and fluids. Notwithstanding the infinite variety of food, albumen is its principal nutrient part; and with respect to graminivorous animals, those grasses are the most nutritious which contain the largest proportion of albumen.

Mr. Abernethy observes, that when the gastric fluid acts imperfectly, gaseous fluids are produced. It is a law in nature, that two actions cannot go on in the same portion of matter at the same time; if the secretion of soda should be deficient, or the stomach surcharged by its contents, the proper separation of the albumen is prevented, fermentation

* How the process first commences is difficult to conjecture: when milk is the only food, the communication appears to be direct into the fourth stomach, from a preparation in the Museum of the Surgeon's Company, and which passage, when the animal feeds on grass, is subsequently obliterated. I have not had the opportunity of examining this part of the milk calf, and, therefore, incompetent to give any description.

takes place, and carbonic acid gas is evolved. Thus, sheep feeding in rich clover pastures frequently overload the first stomach, as to prevent the communication into the second; the food, too long retained, ferments, and the animal becomes painfully distended by the developed carbonic acid gas, as frequently to require the operation of houghing.

Dyspeptic affections very frequently depend on a defect in the secretions of the soda or the acid; this becomes easily ascertained, by an examination after the exhibition of a gentle emetic, and very few instances occur where it is not connected with a relative excess of acidity, particularly in those cases where an uneasy fulness is experienced even after moderate eating, in such cases soda may be conveniently taken in the form of lozenges.*

Upon this principle is easily explained, the thin and emaciated constitutions resulting from an indulgence in acids. It is well known that many young persons sacrifice their health from a dread of corpulency, by taking lemon juice, which, by its agency, destroys the solvent power of the soda, and what food is taken into the stomach passes off in an undigested state, the animal matter becomes rancid and putrid, the chyle, blood, and all the secretions, in the same proportion deteriorated.†

* On my return from Geneva, I believe I first submitted to the public the exhibition of soda in this form, about 4 gr. of the bi-carbonate of soda in each lozenge, and one taken when the stomach is thus distressed, and which is now generally used; this mode of exhibiting soda is preferable to soda water, the coldness of the water is unfavourable to the solutions of albumen, and the carbonic acid with which the water is strongly impregnated, frequently induces an uneasy distension of the stomach. In the form of a lozenge the solution is slow and gradual in the saliva, and more efficient in separating the albumen, and of supplying that deficiency on which the disease materially depends.

I+ n the months of August and September, gramnivorous animals, feeding on pastures which lie on the marl which covers some of the beds of the blue lyas, are subject to that dreadful disease called scouring; although hay made from the same grass is not injurious: it generally appears after the first cutting, and the grass acquires an acid property from the formation of acetic acid; this combines with the soda; the result is a purging salt, and the food, by the destruction of its solvent, rendered inefficient; upon drying the hay the acid is volatilized.

Many cases of dyspepsia depend on the secretion of the liver being imperfect; in such cases, chylification cannot proceed—mercury, in its mildest medicinal form, as in that of the blue pill, is found the most efficient in meliorating and augmenting the secretions of this viscus. Mr. Abernethy observes, that when the appetite is good and digestion imperfect, he recommends bitters and alkalis; if appetite be deficient, acids. With due deference to this excellent practitioner, whenever in such cases I have observed the appetite increased, it is a depraved one, probably arising from the stimulus of a relative excess of hydrochloric acid, and in the latter case the apparent increase of appetite by the exhibition of acids is generally deceptious. I always regulate my practice by an examination of the contents of the stomach after the exhibition of an emetic; and the cases are comparatively very few where I have found an excess of alkali—in such instances I always prescribe the muriatic or hydrochloric acid, as being that acid which nature herself employs.

Albumen is insoluble in alcohol, but congulates, and subsequently difficult to be acted upon; hence the injurious effects of a daily recourse to vinous or spirituous liquors. If the dyspeptic patient at his meals would substitute warm water, he would soon experience its beneficial effects.*

It is well known that irritation of the stomach from worms, induces a teazing sensation in the nose, and hence is reasonably supposed that red and large noses are frequently the result of spirituous liquors.†

* I have experienced considerable advantage from a cold infusion of Chamomile flowers and soda, and when taken, intermixt with a sufficient quantity of boiling water so as to be about the temperature of the Bath waters, viz. 110 or 112° although at the spring the waters are at 114½, they lose of temperature by pumping, but to attribute any difference in effect to the slight variation of a degree or two in temperature is unscientific, and unworthy of any professional attention.

† Although in many cases such a discolouration and enlargement may be the result of a too liberal indulgence in spirituous liquors, yet we observe many fe-

Some physiologists have considered the duodenum as a second stomach, but from the follicular structure of the *valvulæ conniventes* of the mucous membrane of this intestine, it more resembles the third stomach of ruminating animals. It is difficult to conceive why the jejunum is generally found more empty than either the duodenum or the ileum, as in the small intestines the mesenteric glands which appertain to the jejunum are larger than those belonging to the other intestines.

When bile is prevented entering into the intestines, the chyme is not converted into chyle. Mr. Brodie tied the ductus communis of a cat, and the lacteals were only charged with transparent lymph.

