I cannot but think that operating is a very serious matter in these cases. I believe the great secret of treatment is, to take the cases early, and not to treat them by extension and counterextension, but to lock the parts thoroughly together. Our object is to give the patient rest, which I do not think he will get by pulling at the limbs, for it must be remembered that we are not dealing with a joint in which the articular surfaces can be separated. I have proceeded on this plan, and I must say that our cases have done very well.

THE ESTIMATION OF THE QUALITY OF POTABLE WATERS.*

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THE object of this paper is :

1. To draw attention to the increasing practice of analytical chemists and civil engineers in giving opinions upon the suitability of a water-supply for consumption by a human population ;
2. To show the mischief that is done by such opinions in preventing the introduction of a proper water-supply into our large towns ; and
3. To prove that the determination of the suitability of a water-supply, in relation to the public health, is exclusively a medical question—one for the physician, who has specially studied sanitary subjects.

I will confine myself to a single illustration—the water-supply of a single town. But that illustration, I think you will agree with me, is a notable and sufficient one. I refer to the present water-supply of Perth, once the capital of Scotland, but now an eighth-rate town of about 26,000 inhabitants. It is the capital of a county which is, perhaps, better supplied with natural reservoirs of water, suitable for the domestic use of towns, than any other county in Britain. These reservoirs consist of the numerous lochs (or lakes) scattered over the district, the most important of which—as it is the feeder of the Tay—is Loch Tay. This loch is fifteen miles long, one broad, one hundred to six hundred feet deep, and three hundred and fifty-five feet above the sea-level. But there are also Loch Earn, Loch Rannoch, Loch Katrine, and many others—all of them situated in the area of the Lower Silurian rocks, an area that supplies the best potable water of this country. One of these lochs (Loch Katrine) furnishes the water-supply of Glasgow ; another that of Crieff ; and they are the natural sources of supply for Perth itself, as well as for all the towns or large villages of the county.† No doubt they are at considerable distances from Perth—fifteen or twenty to fifty miles. But this is no serious objection when public health is in question ; and when we consider from what distances other towns have not hesitated to bring their water-supplies, what the old Romans thought of distance in such a matter, or how the gold-diggers of our colonies dispose of such a difficulty.

But, in addition, the county of Perth is drained by the largest river in Britain, the Tay—a river with a basin of 2,500 square miles ; receiving, above Perth, a number of important affluents, such as the Lyon, Tummell, Garry, Isla, and Almond. The river itself flows through the town of Perth, dividing it into two unequal halves.

You will naturally suppose that, with such an affluence of suitable water for domestic supply and other purposes, Perth should be the best water-supplied city in Britain ; and you will probably be astonished when I tell you that :

1. The water-supply of the town is drawn from the river after it receives the town-sewage, which consists of—(a) The excrements, fluid and solid, of 26,000 inhabitants ; (b) The excrements of domestic animals—horses, cattle, and pigs especially ; (c) The outpourings of dye-works—among the largest in the kingdom—tanneries, and other public works ; and (d) The drainage of two overcrowded graveyards. And the river contains further, the sewage of all the towns and villages on its banks, or on those of its tributaries above Perth—including Dunkeld, Aberfeldy, Coupar-Angus, and Blairgowrie ; with the refuse of the numerous public works which take advantage of the water-power of the river or its affluents.

In other words, the river Tay at Perth is a huge river-sewer ; and it is from the river-sewage, filtered naturally, that the town of Perth takes, and proposes continue taking, its water-supply.

* Being a paper prepared for the Public Health Sections of the British Medical Association meeting at Sheffield, August 1876 ; and the National Association for the Promotion of Social Science meeting at Liverpool, October 1876.

† Had it been possible for Perth and Dundee, Forfar and Brechin, and other towns of Perth and Forfarshires, so far to have forgotten their local interests, prejudices, and jealousies, as to have harmoniously co-operated for a great common good, Loch Tay might have afforded to all of them, by conjoint waterworks, an un-failing, unlimited, unobjectionable, and economical water-supply.

