ON

WATER,

AND THE SUPPLY

TO THE

METROPOLIS.

1828.

ON
WATER,
WITH
CONSIDERATIONS UPON THE SUPPLY OF WATER
TO THE
Inhabitants of the Metropolis.

Recommending to all those who value their health to endeavour to obtain a supply of the *pure soft* spring water which abounds in inexhaustible quantities under the blue clay of all the county of Middlesex and adjacent counties, known by geologists as the London Basin, and allowed to be the purest of all water, having no connection nor communication with the common springs or pumps.

CONTAINING ALSO
A LIST OF THE PURE SOFT SPRING WATER WELLS ALREADY IN USE.

Prodesse Civibus.

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ADVERTISEMENT.

Water, from its importance to mankind, deserves at all times particular attention; being so essential a necessary of life; upon the purity of which our health and even our very existence depends. And it is a duty every man, who has the least spark of philanthropy about him, owes to society, to endeavour by the best means in his power to benefit his fellow countrymen.

It is lamentable to witness such a numerous population gathered together in the Metropolis, and compelled to drink and use any water that may be given them, without being able individually to help themselves.

One general remark made by all visitors to the Metropolis is, they can procure any, and the best of every commodity in London,—good, pure, and wholesome Water excepted. In these enlightened days should such things be? Should such a reproach any longer exist, when the remedy is at home: the best of water being under every house in the Metropolis! This is no new discovery; the novelty would be to give London a plentiful supply of the water.

Able engineers have for some years been employed in procuring it, and given decided opinions that an inexhaustible quantity may be had. A report of a similar nature was made eight or nine years ago by that celebrated engineer Mr. W. Walker.

The Writer has compiled in one view the best remarks and opinions he has been able to meet with on the subject; conceiving it must be desirable for every one to become acquainted with the nature and properties of water, that he may select and obtain the best for his use.

ON

WATER,

&c. &c. &c.

In the earliest ages, water was a symbol of the Divinity; and hence, the devotion with which the ancients regarded rivers, springs, and fountains, and their allegorical practice of representing them as tutelary divinities. The Hindoos have ever been of opinion that their most sacred river, the Ganges, flows from the feet of their god Brama. The inundations of the Nile are expected by the Egyptians with the greatest anxiety; and when it fails to reach its usual height, generally produces famine or pestilence —sometimes both.*

Philosophers consider water as the stamen of all things, and the most active agent in the operation of nature. Sir I. Newton observes "All birds, beasts, and fishes, insects, trees, and vegetables with their several parts do grow out of water;—watery tinctures and salts, and by putrefaction return again to watery substances."

It is undoubtedly the most universal of all

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* The water of the Nile is perhaps one of the purest of river waters known; remarkable for its easy digestion by the stomach, and for its salutary qualities in all cases to which it is applied.

The mud or slime left by this water contains nearly half its weight of alumine in a state of great purity. The rest is carbonate of lime, water, carbon, iron oxyde, silex, and carbonate of magnesia.

In all the great houses at *Grand Cairo* the earthen vessels for containing water are perfumed. They first put into the vase some mastic, and a substance called mackergourivie, which is brought from Upper Egypt; they then clarify the water with almond paste, cool it by the evaporation jars, and thus it is made fit for drinking.

aliments, and in the opinion of many celebrated physicians the most wholesome: its power of sustaining life for a very considerable period has been exemplified in numerous instances. In every branch of manufacture, domestic economy and the arts, its uses are too obvious to need enumeration. Much difference of opinion has existed amongst the learned in the definition of water: some considering it a solid body which, like the metals, becomes fluid at a certain temperature; and others, according to the generally received opinion, define it a pellucid fluid, converted into ice at 32° of Farenheit; naturally pervading the strata of the earth, and flowing into, or stagnating upon, its surface. It possesses the properties of dissolving all saline bodies in a surprising degree, without increasing its own bulk. At a boiling temperature it will take up nearly its own weight; but when reduced to 32° it deposits any portion, however small, it may have previously received into its composition, and forms crystals under the invariable range of 60°.

We may divide water into two kinds; simple, and medicinal. Although a simple or unmixed water has never been in reality discovered, and most probably does not exist in nature; yet we apply the term generally to such as are perfectly clear, tasteless, and inodorous. And we may term medicinal, all those whose taste, smell, or other obvious qualities, denote their containing metallic, saline, or mineral particles. We may esteem that water as most pure which, in addition to the former qualities, is transparent, dissolves soap readily, without curdling it,—brews well,—boils vegetables quickly and tender,—and leaves no sediment in the vessel in which it is used.