In the interesting experiments of Dr. Wilson Philip with a man in good health abstaining from eating for twenty-four hours, at the end of which time he became extremely hungry, vomiting was excited by warm water, the water returned mixed with a ropy fluid resembling the gastric, the sensation of hunger ceased, and some bread and milk forced down, ran into the acetous fermentation, indicated by flatulence and acid eructations. It is to be regretted that Dr. Philip did not so far examine the fluid as to ascertain whether there existed any acescent or alkalescent quality.

The first food of nature is milk: immediately on entering the stomach it is separated, the nutritious curd is then in a favourable state of consistency for the albumen to be acted on by the soda. From this first operation of digestion, we are instructed not to let the nutrient part of our food be too much diluted, nor too hard to prevent the requisite combination with the soda, hence at meals drinking should be as limited as possible, and if deferred till the

males—paticularly after the change of life—with occasional great determination of blood to their faces, who, in every respect, are very abstemious. As branches of the eighth pair of nerves are distributed to the stomach, lungs, larynx, and pharynx, sympathetic diseases of these parts may be reasonably expected.

stomach has disposed of its contents, the more beneficial are the results.

In persons advanced in life, when the secreting powers lose a portion of their energy, food is not so quickly digested. To obviate the effects of decomposition, salt should be used very freely; for salt prevents changes of vegetable and animal matter, by combining with that water, without which decomposition cannot take place.

As to the propriety of sleeping after dinner, different opinions are entertained. Most animals, when their stomachs are loaded, generally take their rest; and there are many persons who experience great uneasiness, if deprived of an indulgence in a recumbent position. For the last thirty years, whenever I dine late, I experience the greatest corporeal distress, without an hour's repose; if I dine early, I have no inclination to sleep.

By these processes we may conceive how the nutritious part of food is converted into chyle, in which are observed the same formed globular particles as exist in the blood, deriving their colouring rudiment from the bile, and then determined into the thoracic duct, from whence it passes into the venous system. The globules there undergo a change in colour, become less opaque, instead of reflecting white light, exhibit a dark purplish blue. When they have passed through the lungs, another change takes place as to colour, and becomes of a light Modena red. It has been conjectured by some physiologists that by the pulmonary process the albumen is converted into fibrin. In both these substances, carbon, hydrogen, oxygen, and azote exist nearly in the same proportion with the two former; but albumen has a larger proportion of oxygen, and less of azote, than fibrin; the excess of the one nearly corresponds to the diminution of the other, viz. the azote. The red globules have now undergone their last arrangement, and are then devoted to the restoration of the continual loss the system

undergoes. By the colouring portion of blood, all new parts are formed; the arterial system never permits the red particles to enter again into the veins, unless in cases of disease. Thus the circulation is no way general, and the colourless part of the blood can only be said to undergo a regular circulating course.*

I believe it is generally admitted that the arteries terminate in four different ways, the most common of which are by branches so very tenuous and minute as not to admit the red blood, and which are generally termed seriferous vessels, which ultimately unite with the origin of veins; the second mode into cells; the third on the surface where the exhalants are formed; and fourth, into the excretory ducts of the glands. I believe that no anatomical proof can be brought of the return of the coloured part of blood by the veins; and it would be contrary to the simplicity nature adopts, to have it again deteriorated and again obliged to undergo a pulmonary change.

When a solution of continuity takes place from either a wound or ulcer, for its restoration, pus is formed, and which, on examination, has the same formed globular particles as observed in blood; this microscopic test may be advan-

* In the Elements of Galvanism, I published in 1804, I believe I was the first who endeavoured to prove, by a series of experiments, the incorrectness of the theory advanced by Dr. Crawford relative to animal heat. I therein attributed the regulating power as to animal heat, to the energies of life, and which opinion has been strongly corroborated by the subsequent experiments of Mr. Brodie.— It had frequently been observed by Volta, Reid, and myself, that air, as soon as it is expired, its quantity of electricity is always found to be diminished, and further remarking the great similarity in structure between the vesicular formation of the lungs, and the cells in the electric organs of the torpedo, I concluded that the function of respiration is a galvanic action, by which is unfolded that principle, which, by stimulating the heart, becomes diffused through the whole frame, and proves the source of general energy. What changes in our sensation do we experience as this principle varies, languid and low, when the atmosphere is feebly charged with electricity, so also on the contrary we may account for the cordial exhilaration we feel when the barometer is high and the air consequently charged with this principle.

tageously employed in distinguishing pus from mucus. Although it is well understood that inflammation is presented to our attention, in two different states, viz active and passive: active, when there is that increased arterial action by which red blood is determined into the seriferous vessels; passive, when the seriferous vessels have lost their resisting power, and admit red blood under common arterial action. Under these varied conditions the mode of treatment is necessarily different; although we are ignorant of the proximate cause of inflammation, yet we alleviate by diminishing the resulting effects. The same mode of reasoning applies to the stomach: our practice is regulated by the condition of the secretions, without knowing the state of action existing in the viscus, from whence the secretion arises. Our duty is to supply any deficiency, by imitating as much as possible the process nature herself adopts; and thus by preventing the constitution being disturbed, the powers of life, the vis medicatrix naturæ will be competent to her own restoration.