2. This water-supply, however, is available for only a portion of the inhabitants, who have, instead of fifty gallons per head per day for all purposes, under twenty.*

3. Not only so, but there is absolute scarcity and insufficient pressure in case of fire.†

4. A large portion of the inhabitants—those who occupy the better parts of the town, its suburbs, rising to elevations of 200 to 300 feet—are dependent for their water-supply on surface or well waters—drainage-water—contaminated with the manure washed from fields, gardens, farm-yards, and roads.

5. And, in addition to bad quality, such is the scarcity in summer of this kind of water-supply that it is common for residents in the suburbs to borrow from each other ; while even whole suburbs and important public institutions therein have to resort to the cartage of water from the distant river ! In other words, there is frequent short supply for (a) drinking, (b) cooking, (c) ablution, and (d) flushing drains.

This being the case, and having been the case, to my own knowledge, for at least twenty years, with no indications of any movement for an improved water-supply, I took advantage of an opportunity offered me by a local scientific society, in February last, to draw the attention of the people of Perth to the unsatisfactory state of their water-supply in relation to public health. I described the river at Perth as virtually a common-sewer on a large scale ; and denounced all sewage-water, however diluted and filtered, as unsuitable for domestic use as a potable water—having special reference to the ease with which unobjectionable water, in any quantity, may be introduced into the town, as well as to the natural tendency of rivers, such as the Tay, to become annually more and more polluted.

The people of Perth have long laboured under the complacent and egotistical delusion that, sewage here or there, the river-water below Perth “is the finest in the kingdom for drinking use” ; and, unfortunately, they have never had any difficulty in getting analytical chemists and civil engineers to confirm them in their serious error. In order, apparently, specially to neutralise the effect of the opinions which I publicly expressed on the subject in February, the Water Commission and the citizens of Perth have lately had reports regarding the quality of the river-water—in reference to its use by the inhabitants for drinking and other domestic purposes—from an analytical chemist, Stevenson Macadam, Ph.D. of Edinburgh, and a civil engineer, James F. Bateman, C.E., of London.‡

Dr. Macadam says, as the result of a couple of analyses of bottled samples of water sent to him by the Water Commission : “I am of opinion that the waters are of wholesome quality and may be *confidently* employed for domestic supply, including drinking”. He describes them as “free from contamination with noxious element, either of an organic or inorganic character”.

Now, it has been abundantly proved of late years, that : 1. Chemists utterly fail to detect those matters in sewage which are most dangerous to human life, which escape filtration, are invisible to the naked eye—sometimes even to the microscope—and nevertheless produce wholesale disease in man—the germs of zymotic disease.§ And it has equally been shown that : 2. Even were chemical analysis capable of detecting what the Registrar-General of Deaths in London calls “zymads”, chemists are at irreconcilable variance among themselves|| as to their modes of analysis—some of the most eminent chemists in this country, for instance, denouncing as

* In Rome, of whose unhealthiness, real or alleged, we hear so much, there is a water-supply of no less than three hundred and seventeen gallons per day to each inhabitant, from four aqueducts alone, besides further sources, which render its water-supply “enormous”, according to Dr. Lachlan Aitken of Rome.

† This has repeatedly been pointed out by the sanitary inspector, who is also the head of the police force, Captain Welsh ; and it was, unfortunately, only too well illustrated at a fire in St. John Street in October 1876.

‡ In the belief, apparently, that my opinions must have undergone modification under the influence of Dr. Macadam's analyses and positive assertions, the said Commission applied to me by letter in July 1876, to ascertain whether and how far my opinions had undergone change. My published reply gave me the opportunity of more emphatically expressing my belief that the determination of the quality of a water-supply in relation to human health is exclusively a medical—not a chemical or engineering—question.

§ In August last, I put the question to Dr. Klein, by letter, whether he could conceive the possibility of a chemist detecting zymotic germs in water. He was kind enough to reply at once. “A chemist cannot distinguish innocuous sewage from sewage containing specific germs of disease. Even the microscope is unable to detect matters deleterious to health which may be present in water.”

|| In illustration, I need only cite two recent public trials in Scotland, which are types of incidents that are constantly occurring in all parts of the three kingdoms. I refer to—1. The Bunchrew (Inverness) bone manure case, tried before the Court of Session, Edinburgh, in March 1876 ; and 2. A crucial butter case, tried before the Sheriffs' Court, Glasgow, in July and August 1876. In both of these cases, it so happened that Dr. Macadam held opinions that were pronounced erroneous by the issue of the trial ; which issue was determined by the concurrent evidence of numerous other analysts, including those employed by Government at Somerset House.