It may be proper now to proceed to notice the means by which water is obtained; and then consider the proporties of each supply individually.

That which is drawn from rivers being the most prominent, may rank in the first place;

secondly, that which falls from the atmosphere as rain or snow; thirdly, that which is obtained from the earth by springs rising to the surface, or by perforation.

A river is a stream descending by its gravity from higher to lower parts of the earth, in a channel supplied by waters collected on the tops of mountains, from rains, fogs, dews; and by the force of attraction, even from the clouds themselves: which waters, running through fissures into different parts of the earth; some of which rise again through different crevices as springs,—collect in hollows as Lakes or pools; and some descend so deep into the earth as never to rise without the aid of the mechanic art and the labour of man.

How evident is this when water is more than 800 times heavier than air. As such by the laws of gravity it must descend to every place as low as it can in the earth, where it finds a vacuum and forces the air before it, till it meets with some obstruction ; but it will never rise higher again until compelled by, or lifted by a superior power to its own gravity ; very few are the strata which refuse to admit its free passage through them : these are beds of stiff clay, marly bands of stone void of fissures, and such like ; yet we find its sociability with them, or whence could arise the moisture or watery particles to be extracted from even the stiffest clay.

When it is considered that the deepest excavations made by men into the surface of our earth (which is 7980 miles in diameter) cannot be considered as passing even the outer shell, and not more by comparison in depth than a gnat can perforate into the skin of an elephant ;—yet in the little way that men have penetrated, what springs, streams, and rivers, (some of large dimensions,) and great currents have they not found ; and how many must yet remain undiscovered.

As blood, the vital stream of life, passing through our veins, enables us to perform all the functions of life; so does water, passing through the various channels of the earth enable it to support its numerous inhabitants—men, beasts, and vegetables; and aid in the changes of heat and cold, summer and winter.

The late Sir Richard Sullivan, compared the earth to the human body, as abounding in vessels of different magnitude, filled with fluid matter into which when an incision is made the effusion which ensues is in proportion to the depth of the wound, because the larger channels lie deep; and he presumes the largest of all from whence they may be supplied, are placed in the centre of the body.

Much difference of opinion has existed on the manner in which springs and rivers derive their supply; some authors imagining a great promptuary in the centre of the globe; others contending that the evaporation which is continually rising from its surface is abundantly sufficient to supply all the rivers in the world. Descartes was of opinion, that the ocean diffused itself in all directions under the surface of the earth, and meeting with large cavities it became rarefied by the central heat beneath it, and ascended in vapours, leaving its saline particles behind, as being specifically heavier; and those vapours being impeded in their ascent and condensed, formed small streams or currents. This theory of Descartes seems to be supported by observing, that the largest rivers have their sources in the highest mountains, and the summits of these mountains being ever of an exceedingly low temperature, the vapours rising through them becomes suddenly condensed and escapes in a stream through the fissures in their sides; while the vapours rising to a plane surface, are either condensed and descend again to find an outlet, or finding the atmospheric temperature too high for producing that effect, continue their progress until they reach the upper regions of the air, when they are precipitated as rain, hail, or snow, to the earth, according to the degree of temperature being more or less sudden.

But unless we could suppose the sea water to deposit its salt previously to distillation, it is obvious that the receptacle must become clogged up with the residuum; and that the ocean, being continually deprived of its saline particles, would gradually decrease in its specific gravity; but as that is not found to be the case, the objection seems fatal to this doctrine.

Another argument, advanced in favour of an internal supply, distinct from that which is drawn from the atmosphere, is, that in small Islands in the midst of the ocean, and possessing little elevation above its surface, are sometimes found plentiful springs of fresh water, which cannot be supplied on any known principle of Hydraulics; and further, that in penetrating the earth we never fail to find water in greater plenty as we increase in depth. Now, if these stores depended upon the quantity they received from the surface, they would rather fail than increase as we descended, by their expanding into springs and rivers wherever they find an outlet. And, it being certain that many rivers have subterraneous channels, it is most rational to conclude the ocean to possess them also.

Hales objects to any supply from interior channels, because the surface of the sea at high water is lower than that of the land; and therefore, if springs derived their source from it by filtration or subterraneous communications, by the laws of hydrostatics they could not rise above its level.