When the functions of the stomach become disordered, when healthy gastric fluid is not secreted, then undigested matter is intermixed with the imperfect chyme, a portion of which is absorbed by the lacteals, a turbid matter is seen floating in the serum; and when separated by the kidneys, if a saccharine combination take place, the disease called diabetes is the result, and under another condition urea is formed. Urea differs from sugar by having a less relative proportion of oxygen and carbon, and with the addition of azote. It does not appear that urea, as long as it retains this form, is productive of any corporeal disease—in all urine it is found, and is very soluble; when it is converted into uric acid, then, by its combinations with ammonia, urinary calculi are formed, or when distributed through the animal fluids, detaches the soda, and produces those troublesome concretions called chalk stones; or, probably,

the urate of soda may be found in the chyle, the origin of the generation of the acid being in the stomach, as uric acid is not very soluble in animal fluids but at high temperature.*

How these varied changes are effected by the agency of life, our limited powers cannot comprehend; all that we know is, that life can only be supported by matter which has constituted a part of an organized being. In the year 1798† I published some physiological essays, in which I attempted to prove the circulation of vitality. All nutrient food contains a living principle which is added to the general stock, by which we are enabled to explain their subsequent growth. The late experiments of Prevost and Dutrochet have evinced that when the fabric of an organized being is resolved into its simple constituent parts, that each part has a globular appearance, possessing powers of motion.

* About fifteen years since I was the first who suggested the aerated magnesian waters, viz. in Dr. Nooth's elegant apparatus to substitute the carbonate of magnesia for that of soda, as it is soluble in carbonic acid, and principally with the view of neutralising any uric acid in the stomach. This acid I considered as one of the principal causes of gout, and calculous concretions. The above was made under my directions by the late Mr. Ricards, surgeon, in Bath.

† In the years 1795 and 1796, I was a Member of a Scientific Society, held in the Laboratory of the late Dr. Higgins, in Greek Street. I introduced an Essay, to endeavour to prove that the elements of matter are comparatively very few, and how, by binary, ternary, and quaternary combinations, the infinite variety of form under which material bodies are presented to our attention, may be produced. At that period, Dr. Higgins, the late Professor at the Dublin Society, was attending his uncle's laboratory. In the essays I published in 1798, I introduced some of these observations; and the following year Dr. Higgins (then Mr. Higgins), at Dublin, in a pamphlet advanced corresponding doctrines, which ultimately led Mr. Dalton to more extensively apply the theory of atoms to the explanation of chemical combinations.

There is no doubt that many supposed discoveries have been brought forward to public notice by individuals who supposed them to be original, which have been subsequently found not to be so. This, probably, was the case of Woulfe's apparatus, which is now well known to have been described by Glauber; also some of the interesting experiments on heat and cold, by Pictet, were published near a century before, by the Florentine Academicians; the galvanic combination of one metal and two fluids has been attributed to Sir H. Davy, whilst it was previously communicated to Vassalli by Volta ten

My learned friend, Sir G. Gibbes, has directed to this subject considerable attention, and very reasonably concludes them to be animalcula, or those monades which constitute the last link in the chain of organic life. The process of digestion is considered as the separating power of these monades from their state of combination in the food taken, and assimilation is the deposition of them to their destined purposes. The albuminous globule, as well as that of the red particle of blood, is not spherical, but bears some resemblance in figure to that of the monas termo, and a further cultivation of this interesting subject will probably lead to an explanation of the powers of reproduction, and of many other important phenomena of nature.

years. To these instances I may be permitted to add, that in the year 1804, whilst engaged in some lectures at Edinburgh, I first introduced a galvanic trough with non-conducting divisions, on which I suspended plates of copper and zinc, on the principle of the Couronne des Tasses. Having experienced advantage from this arrangement, I published in 1808, in Tilloch's Magazine, a description of it, and referred to a Mr. Eastwick, in Aldersgate Street, who was then a manufacturer of galvanic apparatus, and now acting engineer to the Kennet and Avon Canal Company; in consequence of which reference Mr. Children and Sir H. Davy employed Mr. E. to construct their very extensive apparatus on the same principle. By some mistake, the apparatus has been ascribed to Dr. Babbington. From my personal knowledge of this highly respectable character, I am well assured that he never made such a claim himself.

APPENDIX.

At the period when the preceding sheets were printed, my friend, W. L. Caldecot, esq. having occasion to visit Barbados, it was considered advisable to defer the publication during his absence, in consequence of which more satisfactory statements of the efficiency of this important product of nature have been obtained from highly respectable medical residents; also very valuable information as to the geological construction of the island.

At a Meeting of the General Assembly at the Town-Hall, Barbados, on Tuesday, the 18th of May, 1830, the following Memorial from Mr. Abel Stuart was presented by the Hon. Wm. Eversley, which being seconded by James S. Bascom, esq. the same was read accordingly.

"BARBADOS.

"To the Honorable the Speaker, and the Honorable the Members of the General Assembly.

"The Memorial of Abel Stuart, most humbly Sheweth:

"That your memorialist, influenced chiefly by motives of humanity, and a desire to ascertain the medicinal properties of the Mineral Oil, or Naphtha, commonly know as the 'Barbados 'Green Tar,' and to establish its reputed efficacy, especially in

diseases of an intractable cutaneous nature, hath instituted a code of experiments during the last sixteen months at '*Mount Hall*,' Mrs. Straghan's estate, in the parish of Saint Andrew, where the valuable Spring of Green Tar, called the 'Pottery,' is situated, together with the powerful agency of the Sulphureous Waters of that Spring, which holds in solution mineral products similar to the Harrowgate Waters, so efficacious in cutaneous affections, from which, and with other auxiliaries in medicine, your memorialist hath obtained results important in the highest degree to his suffering fellow-creatures, for whose benefit he wishes to extend them, and in whose behalf he ventures respectfully to approach your Honorable House, persuaded that the motives which govern this appeal, will be a sufficient apology for bringing the subject under the consideration of the Legislature.