worthless such methods as are followed by Dr. Macadam.* Moreover, such a conclusion as Dr. Macadam's, as to the use of sewage-water, is diametrically opposed, not only to: 3. The testimony of the medical profession as a whole, and especially of that large section thereof whose members are connected and conversant with sanitary science and sanitary operations—the important body of medical officers of health in our large cities; but also to: 4. The emphatic conclusions of the Rivers Pollution Commissioners, in their concluding Report (in 1874) on Public Water Supply.

Inasmuch as the object of this paper is less to communicate information, or to set forth and support my own views, than to invite discussion by, and the expression of the opinions of, the members of so important a Congress as that which I have the honour to address, I cannot occupy your time with citations calculated to show how erroneous and mischievous such a conclusion as Dr. Macadam's is. It is proper, however, that I should quote one or two paragraphs from the Blue Book just alluded to [on "The Domestic Water-Supply of Great Britain"].

1. "Dangerous water is . . . river or flowing water . . . which is known, from an actual inspection of the river or stream, to receive sewage, either discharged into it directly or mingling with it as surface drainage."

2. "When any portion of the manure consists of human excrements, the organic matter, dissolved in the water, becomes not only disgusting, but also dangerous."

3. "Even when not contaminated by the actual admission into it of the sewage of towns and villages (river-water), is not of suitable quality for domestic purposes. But when it is further polluted by excremental drainage, its use for drinking and cooking becomes fraught with great risk to health."

4. "Nothing short of abandonment of the inexpressibly nasty habit of mixing human excrements with our drinking water can confer upon us immunity from the propagation of epidemics, through the medium of potable water."

5. "If fatal results had never been known to follow the domestic use of such water, the refined feeling which separates the civilised man from the savage, and which excites loathing at the bare idea of organic matter, which has formed part of a human body, being supplied for human consumption, ought here to make itself felt, and to secure the rejection of such a beverage."

6. "It is difficult to conceive anything more disgusting and dangerous to health than a populous community . . . systematically, and by an elaborate and costly arrangement of reservoirs, pumps, filters, and distributory apparatus, drinking its own filtered sewage!"

I venture to believe that these emphatic declarations of the Rivers Pollution Commissioners—among whom is one of our most eminent chemists, Professor Frankland, and which conclusions are based on an infinity of data collected alike from medical sanitarians, chemists, and civil engineers—will meet with the unanimous approval of the medical profession. And if these declarations or generalisations be correct—if they are (as I, and I hope you also, believe them to be) unassailable—it must be obvious that such opinions as Dr. Macadam's are, on such a point, worthless and misleading.

Mr. Bateman, who was asked to report on "the best means of providing an extended water-supply for Perth", went very far out of his way when he ventured on the following opinion regarding the quality of the Perth river-sewage as a potable water. He says: "I am convinced no better water could be procured anywhere. . . . It is of very great purity. . . . Notwithstanding the sewage of the city, which is poured into the river above the (filtering) island, the water is not only remarkably pure, according to chemical analysis; but, as I am informed, and as I had in part the opportunity of observing, it is bright and brilliant under all circumstances of the river." . . . (Natural filtration) "is sufficient, I imagine,† to obviate any possible objection to such pollutions as enter the river above the island."

His opinion, then, appears to be based on: 1. Dr. Macadam's ana-

* Thus, Professor Frankland informs me (*in litt.*) that "the albuminoid ammonia method of analysing waters is quite useless for ascertaining their fitness for dietetic purposes". Dr. Mills, F.R.S., Young Professor of Technical Chemistry in the Andersonian University, Glasgow, tells me that in the Young Laboratory of Technical Chemistry, Glasgow, "the method of analysis adopted is that of Frankland, improved by myself. The results are thus obtained in the only form in which they can be compared with those of the late Rivers Commission, whose reports contain two thousand analyses of waters from all the chief strata and under all the usual conditions. With Wanklyn's method, as such, I cannot agree on chemical grounds, and therefore never use it". On the other hand, a local Scotch analytical chemist writes: "I may be permitted to say that I put no confidence in any other method of analysis of water than that I carry out myself—viz., the ammonia or Wanklyn method. . . . The latter is used over the whole civilised world; the former (the Frankland method) by not six chemists; which remark also applies to Macadam's method."