But in answer to this objection we must remember, that the sea water is salt, and therefore, will require a much higher column of fresh water to restore the equilibrium; and consequently, if a communication exist between the interior of the earth and the bed of the ocean, water may rise even to the highest mountains, either by sap or percolation, on the common principles of statics. The great difficulty appears in attempting to explain by what process the sea water is deprived of its saline particles; for we are not able to produce this effect by percolation only. Besides it contains a volatile as well as a fixed salt, which is very difficult to be separated from it, although it is certain that there does exist some process in nature by which this is effected; since vapours are perceived to arise from the ocean at great distances from the land, and afterwards falling as rain, are found perfectly fresh; and a powerful argument in favour of the internal communication appears in the existence of numberless salt springs in the earth.

River water in its pure state may be considered more fit for general use than the hard spring water; but when the stream passes through a populous district, as is the case with the noble river of our Metropolis, and receives in its course the common sewers, and refuse of dye-houses, gasometers, and offals of every description, and is impregnated by animal and vegetable matter in a state of putrefaction; there may indeed be doubts if the softness, as it is called, be any compensation for its impurity. Besides, river water is of all others the most liable to putrefaction; and when in a quiescent state, particularly during the summer months, this very quickly takes place.

Rain water is replete with exhalations of all kinds, imbibed in its progress through the atmosphere; and that which in large cities is collected from the roof is so strongly impregnated with carbonic acid gas as to render it entirely unfit for culinary or domestic purposes.

Rain water in storms is more impure than that in gentle showers, and that water which falls first is less pure than that which falls after several hours or several days of rain. The water which falls when the wind blows from the sea, southwards, contains sea salt, whereas that produced by a northerly wind does not contain a particle of that salt.

Water which flows upon the surface of the earth is never pure; it carries with it as it flows certain earthy, saline, metallic, vegetable, or animal particles, according to the matter over which it may pass.

Hard water is usually understood to be that in which soap does not dissolve uniformly, but with curdling; and is unfit for bleaching, dying, and many purposes of domestic economy. This harshness is caused by the presence of some salts, which are decomposed by its acids, uniting with the alkali of the soap, whose oil being then separated from it, appears curdled, and will not enter into solution. The salt most frequently found in water is termed selenite, and is formed by the union of vitriolic acid with any calcareous earth; but the presence of a salt whose basis is a fixed alkali, does not in any degree harden the water containing it.

Even in the purest water, viewed through a microscope, there are to be found animalculæ or living bodies; how many kinds, is yet unknown, as they are discovered of all sizes, and no doubt many so small as to resist the force of the microscope, as the fixed stars do that of the telescope.

The smallest animals our instruments can shew, are those which inhabit the water. The movements of these little creatures are observed to be in all directions, with ease, and rapidity; sometimes obliquely, sometimes strait forward; sometimes moving in a circular direction; running backwards, and forwards, rolling upon each other, as if diverting themselves; at other times greedily attacking the little parcels of matter they meet with; and notwithstanding their extreme minuteness they know how to avoid obstacles, or prevent any interference with one another in their motions. They will easily change the direction in which they move, and take an opposite one, and appear to move as easily against the stream as with it. When the water begins to evaporate they flock towards the place where the fluid is ; and shew a great anxiety, and uncommon agitation of the organs whereby they draw in the water ; these motions grow languid as the water fails and at last cease altogether, without a possibility of renewal, if they be left dry for a short time : they sustain a great degree of cold, and will perish in much the same degree of heat that destroys other insects ; indeed some animalcules are produced in water at the freezing point, and some live in snow, and it is commonly believed that the very air we breathe is impregnated with living matter ; but it is impossible to confine such air to get a view of its minute inhabitants by the use of the microscopic glasses.

Water presents itself also under three forms of aggregation ; as a solid, when it is ice ;—as a liquid, when it is called water ;—and lastly, as a vapour, or atmospheric gas. Water was, for a long time, regarded as an element ; but modern chemistry reckons among its triumphs the discovery of the elementary substances, of which even water is composed. It is now ascertained to be a compound body, formed by the union of two different kinds of air,—oxygen and hydrogen.

It has the property of becoming, in certain cases, much lighter than air; though, in its natural liquid state, it is more than 800 times heavier than that fluid; and has also the property of afterwards resuming its natural weight. Were it not for this property, evaporation could not be produced; and consequently, no clouds, rain, nor dew, could be formed, to water and fertilize the different regions of the earth. But in consequence of this wonderful property, the ocean becomes an inexhaustible cistern to our world. The air and the sun constitute the mighty engine, which works without intermission to raise the liquid treasures, while the clouds serve as so many aqueducts to convey them along the atmosphere, and distribute them, at seasonable periods, and in regular proportions, through all the regions of the globe.