"That your memorialist hath made his experiments chiefly upon cases of confirmed leprosy; and he has the gratification of stating, that in no instance has he failed to arrest the progress of the disease, even in the last stages—thus establishing the hitherto doubted fact, that a remedy can now be had for that most dreadful of all diseases to which human nature is liable.

"That your memorialist hath been most reluctantly necessitated to abstain from affording to numerous applicants the practical result of his experiments, by reason of the impracticability of their being carried into effect under existing circumstances—an establishment, upon a proper scale for such general purposes, being indispensably necessary. It is, then, to such an important object as that, to which your memorialist solicits the attention of your Honorable House, taking leave to urge on public grounds, the advantages which this community would derive in the erection of a Hospital on the small island known, in the last plot of Bridge-Town, by the name of 'Bird Island,' where individuals of the country so afflicted might resort, and where medical aid may be afforded them.

"That your memorialist, in anticipation of any difference of opinion which may arise as to Bird Island being within

legislative controul, takes leave respectfully to refer your Honorable House to an Act of the Legislature of this Island, passed in the year one thousand eight hundred and twenty-two, defining the limits of Bridge-town—a plot of the same being in the Secretary's Office of the Island; and which, on reference thereto, will be found to embrace and include within the parochial jurisdiction of Saint Michael the spot of land in question, the same being thereby available to the uses and disposal of the Local Government.

"Your memorialist, therefore, most humbly prays, that your Honorable House will, by an enactment, grant him Bird Island to erect a Hospital upon; or otherwise afford him such assistance in the premises set forth, as may in the wisdom of your Honourable House be deemed meet and proper, towards the attainment of the desired end.

"And your memorialist will ever pray, &c. &c. &c.

"ABEL STUART.

"*Bridge-Town, May* 18*th*, 1830."

After the reading of the memorial, the Hon. W. Eversley gave notice of his intention to introduce a Bill, in order to carry the object of the petition into effect, and which Bill has since passed the House of Assembly.

This resolution excited so much attention in that island, that a considerable portion of the Barbados Globe and Demerara Advocate, for July 26, 1830, was devoted to a more minute statement of the circumstances which gave rise to the memorial, and from which the following particulars have been extracted:—

"THE MINERAL SPRINGS OF NAPHTHA.

"It is with great pleasure that we are now enabled, upon this subject, to offer to our readers a sketch, which, although of a cursory nature, is entitled to the highest consideration; emanating as it does from such eminent and distinguished mem-

bers of the faculty. The primary cause of the mineral products of the country, of a medicinal character, being thus brought under scientific review, and to the notice of the public, is to be traced to a series of experiments, which Mr. Abel Stuart of this town, has been making upon their virtues, in the cure of cutaneous diseases of an intractable nature. This gentleman's philanthropy and disinterested feeling in the cause of suffering humanity, entitle him at least to our gratitude. Without *fee or reward* he has devoted his talents, and alike bestowed his time, under perplexing difficulties and fatiguing journeys, in all weathers, into the interior, for the attainment of the all-important object he has had in view; and to his experiments therefore, we are, in a measure, indebted for the able and valuable summary contained in the correspondence which follows :—

"*Naval Hospital, Barbados,*
"*Thursday evening, 15th July,* 1830.

"My dear Sir,—I send you enclosed a note with my opinion upon the mineral springs on Mrs. Straghan's property in Scotland. It is brief—for in this age of enquiry after truth, it is better not to go too fast, and I think it is a mistake on the right side to say rather *too little than too much in a first essay.* Bring the subject once under notice—set it going—and then its march and progress will, with '*an open field and fair play,*' be commensurate with its intrinsic merits. Enlist the enlightened minds in its cause, and leave the vulgar herd where they are doomed by nature always to remain—at the tail of the column: let their cavils and prejudices pass unheeded—time and experience will put every thing in its proper place. Wishing you a pleasant and prosperous passage to England, always faithfully yours,

"CHARLES DOYLE.

"W. L. Caldecot, Esq., Barbados."

"NOTE FOR MR CALDECOT.

"The water in the spring called the 'Pottery' (on the surface of which floats the *Naphtha,* or green Barbados tar), appears to