† The italics are mine.

lyses; 2. Hearsay evidence; and 3. The clear appearance of the filtered water.

I have endeavoured to show that no mere chemical analysis is of any value, as determining the probability or improbability of a sewage-water producing in man the zymotic or other diseases; failing, as such analysis does, to detect the germs of such diseases as typhoid fever and cholera. In this case, all opinions based on mere chemical analyses necessarily fall to the ground.

Hearsay evidence is obviously inadmissible in an opinion given by a scientific expert on a scientific question; and I confess my astonishment that Mr. Bateman should have made use of it.

The clear, sparkling, or brilliant appearance is so far from being any criterion of their innocuity that, perhaps, the finest-looking waters are those which owe their appearance to the products of human decomposition in our overcrowded city graveyards!

It is very significant that, notwithstanding Mr. Bateman's very confident opinion as to the unapproachable excellence of the Perth sewage as a drinking material, he says this: "To the superficial observer, the sewage which enters the river above the island, and the rise of tide, which dams back a portion of the sewage which enters below, are apparently grave objections. But the water, after passing through the great filtering island, is not injured; and it will cost less money to divert the sewage to a sufficient distance below the intake than to bring in pure water from a distance."

Here we have a very singular series of assertions, insinuations, and admissions. It scarcely becomes a civil engineer, who trusts to chemical analyses, hearsay evidence, and the naked-eye characters of a water to enable him to give a confident verdict as to its medical qualities, to assign to the category of "superficial observers":

1. Medical officers of health, who have made water-supply, in its bearing on the maintenance of health and the prevention of disease, a life-study;

2. All the eminent men—medical, chemical, or engineering—whose evidence is embodied in the six reports of the Rivers Pollution Commissioners;

3. The following distinguished members of our profession—all of them well known Fellows of the Royal Society: (a) The late Professor Parkes of Netley; (b) Dr. Benjamin Ward Richardson of London; and (c) Dr. Klein of the Brown Institute, London, who has made a special and most successful study of zymotic germs and their actions; these eminent authorities emphatically confirmed the propositions contained in my address on "Public Water-Supply, with special reference to the requirements of Perth".

4. The local medical men of Perth, who have been familiar for twenty or thirty years or upwards with the quality of the river water, on the one hand, and the fluctuations of disease and of health in the city on the other.

And it would appear to indicate a want of confidence in his own assurance when, after proving, or attempting to prove, that the river sewage is first-rate in quality and is "not injured" by filtration, Mr. Bateman yet refers to the diversion of the city sewage to a point below the filtering tank! Further, his allusion to bringing in "pure water from a distance" does not quite harmonise with his previous assertion as to the "very great purity" of the filtered sewage of Perth.

In short, Mr. Bateman's report on the Perth water-supply seems to me a scientific curiosity. But were this all, I would scarcely ask the attention to it of the present Congress. The practical effect, however, of such assertions as those of Dr. Macadam and Mr. Bateman—as to the purity of the filtered river-sewage of Perth—is this, that not only for the last forty years, the state of matters which I have already described, as regards scarcity of water and objectionable quality, has existed in that city, but there is a prospect* of its being perpetuated, unless it can be and is shown that the opinions of analytical chemists and civil engineers, as to the quality of potable water, are valueless beside the very opposite opinions of the whole medical profession and of the Rivers Pollution Commissioners. For, what Mr. Bateman proposes is not a gravitation supply from some of the natural reservoirs already spoken of, and which supply, at £2,000 per mile, might be introduced perhaps for £40,000 or £50,000, while it would be unfailling, unlimited, unobjectionable, and permanent; but he suggests the expenditure of £30,000 on mere extension of present works—on additional engine-pumps, reservoirs, and pipes—the water to be supplied being still the filtered sewage so emphatically denounced in the Government Blue Book of 1874.