Water exists in three forms :—

1. As a Solid.
2. As a Liquid.
3. As a Vapour.

Water in a solid state ;—or Ice.

This is the simple state of water ;—when combined with a greater portion of caloric it becomes liquid or Water ;—when combined with a still greater portion of caloric it becomes Vapour.

The conversion of water into Ice is attended with several phœnomena, which seldom vary.

The first, and that which is probably the most extraordinary, is a sensible production of heat at the moment in which the water passes into the solid state. The experiments of different chemists leave us no doubt on that subject; and the particles of heat, contained in water in its liquid state, get disengaged and escape into the atmosphere, when it assumes a solid form.

The external air promotes the formation of ice; for water in a close vessel freezes very slowly, but if exposed to the open air, even in the same temperature, ice will almost instantly appear; a gentle agitation of the fluid likewise facilitates the conversion of water into ice.—This arises probably from the circumstance, that by this means the caloric, which is interposed between the particles and may oppose itself to the production of the phœnomenon, may be expressed or disengaged.

It may be observed in the next place, that frozen water occupies a larger space than fluid water. In an experiment by the academy del Cimento, bomb-shells, and the strongest vessels, being filled with water, were burst into pieces by the congelation of this fluid; indeed, the same effect is produced in many houses during the winter months, as the water vessels are found broken by the freezing and expanding of the water contained in them.

It frequently happens that the trunks of trees are split and divided with a loud noise by the freezing of the sap which they contain. So likewise stone, and blocks of marble, into the cavities of which water has been introduced, are split in pieces when the water passes to a state of ice.

In very cold climates ice becomes so hard that it may be hewn in pieces like stone, and its solidity is so great, it may be reduced to powder and be carried about by the wind. The gravity of water as ice is less than that upon which it swims; which seems to be occasioned by the quantity of air it contains in proportion to its bulk.

The same phœnomenon takes place in most of those bodies that admit of concretion by cold, and fusion by heat: such as animal fat, wax, lead, &c., and arises from the same cause; for every substance is more dense and weighty in its solid, than in its fluid, state.

It is said, ice formed by salt water produces fresh water when melted.

Water immediately produced by melting snow, is improper to drink, until combined with atmospheric air.

Water in a liquid state.

It has already been observed, that the natural state of water is that of ice.

Its most usual state when combined with caloric above 32° and under 212° of the thermometer, is that of fluidity; and it is kept in that state by the pressure of the atmosphere; and in this form it possesses certain general properties, which are very different from those which it has in a state of ice.

Some experiments which have been made, led the philosphical world to deny the least elasticity to water; because, in the trials that were made, it escaped through the pores of balls of metal, even gold, when strongly compressed, rather than yield to pressure; but its elasticity has been attempted to be proved by the very experiment upon which the contrary opinion had been formed.

Water, being composed of two known principles,—*viz.* oxygen and hydrogen,—must act like all other compound bodies with which we are acquainted; that is, according to the affinities of its constituent parts. It will in some instances yield its hydrogen, and in others its oxygen.

If it be placed in contact with bodies which have the strongest affinity with oxygen,—such as the metals, oils, charcoal, &c.—the oxygenous principle will unite with these substances; and the hydrogen, being set at liberty, will be dissipated. This happens when hydrogen gas is disengaged, by causing the acids to act upon certain metals, or when red hot iron is plunged into water.

But on the contrary, in vegetables it seems that the hydrogen is the principle which is absorbed, while the oxygen is easily disengaged and makes its escape. From the whole of the experiments, both analytical and synthetical, it may be affirmed, that water is not a simple elementary substance; but is composed of two elements, oxygen and hydrogen, which elements when existing separately, have so strong an affinity for caloric, as only to subsist under the form of gas in the common temperature and pressure of our atmosphere. This decomposition and recomposition of water is perpetually operating before our eyes in the temperature of the atmosphere, by means of compound electric attractions; and we shall find that the phœnomena attendant upon vinous fermentation, putrifaction, and even vegetation, are produced, at least in a certain degree, by the decomposition of water.

WATER AS A VAPOUR.

Water when combined with caloric to 212° of the thermometer flies off in vapour. If the specific gravity of water be at 1000 oz. the cubic foot, the common air will be $1\frac{2}{9}$; fine gold at 20,000.