me to be a water saturated with sulphuretted hydrogenous gas. I recognised at once, in this water the (to me well known) properties, in odour and savour, of the principal source of the Aix-la-Chapelle waters—the 'Bain de l'Empereur.' Indeed, I was so forcibly struck with the great resemblance between them, that it appeared to me, in tasting as I did this water at the source, on Saturday last, that nothing was wanting but the caloric and the air bubbles of the waters of Aix to enable me to pronounce upon their identity. I regret that I have not had, as yet, an opportunity of submitting this water to analysis, by the tests of chemical re-agents; not having received the few bottles of it which Mr. Caldecot was so good as to say he would send me for that purpose; and his embarkation for England being so very near at hand, I fear will not admit of the time requisite for the accomplishment of this object. In the hasty examination which one day's visit enabled me to make, it cannot, of course, be expected that I should say much on the properties and qualities of these waters, or of the *Naphtha* which floats on their surface. It is enough to know that this fluid, the *Naphtha*, is very rare in nature, and is only met with in a very few places on the surface of our globe (chiefly on the north-west shores of the Caspian Sea, where it has been long held in very high repute by the Persians, who regard it as an excellent remedy in rheumatisms and paralysis, and who employ it both internally and externally)—that it is specifically lighter than water, in colour of a yellowish green, of a greasy or oily lustre, easily inflammable, burning with a blueish flame without leaving any residuum, and turning brown on exposure to the air, and thickens in losing its odour. Some of these properties are common to the cajeput oil, so much extolled by the natives of the islands of the East Indian Archipelago—more particularly the Javanese—for the cure of rheumatisms and palsies, and between which cajeput oil and this *Naphtha* there certainly does appear to be great analogy. I think it is a misnomen to call it *tar*. Reasoning, then, by analogy, I do not think it will be saying too much to state, as my opinion, that the waters of the Pottery

Spring, on the Mount Hall Estate, in the district called Scotland, island of Barbados, I do believe possess medicinal qualities of a rare and precious kind. I confine myself to speak of the waters alone; for of the *Naphtha* I profess myself without experience sufficient to give any positive opinion, although I do believe that it must communicate some of its active qualities to the waters—and that it has precious qualities cannot be denied, for of this fact I have had ocular demonstration whilst examining two persons recovering from a hideous and disgusting disease (leprous eruptions), under its use. These waters, I believe, may be beneficially employed for the cure of cutaneous maladies, as well as for those complaints termed obstructions of the liver, spleen, bowels, &c. &c.; and I think that many valetudinarians of the above description, may, by using these waters at the source of the springs, obtain the relief for which they are often forced to undertake long journeys and painful separation from family and friends. Time and experience must confirm this opinion, which I have put forth solely with a view to the benefit of suffering humanity; and I hope that the hurried departure of Mr. Caldecot will apologise for the brevity of this note, which he requested me to make for him.

"CHARLES DOYLE, M.D.
"*Surgeon to the Forces.*

"Barbados, July 15th, 1830.

"P.S.—As my two learned colleagues, Drs. Ferguson and Thomas, were present at the examination of the Mineral Springs and the patients on Saturday last, I would recommend to Mr. Caldecot to request those gentlemen to state their opinions on the subject.

C. D."

"*Saturday morning, July 17th*, 1830.

"My dear Sir,—I send you enclosed a note from Dr. Ferguson, of the 27th regiment, which I received this morning. I think it will be gratifying to you to receive it; and the more so when I assure you, that, in all communications with that

gentlemen, I have found him remarkable for the rectitude of his judgment. Always faithfully yours,

"CHAS. DOYLE.

"To W. L. Caldecot, Esq. Bridge-Town."

(COPY.)

"My dear Sir,—I entirely coincide in the opinion you have given of the mineral waters of Scotland, and shall be happy to support you in it, if my poor opinion can have any weight after the few but valuable observations you have made on the subject. You have overlooked the first spring, so strongly impregnated with iron and naphtha, and so slightly with sulphur. The water of this spring, I conceive, would be invaluable in diseases arising from atony of the stomach and bowels, and several diseases incident to females. It is a matter deeply to be lamented that the salutary properties of those waters should have been so long concealed from the public, in a climate where they are so often required; and too much praise cannot be bestowed on Mr. Abel Stuart for the active part he has taken in proving and promulgating their efficacy.

"Ever yours,

(Signed,) "J. FERGUSON.

"*Friday evening.*

"You can send this note, if you think proper, to Mr. Caldecot.

"Dr. Doyle, Surgeon to the Forces, &c. &c. &c."

"*July* 16, 1830.

"My dear Sir,—In returning you my most sincere thanks for your able and valuable *note* upon the mineral springs at Mount Hall, believe me I shall carry with me to England the highest consideration for that distinguished talent and zeal which you have so disinterestedly shewn in the cause of suffering humanity. I shall not fail to profit by your kind advice in every particular; and allow me to remain, my dear Sir, very faithfully yours, W. L. CALDECOT.

"Chas. Doyle, Esq. M.D. &c. &c. &c."

"*Bridge-Town, July* 24, 1830.

"Dear Stuart,—According to your request, I have read the notes of Dr. Doyle and Dr. Ferguson, respecting the mineral waters in Scotland. I concur wholly in opinion with them, as to the rare and useful qualities which they seem to possess. Dr. Doyle has said, in a general way, as much respecting them as could be expected from one day's inspection. To the *senses* they shew that they are impregnated with various valuable medical agents.

"In our visit we were conducted to five springs, which seemed, in some respects, to differ from each other. First, a strong chalybeate, and an impregnation of the Barbados *Naphtha*; second (or Pottery), a sulphuretted hydrogenous water, with a plentiful percolation of naphtha on its surface; third, a strong and simply chalybeate; fourth, a weaker ditto; fifth (looking over to *Vaughans*), a spring with the evident taste of sulphate of magnesia, and no doubt an aperient.