It is a striking practical commentary on the opinions of Dr. Macadam and Mr. Bateman that, just about the period of their reports, in June last, the Registrar-General of Deaths and their Causes in Scotland

* This prospect has been converted into something like a certainty; for a Water Bill for Perth, on the basis of Mr. Bateman's report, has been prepared for Parliament—to be passed this session.

announced that "the town which suffered most from epidemics is Perth, where 23.0 per cent. of the deaths are ascribed thereto". In February I had publicly pointed out that, if my opinions regarding the connection between the water-supply and the mortality of Perth are correct, the mortality from zymotic disease should be greatest when the river is at its lowest—the dilution of sewage therefore least; and I am only sorry to find that my vaticination was so correct.*

I trust that those who have done me the honour of listening to a history that is not, I think, of mere local interest, will now do me the further favour of freely expressing their opinions, or recording their experience—the question for discussion being: Whether or not, and what, mischief arises from analytical chemists and civil engineers usurping the place of physicians in questions which necessitate the possession of special medical knowledge and experience?

CASE OF TUMOUR OF THE SKULL, WITH HEMIPLEGIA OF THE SAME SIDE OF THE BODY.

By EDWIN RICKARDS, M.B.,

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Tumour of the Left Posterior Fossa of the Skull, causing Absorption of the Left Half of the Cerebellum, and pressing against the Pons Varolii and Medulla Oblongata: Hemiplegia of the corresponding Side of the Body.—Harriet T., aged 39, was the mother of ten children; the last four died shortly after birth. She had always been strong and well up to October 1870. Until then, she had not lost a child. From that date to her death, she was subject to headache and epileptiform fits, occurring at intervals varying from a week to two months. In July 1874, she for the first time experienced difficulty in walking straight; and one day she was accused of being intoxicated. In the following October, she noticed that the limbs on the left side were weaker than formerly. In March 1875, she had an unusually severe fit, lasting three hours. When she rallied from it, she found that she had lost so much power over her left side that she could not raise the arm or leg on that side; this loss of power was increased by subsequent fits. In January 1876, I saw her. There was paralysis of the left side of the body, though the fingers and toes could be moved slightly. The whole of the left side of the face was completely paralysed. The left eye could not be closed; its conjunctiva was insensible; its pupil was unaffected. There were complete deafness and defective vision on the left side. The sensibility of the left side (limbs and face) was greatly diminished. The face was drawn to the right side. There was no heart-disease, nor albumen nor sugar in the urine. All these symptoms persisted until her death, which occurred suddenly, as she was being carried up stairs to bed, in November 1876—her intellect remaining clear to the last. I saw her many times. Her various complaints were that she had no power or feeling in the left limbs; that she could not sit up, for she had no power in her back; that the pain in the left side of her head was constant and very severe; that she could not eat, for she had no appetite, and she could not swallow solids, as they seemed to lodge in her throat; that, though always thirsty, she had great difficulty in taking liquids, as they brought on fits of coughing; that she had great difficulty in clearing her throat of phlegm in the morning; that she could not feed herself, for, although her right hand was strong enough, it was unsteady. In April preceding her death, she had great exacerbation of the pain in her head; and, for three weeks, she lost control over her bladder and rectum, and was much troubled with cough.

POST MORTEM EXAMINATION, twenty-four hours after death.—The body was much emaciated. There was no abnormality in the vascularity of the surface of the brain, nor was there any effusion there. On section of that organ, the tissue was more tough and less vascular than usual, and had a faintly fawn-coloured tint throughout. All the ventricles were much dilated, and contained about eight ounces of clear watery fluid. A crow-quill could have been passed through the iter à tertio ad quartum ventriculum. On raising the brain from the skull, the vessels of the base were healthy; and nothing abnormal was noticed there, until a tumour was seen projecting through the aperture in the tentorium against the pons Varolii and the medulla. On dividing the tentorium, the tumour was found to occupy the left posterior fossa of the skull, and was covered over by a thin layer of cerebellum about half an inch thick. The remainder of the left half of the cerebellum had not been displaced, but removed by absorption, as if by a spoon;

* A signal illustration is to be found, moreover, in the fact, that in September 1876, in a single industrial school for girls in Perth, of a total of seventy three pupils, forty-three were simultaneously prostrated with typhoid fever—a fever that may be said never to be absent from Perth; the assigned cause of the said outbreak being scarcity of water for flushing drains.