Thus the heat of the sun raises water in the form of vapours; these remain a certain time in the atmosphere, and afterwards form dew, by simple refrigeration, by which process it acquires new properties—the rise and fall of humidities which succeed each other, wash and purge the atmosphere of all those particles which by their corruptions or developement might render it infectious; and probably, it is this combination of various miasmata with water that renders the evening dew so noxious and unwholesome. It is also to a similar natural distillation that we might refer the alternate transitions of water from the liquid state to that of vapour, which forms clouds; and by this means it is conveyed from the sea to the summits of mountains, from which it falls in streams into the common receptacle.

It evidently follows, that the volatilization of water being nothing more than a direct combination of caloric with this liquid; the portions of water, more immediately exposed to heat, must be the first volatilized, and this may be daily observed: the ebullition begins at the part most heated, and when the heat is applied to all parts equally, the ebullition becomes general. It seems evident that water may be converted into air by the process which the glass-blowers follow in making large spheres, the manner of assisting combustion by sprinkling a small quantity of water upon coals appear to announce the conversion of water into air.

Steam is the name given in our language to the visible moist vapour which arises from all bodies that contain juices easily expelled from them by heat not sufficient for their combustion.

Thus we say, the steam of boiling water is distinguished from smoke, by its not having been produced by combustion ; by not containing any soot ; and by its being condensed by cold into water. Again, we see it rise in great abundance from bodies when they are heated, forming a white cloud, which diffuses itself and disappears at no great distance from the body from which it was produced. In this case the surrounding air is found loaded with the water, and the steam seems to be completely soluble in air, as salt is in water, composing, while thus united, a transparent elastic fluid. But in order to its appearance in the form of an opaque white cloud, the mixture with or dissemination in air, seems absolutely necessary. If a tea-kettle boil violently, so that the steam be formed at the spout in great abundance, it may be observed, that the visible cloud is not found at the very mouth of the spout, but at a small distance before it, and that the vapour is perfectly transparent at its first emission. This is rendered still more evident by fitting to the spout of a tea-kettle a glass pipe of any length, and of as large a diameter as we please. The steam is produced as copiously as without this pipe, the vapour is transparent through the whole length of the pipe. Nay, if this pipe communicate with a glass vessel terminating in another pipe, and if the vessel be kept sufficiently hot, the steam will be as abundantly produced at the mouth of this second pipe as before, and the vessel will be quite transparent. The visibility therefore of the matter which constitutes the steam is an accidental or extraneous circumstance, and requires the admixture with air; yet this quality again leaves it when united with air by solution. It appears therefore to require a dissemination in the air. The appearances are quite agreeable to this notion; for we know that one perfectly transparent body when minutely divided and diffused among the parts of another transparent body, but not dissolved in it, makes a mass which is visible. Thus oil, beat up with water, makes a white opaque mass. In the mean time, as steam is produced, the water gradually wastes in the tea-kettle, and will soon be totally expended if we continue it on the fire. It is reasonable therefore to suppose that this steam is nothing but water changed by heat into an aerial or elastic form. If so, we should expect that the privation of this heat would leave it in the form of water again. Accordingly this is fully verified by experiment; for if the pipe fitted to the spout of the tea-kettle be surrounded with cold water, no steam will issue, but water will continually trickle from it in drops; and if the process be conducted with the proper precautions, the water which we thus obtain from the pipe will be found equal in quantity to that which disappears from the tea-kettle. This is evidently the common process for distilling; and the whole appearances may be explained by saying, that the water is converted by heat into an elastic vapour, and that this meeting with colder air imparts to it the heat which it carried off as it arose from the heated water, and being deprived of its heat it is again water. The particles of this water being vastly more remote from each other than when they were in the tea-kettle, and thus, being disseminated in the air, become visible, by reflecting light from their anterior and posterior surfaces, in the same manner as a transparent salt becomes visible when reduced to a fine powder. This disseminated water being presented to the air in a very extended surface, is quickly dissolved by it, as pounded salt is in water, and again becomes a transparent fluid, but of a different nature from what it was before, being no longer convertible into water by depriving it of its heat.

In order to make water boil, the fire must be applied to the bottom or sides of the vessel. If the heat be applied at the top of the water, it will waste away without boiling; for the very superficial particles are first supplied with the heat necessary for rendering them elastic, and they fly off without agitating the rest.