"I regret that these waters have not been analyzed long ere this, by some skilful and accurate chemist, as we must remain much in the dark about them until that is done. Next, the wells should be walled in, so as to prevent the admixture of rain-water, and the surrounding heterogeneous matters which abound in that district. We might then, indeed, often send some of our chronic cases there. It will give me pleasure to hear that the matter is followed up and more fully elucidated, and that we shall not longer, by our apathy, overlook a boon which kind Providence has placed in our reach. I trust that your praiseworthy zeal in the administration of the *Naphtha* may be crowned with all that your most sanguine wishes can hope for. Yours, very truly,

"R. C. Thomas.

"Abel Stuart, Esq."

It is evident from these statements, the very high repute in which this mineral product is held in the Island of Barbados. All these united testimonies, from professional

gentlemen of the first respectability, uninfluenced by any other motive than that of humanity, concur in warmly recommending this production of Nature in all oppressive cutaneous affections, in the milder, as well as the more advanced stages of Leprosy.

WORMS.

When the actions of any organs in the animal body become morbid and depraved, we find many of them subject to become the repository of worms. We are not to consider that their existence constitutes the primitive disease, but as the resulting products; and which sometimes pass off without any corporeal derangements, and at other times are productive of the greatest constitutional disturbance. It is surprising the account of great numbers of worms being discovered by dissection, and which did not apparently produce any uneasiness to the individual: on the contrary, we have many instances of their dreadful effects. Whether worms assume a different character, according to the Nidus, where they appear to have been formed, certainly most of those which are found in the human body are not found in any other part of animated nature; thus the tape-worm in man is jointed, but in sheep no such appearance is observed, but more resembling a tape. We have many instances of worms found in the human fœtus. Kerkring has given an account of the intestinal canal of a fœtus, six months and a half old, being full of worms; Pallas and Bloch have found tænia in the fœtus; and I have seen a tape-worm seven feet long in a fœtus of six months, the mother being accidentally killed gave rise to the examination. In Switzerland the tape-worm is very prevalent;

and fish, particularly the trout caught in the Lake of Geneva, are frequently loaded with them. All these worms die immediately on being detached from their respective nidus, and, consequently, no ways accordant to the supposition of being introduced into the system by means of the stomach.

Linnæus erred in saying that he had found *la douve du foie*, *tænia lata*, and l'ascaride vermicularis, in marshes and in the decayed roots of plants. Dr. Bremser says, that he has examined many thousands of worms in the Cabinet of Natural History, and in an instant could always distinguish the difference between intestinal worms and those found in water and earth.

Not only in the intestinal canal, but in almost every part of the human frame worms have been found,—in the cellular membrane, between the skin and the muscles, in the liver, the gall-bladder, trachea, lungs, brain, loins, heart, spleen, and ovaria. From whence they originate, is a question extremely difficult to answer, and give some support to the Aristotelian idea as to spontaneous generation.

The diagnostic signs of worms are generally so well known as almost to be superfluous to enumerate. To unprofessional readers it may be adviseable to cursorily notice the following, as more particularly indicative of intestinal worms:—Countenance changeable and generally pale; ash-coloured complexion; sometimes a temporary animation of the countenanee, with a redness on one cheek; the eye losing its natural brilliancy, pupil enlarged, and the inferior part of the eye bordered by a bluish circle; the nose frequently swelled, and with a perpetual itching, accompanied by head-aches and a humming sound in the ears; breath offensive, particularly when fasting; appetite variable, sometimes very defective, at other times depraved; nausea, and not unfrequently violent colics, with great pain in the umbilical regions, and the lower part of the abdomen tumid and hard; disturbed sleep; grinding of the teeth, particu-

larly in children suddenly awaking with loud cries of pain; and in the fœcal matter frequently are found pieces of worms. All these symptoms are rarely found existing in the same individual; they vary according to the species of the worm, and the part of intestine affected, and it is necessary that it be accurately ascertained before any remedial means are attempted. The limits of this Essay will not admit of that minute investigation which so important a subject merits; and it cannot be too seriously impressed on the minds of those afflicted with worms, that proper medical advice should be obtained before recourse is had to any attempts of removing them.

A great variety of medicines have been recommended, as tin and zinc filings, stizolobium, or corrhage: these act mechanically. Galen and Pliny speak highly of the *fougére male* (Polypodium filix mas.) in tape-worm. Mons. Nouffer employed it with great success, about 60 years since, at Berne; and his widow continued the same mode of practice for 20 years, and the French government gave her 18,000 francs for the secret, which consisted of two or three drachms of the dried root of the Male Fern-Root, gathered in Autumn, and reduced to a very fine powder, mixed in any agreeable vehicle. The powder is so extremely bitter as to be very distressing to the mouth and throat. Although this remedy has been recommended by several eminent practitioners since the period of Galen and Pliny, it probably failed from not being properly prepared, and gradually fell into disuse. My friend, Mons. Peschier, a celebrated chemist at Geneva, has happily succeeded in separating the essential oil from the root by means of æther: twenty drops constitute an efficient dose, of which I have made trial with the greatest success.* Rosenstein

* The tape-worm varies in length from a few inches to 100 feet; and it has been generally noticed, that the worm has never been seen entire. A curious circumstance occurred to a patient in an hospital, having passed a worm of a

recommends the external application of the Egyptian Naphtha and Garlic well rubbed over the lower part of the abdomen, and the occasional employment of warm baths; and the following formula has been recommended by many continental practitioners: one ounce of garlic pounded, one drachm of camphor, three ounces of naphtha, and two ounces of æther, to be used as an embrocation, and well rubbed in every morning and evening over the lower part of the abdomen.