it was the upper surface which remained, and this was attached by the peduncles, which were thin nervous bands. There were no adhesions between the brain and the tumour. The tumour was about the size of a hen's egg, soft but tense, and covered over with a smooth vascular membrane, doubtless altered dura mater. This membrane had to be divided before the morbid mass could be scooped out. It had eroded the temporal bone to such an extent that the thumb could be placed in that bone. The consistency of the tumour was not quite the same throughout, but for the most part resembled bacon. The tumour was fawn-coloured throughout. In the mass was a thickened cord, which was the distal end of the eroded seventh nerve. The pons Varolii and medulla on the left side were not eroded, but, by the pressure of the tumour, had been reduced one-third of the size of the right halves. The left half of the medulla felt like a bag half-filled with feathers containing a solid body, which was the olivary body. The lungs were engorged and filled the chest. The heart was empty and healthy. The other viscera were healthy. There were no signs of syphilis or tubercle. The tumour was composed entirely of fine nucleated oat-shaped cells. It was without stroma, and contained numerous vessels. Doubtless it was a sarcoma arising from the dura mater. The tumour only could be removed for examination.

REMARKS.—The facial paralysis and loss of hearing on the left side are readily explained by the facial and auditory nerves on that side being eroded through; and, from the position of the tumour, there was doubtless pressure on the fifth, eighth, and ninth nerves, which would explain other symptoms. As to the loss of power which affected the left limbs, there seem two possible explanations, viz., pressure of the tumour on the non-decussating fibres of the medulla, and the accumulation of fluid in the ventricles. Vulpian (*Moniteur des Sciences Médicales*, June 25th, 1861) records a case where a tumour, situated in the right posterior fossa of the skull, was accompanied by paralysis of the limbs of the right side; and he states that the accumulation of fluid in the left lateral ventricle was greater than that in the right; but, in the case above recorded, both ventricles seemed equally distended. The extensive damage to the cerebellum tallied with the early symptoms of loss of power of co-ordination.

EXTRACTION OF FOREIGN BODIES FROM THE EAR.

By WALTER RIVINGTON, M.S.Lond., F.R.C.S.Eng.,

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IN THE BRITISH MEDICAL JOURNAL of July 15th, there is an article by Dr. H. A. Alford Nicholls, of Dominica, West Indies, in which, whilst concurring with and commending the general rules which I ventured to offer (*BRITISH MEDICAL JOURNAL*, March 18th, 1876) for the extraction of foreign bodies from the ear, he calls in question the soundness of my belief that the ear-scoop should be banished from the surgical armamentarium. In support of this instrument, which I had the temerity to characterise as a "rude implement" and to condemn, Dr. Nicholls relates an interesting case in which he was enabled to remove the trunk of a cockroach with the ear-scoop. He did not succeed in removing it with forceps; and he did not employ syringing, because he believed that "all the syringing in the world could not have shifted the mass in the slightest degree". Unfortunately, or fortunately perhaps, I have had no experience in the removal of cockroaches, and I should hesitate to hazard an opinion on a case which I did not see; but, in the present state of my knowledge, I do not altogether perceive why a dead cockroach should not be displaced by careful syringing. Nor should I have anticipated that, with a good light, a mirror, a Toynbee's speculum, and proper forceps, any serious difficulty would be experienced in dislodging the intruder. Of course, the ear-scoop may be used successfully in some cases, and, in skilled hands, without the infliction of injury to the tympanic membrane and chain of bones; but its adaptability to the extraction of foreign bodies is essentially limited. It is, at least in my judgment, a clumsy instrument. It occupies a great deal of space; and it must be insinuated by the side of the foreign body, and reach its posterior part, to be of any service at all.

Now if, in any given case, the ear-scoop be capable of being introduced by the side of the foreign body and made to act in its rear, that foreign body cannot well be very formidable, or so block up the meatus as to offer insuperable difficulties to the more gentle influence of a stream of water. If, on the other hand, the foreign body, as it so often does, fill or nearly fill the meatus, the ear-scoop is worse than useless. When the ear-scoop has gained the rear of the foreign body, it is very liable, even in skilful hands, to do mischief. Contact with