The following account of the mode of supplying ancient London with water, as described by Stow, in his Survey of London, forms a curious contrast with the system as existing at the present day. "Anciently," says the curious Historian, "untill the Conqueror's time, and 200 years afterwards, the Citie of London was watered, besides the famous river of Thames on the South part, with the river of *The Wels*, as it was then called, now the Fleet. On the West, with a water called Walbroke, running through the middest of the Citie into the river of Thames, serving the heart thereof, and with a fourth water or boorne, which ran within the City, through Langbourne Warde, watering that part in the East. In the West subburb was also an other greate water called Old Boorne, which had his fall into the river of Wels; then there were three principal Fountaines or Wels in the other suburbs; to wit, Holly Wel, Clement's Wel, and Clarke's Wel; neare unto this last named Fountaine was divers other Wels, to wit Skinners' Wels, Fag's Wel, Tode Wel, Leder's Wel, and Rad Wel. In West Smithfield there was a poole, called Horse-poole in the records of that day; and one other poole near unto the Parish Church of St. Giles without Criplegate; besides all which they had in every streete and lane of the Citie divers faire wels, and fresh springs; and after such manner was this Citie then served with sweete and fresh waters." In addition to these supplies of water, however, the increased population in the reign of Henry VI. required that fresh sources should be opened;

and various bosses and conduits were erected in different parts: yet the whole supply being still deficient, the citizens obtained from the Abbot of Westminster, in the year 1439, a perpetual grant of a fountain in the manor of Paddington, together with a right to break up the ground for laying their pipes, for an annual rent of *2lbs. of pepper*. The abbot's grant was confirmed, in June, 1443, by the King, who likewise authorised the City Magistrates to break up any public road or ground belonging to himself or any other person, to purchase 200 fodder of lead for their pipes, &c. and to press into their service plumbers, masons, and other workmen.

The last mentioned water, which arises from a land-spring, having been little used since water companies were established to supply a softer water from the Thames and the river Lea.

A few years ago a company attempted to renew the supply of the above water for the use of the town. A celebrated engineer, was the manager of the scheme,—with a boasted conveyance of it in stone pipes,—in opposition to the first conveyance of water in iron pipes,—which did not at the time give satisfaction, great complaints being made of its being unwholesome, and that it imbibed pernicious qualities from the iron. The washerwomen, in particular, held that it ironmoulded all their linen. The conveyance in stone pipes was encouraged, and many persons vested their money in the Scheme. A banking-house in Pall Mall was much concerned in it, and its failure was the ruin of the house.—The company having omitted to try proper experiments with the stone pipes, conceiving that they would certainly contain water; a contract was entered into by them, and about £78,000 worth of stone pipes were laid down in the roads and streets. When the water was let into them they filtered, leaked, split, and cracked; and a greater part remain in the ground to the present day.

The Metropolis is supplied at the present time by the different pumps which raise the land-springs; as well as with water from the river Thames and the river Lea, supplied by the different Water Companies.

The water which is here recommended to be used by the inhabitants of this city lies under the blue clay in what is called the London Basin. A List of the Wells already made into it, particularly noticing those that overflow, will be found at the end of this work.

The general substratum of which, after in some places passing the gravel, is a bluish or black coloured clay, remarkable for its horizontal layers of argillaceous lime-stone, in flattened masses, crossed by veins of carbonate of lime, or sulphate of barytes: it also contains pyrites of amber, fossil, resin, selenite, and phosphate of iron; and an abundance of organic remains of animals and vegetable matter. This clay extends beneath the soil in Middlesex, Surrey, Kent, &c.: its depth varies from 80 to perhaps 800 feet, as the List at the end will partly shew. Its colour, to the depth of from three to ten, and sometimes twenty feet, is a brownish red: a few feet lower it assumes a blueish tint; at 40 feet, a lead colour; and becomes generally darker, until almost black. Beneath this stratum is a layer of shells, from two to three feet in thickness, resting upon a reddish loam: and then succeeds a compact bed of shells, from two to six feet in depth: this stratum is almost invariably found in the county of Middlesex;—but a fine white clay occurs in other places: we next arrive at a layer of small pebbles of various colours, for the most part free from earthy mixture, of from one to twenty feet in thickness; after which there is a bed of sand of considerable depth and abounding in fine pure soft water. To this stratum succeeds one of chalk interspersed with flints, varying in depth; and since water has never been drawn below this, the geological observations may close here with an analysis of the water, (so procured) by an eminent chemist.