Ascarides or thread-worm, are generally found in the rectum, accompanied with intolerable itching, in children so tormenting as to induce convulsions. These worms generate with astonishing rapidity, and are so entangled in the folds of the intestines that ordinary medicines by the stomach lose their efficacy before they arrive at the seat of the complaint; hence injections must be had recourse to, and the following has been advantageously employed: of thin gruel one pint, glauber's salts half an ounce, and the same quantity of naphtha.* When worms are in the cœcum, or in that part of the intestines where they could not be influenced by the exhibition of enemas, in such cases I should recommend a teaspoonful of the

pale colour, oval in form, and a few inches in length. From its peculiar appearance it was kept in a bason for the inspection of the superintending physician. When examined on the following day, the length was increased to several feet, and with all the character of the tape-worm. This remarkable circumstance throws great light upon the probable economy of this surprising animal. The joints do not commence near the part supposed to be the head, but a few inches below. Query, whether in the living state the animal possesses the power of drawing up in folds the extreme length into this part, and whether it may be contemplated as an intestinal arrangement. Blumenbach and Sir A. Carlisle consider each articulation as a distinct worm; but Rudolphi and Bremser, who have paid great attention to this subject, deem it as one animal, and further observe, that the head has four trunks or suckers.

* The Egyptian and Persian Naphtha are similar in properties to the Green Naphtha of Barbados.

Barbados Naphtha in a wine-glass of the decoction of the Male Fern Root, twice a day.*

There are many worms found in other parts of the body, as the *Ver de medine*, described by Plutarch, Larrey, Drs. Keir, Heath, and Anderson, as attacking the arms and legs; the *Hamularia compressa*, observed in the bronchial glands, by Dr. Teutler, in constitutions predisposed to pthisis or dropsy; *Le Strongle des Reins de Lamarck*, in the lumbar muscles and urinary bladder, (Mr. Lawrence describes one case of a female voiding near one thousand by urine); the *Distoma Hepaticum*, or fluke or liver worm, so extensively found in sheep affected with bane or coath. Vesicular worms, or Hydatids,† are frequently found in the ovaria; De Haen mentions also the thyroid gland; and worms have been particularised as having been found in the brain.

When worms are thus distributed, and no intestinal canal for their evolution when dead, it becomes a matter of serious consideration whether, under such circumstances, more injurious consequences might not arise from their

* The Male Fern Root, gathered in autumn, and well dried, may be preserved good for a year, and one ounce of the root cut into very small pieces and boiled in a pint of water and strained. It is adviseable to procure the root of some herborist well acquainted with the plant to obviate any mistake.

† We are indebted to Hartmann, Malpighi, and Tyson, for ascertaining its being an animal; and each made their observations independent of the other. Pallas and Goeze first demonstrated the existence of the head. Externally they very exactly resemble a bladder, the neck of which is adhering firmly to the coats of the different viscera: some are an inch and a half in diameter; the colour of the cyst nearly an opake white; strong material, tense and firm to the touch, and requiring considerable force to tear it from its attachments. The Hydatid itself is another bladder or bag, and the former is a theca; when placed in warm water they move for some time. Occasionally two are joined together, like an hour-glass, when alive, one is red and the other white. Some are hardened into a callous. Dr. Baillie has observed great varieties, from the size of a pin's head to that of a gooseberry, floating about in the large Hydatid.

See a most valuable and interesting publication on the Bane in Sheep, by the late ingenious Mr. Davy, of this city.

being deprived of their vitality, than from their being in a living state. Thus we ought to be cautious as to the employment of any means which might effect their destruction. From the variety of appearances which Hydatids are found to assume, it is probable that the duration of their existence may be limited to a comparatively short period. If such a supposition be admitted, an advantage would be obtained by their destruction, and the agency of the same means would probably prevent their increase.

When the Barbados Naphtha is either externally employed or internally taken, it is by the absorbent system quickly distributed through every part of the animal frame, as is evidenced by the odour imparted to all the secretions. From this principle of active diffusibility, the Barbados Naphtha embrocation, and the Naphtha taken internally, would be likely to produce the desired effect, *particularly* in those affections of the bronchial glands and urinary bladder, noticed by Dr. Treutler and Mr. Lawrence.

There are few medicines whose agency extends beyond the stomach and the alimentary canal, hence the generality of diseases may be considered as remedied by sympathetic influence; but Naphtha possesses the advantage of being conveyed to every part of the human frame wherever the absorbent vessels are present, and to this more immediate influence on the seat of affection may be attributed the admirable effects which have already been experienced.

Since the commencement of this pamphlet, I have been favoured with a communication from an eminent surgeon to one of the hospitals in this city, stating the great advantages he has found from the employment of the Barbados Naphtha in the ring-worm, obstinate cutaneous eruptions, chronic coughs, and morbid affections of the joints, &c.

From a conviction of the great superiority of the Barbados Naphtha, and of the injury society has long sustained from the fabricated imitations of this valuable product of

nature, I have availed myself of the advantage afforded me by the liberal proprietor to arrange all the documents, which have been placed in my hands, for to be subsequently submitted to the public; and if I should thus be enabled to introduce to general notice a highly valuable medicine, pure from its native rock, in lieu of the spurious preparation falsely stated to be imported from Barbados, I shall consider that the time I have devoted to the subject as not having been unprofitably employed.

Since the printing of these sheets, Dr. Maycock, to whom I referred at the commencement of this work, has published an interesting Catalogue of Plants, indigenous, naturalised, and cultivated in Barbados; to which is prefixed a concise Geological Description of the Island. He observes, that the calcareous deposits are the results of the spoils of zoophytes, as several portions of the Madreporæ, Milleporæ, Corallinæ, Alcyoniæ, are found; and that reliquiæ of human bodies, similar to those in Guadaloupe, are found in sandstone incrustations. He remarks, that in that part of the island which has been denominated Scotland and below the Cliff is the base of the clay hills, from whence the Green Mineral Oil arises, and particularly notices its beneficial effects in Leprosy and Tetanus; externally employed acting as a stimulant,* and internally as an aperient, diaphoretic and diuretic; and warmly recommends it to be submitted to the test of unprejudiced experiments, that its medicinal virtues may be more fully and accurately ascertained.

I noticed in my chemical observations that the Barbados Naphtha derived, probably, some of its virtues from an impregnation of iron. This supposition appears now to be satisfactorily confirmed, by the account given by Mr. Caldecot of large masses of clay, finely divided silex, and iron,

* Although its powers are stimulating, instead of any irritation from its employment the results are anodyne and soothing.

in the vicinity of these springs; and the specimens he has brought to England evince their progressive formation by deposits on a Nucleus, so as to present a laminated appearance not unlike the concentric partitions of an onion; the layers differently tinged, some with a deep rich red, calculated to form the basis of a valuable colour, and others of a brilliant yellow, equal to the lately introduced chromate. Some interesting specimens may be seen at the Kingston Pump-Room. The same gentleman has also discovered sulphuret of lead, with a white crust of the carbonate:* a more minute investigation will probably lead to the discovery of the mountain limestone.

To guard the public against any spurious fabrications, it has been determined by the proprietor, that all the Barbados Naphtha, or Green Mineral Oil, from the spring known by the name of Pottery, arising in the estate belonging to Mrs. Straghan, and imported into this country, shall be arranged for sale at the Kingston Pump-Room only, and from thence agents in other parts of the kingdom are to be supplied. Each bottle of the pure Naphtha will be securely sealed, with an envelope containing ample directions as to the ingredients with which it is requisite to be intermixed, in order to answer its intended purpose.

BARBADOS NAPHTHA WATER.

This has been found not only beneficial in cutaneous affections, but also in many cases of defective indigestion, as well as many others particularised in this work. The mode

* An interesting specimen of this has been presented to the Author by Mr. Caldecot.

of preparing this water is to employ a glass vessel competent to hold a gallon of water; to introduce first the contents of a small bottle,* and to pour upon the Naphtha a gallon of boiling water, to frequently agitate it for three or four days: afterwards to be poured off clear from the supernatant Naphtha, and kept in quart bottles. In cases of indigestion, half a pint, moderately warm, with ten grains of the carbonate of soda, should be taken every morning; and if accompanied with constipation, a teaspoonful of Epsom Salts may be added. In the West Indies it is not uncommon to add a little Camphor, which may be effected by adding a drachm of Camphor to the Naphtha before the water is poured on; or, what is more convenient, to put a quarter of an ounce of Camphor, in a muslin bag, into a decanter of cold water, and in twelve hours it is ready for use: of this, half a wine-glass is a proper dose.

As an embrocation, in those cases where the pure Ammonia is not found too stimulating, then three parts of the Naphtha, with one of the Aqua Ammonia pura (pure Ammonia), may be employed. In cases where this admixture would produce too much excitement, then the Spirits of Turpentine may be substituted *for the pure Ammonia*, and in the same proportion.

In ring-worm, after the hair has been removed, the following preparation applied by a pencil to the part, every morning and evening, has been found particularly successful, covering the part affected immediately afterwards with a piece of skin, or thin bladder, smeared with the same substance:—One table spoonful of Naphtha, a teaspoonful of pure Ammonia, and the same quantity of Borax in powder.

* The small bottle holds 4 ounces.

ADDRESS TO INVALIDS.

As there are many cases which require more minute directions as to the employment of the Barbados Naphtha, as also of Mineral Waters, than could be particularised in a small pamphlet, the Author has been induced to resume a plan formerly adopted at this establishment, and from being Proprietor of the Kingston Baths and Pump-Room he is enabled to submit it to their attention.

PLAN.

In the Pump-Room, which is placed over the original Roman spring, the Bath Waters are delivered, and to which have been added waters from other mineral springs, as those of Cheltenham, &c. and the Barbados Naphtha Water. In the consulting room adjoining the pump-room, medical superintendance will be given every day between twelve and two o'clock (Sundays excepted), with the use of hot, tepid, and shower baths; wet or dry pumping daily, if required; and of any of the waters above-mentioned; all expences included in One Guinea per Week.

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Bottles included. Barbados Naphtha Water, in quart bottles, per doz.	..	12	0
Cheltenham and Melksham Waters	.....	12	0
Bath Waters	.....	6	0

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