The hardness of river, and shallow well water, depends upon their containing calcareous salts, with carbonate and sulphate of lime ;* this water is also subject to become putrid on account of the vegetable or animal matter which it contains, and is generally turbid from the suspension of earthy impurity ; and when drank, it is flat, from the absence of air. The water from the deep wells is preferable to the above for the following reasons ; it contains only half the quantity of calcareous salts found in Thames and New River waters, and about one sixteenth of the quantity existing in shallow well water, and is therefore less hard in these proportions, and more fit for domestic use. It contains no

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* Mr. Dalton has shewn, that even one grain of sulphate of lime, contained in 2000 grains of soft water, will convert it into the hardest water that is commonly met with.

suspended earthy impurity, and the air which exists in it renders it more pleasant for drinking. It contains neither vegetable nor animal matter, and may therefore be long preserved without suffering putrefaction.

There is nothing new in the discovery of this water: the only novelty would be to give a plentiful supply of it to London. Able engineers have for some years been employed in procuring it; who give their opinion, that an inexhaustible quantity is to be had.

It may be true, that this water, in most places in Middlesex, lies too deep for an individual to be at the expence of obtaining it for his sole use.

A company was endeavoured to be established a few years ago for this most desirable object; an act of Parliament was applied for, and the following were five of the Reasons offered to support that application :—

REASONS

IN FAVOUR OF THE WATER BILL.

1st. Because the intended Supply of water will be from the deep springs below the blue clay forming the London Basin,—inexhaustible in quantity,—transparent at all times,—twelve *per cent*. softer than the water now supplied by the existing Companies,—and free from any animal or vegetable substances.

2nd. Because the proposed new Supply of water has been experimentaly ascertained to be superior, and eminently fit for washing and every domestic and culinary purpose.

3rd. Because the health and duration of life of the inhabitants of this Metropolis will be benefited and prolonged by the substitution of the wholesome water proposed to be furnished, for the present foul and corrupt element which the public, at times, are now compelled to use.

4th. Because the water proposed to be supplied by this Company, will in no way interfere with the pumps and wells in and about the Metropolis, which water is hard and formed of the land-springs; whereas that to be produced by this company, being found at a great depth from the surface, is entirely different in quality and unconnected with common well and pump water, which will be excluded by iron cylinders in boring and sinking the shafts.

5th. Because by the abandonment of the London Bridge and Beaufort Buildings Water Works, there are now two Companies less than formerly, (whilst it is notorious and indisputable that a most oppressive combination and monopoly exist) and the population has very much increased during the last few years.

At the second reading of the Bill in the House of Commons, a majority was found against the bill.—It met with great opposition not only from the friends of the present Water Companies; but also from persons who had been at great expence in sinking wells to obtain the water.

It is to be lamented, the subject was not sufficiently investigated. It was erroneously thought, when pure spring water was mentioned, that it was the same as the common well water, which supplies the old pumps in London; and it is difficult to remove that prejudice from the Public mind even now.

It was urged against the Bill, that the proposed company would drain dry all the pumps in the Metropolis; whereas the great expence of procuring the pure water from under the blue clay would be, in the quantity of tubes of metal required to prevent any communication with such springs, or the water in the clay, which contaminates the pure water, and renders it hard and unfit for washing, or brewing beer or tea, for which it is so greatly approved.

Many families, who have been fortunate to obtain the use of this water, if from any cause they are deprived thereof, will send miles to obtain it, even for tea only. The well at Norland-House, Kensington, kept several water carriers constantly at work, who earned a livelihood after paying a rent of 50*l.* a-year for the overflow of the well only.

The great brewers, who have been at the expence of obtaining the water, find their profit in it: as it possesses the fine quality of extracting the virtue from the malt and hops, in a much superior degree to any other water.

The Writer earnestly hopes some plan may be devised either by the government,—by the different parishes—or by a new Company—for an immediate supply of such a valuable necessary of life, and which would so materially contribute to the health of this great Metropolis.

It may be asked, Could not the present Water Companies be induced to dig for and give the inhabitants such pure water, if it were only at seasons when the water they now supply is in its most impure state? Or, Could not the different parishes employ their paupers in carrying it for sale from house to house, until a better mode of obtaining it could be accomplished?

If the Public at large were once to become acquainted with it, by a trial of its value and virtues, the public voice would be raised to complete so grand an object.

PARTICULARS

OF DIFFERENT

SOFT SPRING-WATER WELLS

In and around the Metropolis.

	Depth.	Rises to within the surface.
Homerton	40 feet	12 feet
Clapton	120	40
Hackney	70	25
Stamford Hill	120	50
Tottenham	100	Runs over.
Edmonton	80	do.
Tanner's End	90	do.
Waltham Cross	60	do.
Cheshunt	180	176
Southgate	200	160

	Depth.	Rises to within the surface.
Lower Holloway	128	90
Upper Holloway	230	150
Highate Hill	286	200
Barnet	320	300
Duval's Lane	140	80
Herne Hill	120	40
Hornsey	232	90
Muswell Hill	350	240
Finchley	228	225
Mill Hill	310	260
Hendon	200	150
Kentish Town	190	60
Hampstead Hill	220	100
Kilburn	270	100
Castlebear Hill	320	100
East Acton	220	Runs over.
Hanwell	240	do.
Chiswick	280	do.
Kensington Gravel Pits	280	do.
Twickenham	280	do.
Hammersmith	280	do.
South Lambeth	200	do.
Lower Tooting	90	do.
Mitcham	90	do.
Morden	280	do.
Wandsworth	260	do.

	Depth.	Rises to within the surface.
Brentford	300	Runs over.
Clapham	240	40
Upper Tooting	110	10
Balham Hill	300	40
Streatham	200	70
Brixton	150	40
Sydenham Hill	220	90
Stockwell	120	10
Camberwell	100	20
Norwood	280	150
Putney	164	4
Chelsea (deepest)	390	190
Norland House	236	Runs over.
Harrow	70	
Wimbleton	350	
Hanbury's, Spitalfields,	160	
Meux, Liquorpond Street		
Goding, Knightsbridge		
Whitbread, Chiswell Street		
Tickel's, Whitechapel		

A TABLE

Shewing the Price of Boring the Ground for Water, and of Well-Sinking, at every fifth Foot of Depth, at and from 10 *to* 300 *Feet inclusive, and the Cost of each Method of obtaining Water.*

Depths.	Boring.			Well-sinking.		
	£	*s.*	*d.*	£	*s.*	*d.*
10 feet . .	0	3	4	1	5	0
15 . .	0	6	8	2	2	6
20 . .	0	10	0	3	0	0
25 . .	0	15	0	4	2	6
30 . .	1	0	0	5	5	0
35 . .	1	6	8	6	12	6
40 . .	1	13	4	8	0	0
45 . .	2	1	8	9	12	6
50 . .	2	10	0	11	5	0
55 . .	3	0	0	13	2	6
60 . .	3	10	0	15	0	0
65 . .	4	1	8	17	2	6
70 . .	4	13	4	19	5	0

Depths.	Boring. £	s.	d.	Well-sinking. £	s.	d.
75	5	6	8	21	12	6
80	6	0	0	24	0	0
85	6	15	0	26	12	6
90	7	10	0	29	5	0
95	8	6	8	32	2	6
100	9	3	4	35	0	0
105	10	1	8	38	2	6
100	11	0	0	41	5	0
115	12	0	0	44	12	6
120	13	0	0	48	0	0
125	14	1	8	51	12	6
130	15	3	4	55	5	0
135	16	6	8	59	2	6
140	17	10	0	63	0	0
145	18	15	0	67	2	6
150	20	0	0	71	5	0
155	21	6	8	75	12	6
160	22	13	4	80	0	0
165	24	1	8	84	12	6
170	25	10	0	89	5	0
175	27	0	0	94	2	6
180	28	10	0	99	0	0
185	30	1	8	104	2	6
190	31	13	4	109	5	0
195	33	6	8	114	12	6

Depths.	Boring. £	s.	d.	Well-sinking. £	s.	d.
200 . .	35	0	0	120	0	0
205 . .	36	15	0	125	12	6
210 . .	38	10	0	131	5	0
215 . .	40	6	8	137	2	6
220 . .	42	3	4	143	0	0
225 . .	44	1	8	149	2	6
230 . .	46	0	0	155	5	0
235 . .	48	0	0	161	12	6
240 . .	50	0	0	168	0	0
245 . .	52	1	8	174	12	6
250 . .	54	3	4	181	5	0
255 . .	56	6	8	188	2	6
260 . .	58	10	0	195	0	0
265 . .	60	15	0	202	2	6
270 . .	63	0	0	209	5	0
275 . .	65	6	8	216	12	6
280 . .	67	13	4	224	0	0
285 . .	70	1	8	231	12	6
290 . .	72	10	0	239	5	0
295 . .	75	0	0	247	2	6
300 . .	77	10	0	255	0	0

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