who has always operated since I have had charge of the case, states that he is not aware of a similar case being on record.

The dropsy is now confined chiefly to the abdomen, the legs, feet, hands, and arms having become almost normal, though the thighs are distended at times. All the organs have improved in their action, but the improvement in the heart's action is the most marked. The exhibition of cactus has been continued throughout, but other drugs have been given freely as occasion has required, in order to meet the disordered condition of other organs; for instance, for a lengthened period constipation has been a very persistent symptom, refusing to yield alike to pil. hydrarg. and mist. sennæ co., belladonna or cascara, but latterly even this symptom has materially lessened.

A fourth case was that of a young woman, about 20 years of age, who suffered from a very severe attack of rheumatic fever, when, towards the end of the fever, a loud mitral murmur developed. The exhibition of cactus and alkalies resulted in recovery so far that she has been able to resume her work.

Other cases might be brought forward, but these will perhaps suffice to suggest that cactus grandiflorus offers an interesting and valuable field for research, especially in the treatment of asthenic conditions of the heart.

NEW AURAL INJECTOR AND EVACUATOR, WITH A FLEXIBLE EUSTACHIAN CATHETER.¹

By JOHN WARD COUSINS, M.D.LOND., F.R.C.S.,

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SINCE the publication of my paper in the JOURNAL² on Tinnitus Aurium, and its Treatment by a New Method of Alternate Injection and Evacuation of Air, I have considerably modified my apparatus, and have now adapted it for self-application. It consists of one hand ball fitted with a recoil spring, which increases the force and rapidity of its expansion (Fig. 1). The injecting

Fig. 1.

and evacuating tubes both terminate in a vulcanite joint, to which a nasal piece of soft rubber can be attached. The nasal pieces are made in different sizes, and several of them are supplied with each instrument. When medicated air is to be used, the volatile substance must be dropped upon a pledget of cotton wool placed in the vulcanite box, which is fixed on the injecting tube. In this way I use chloroform, ether, creasote, pinol, and many other remedies. For the successful application of the treatment it is essential that the patient should be instructed to practise injection and evacuation of the tympanum in the following manner:

The nasal orifices must first of all be carefully wiped dry, and the nose pieces adjusted, so as to securely and completely plug the nostrils. The nasal tubes are now held in position by the forefinger and thumb of the left hand, and the hand ball is elevated and compressed by the right, and then allowed to ex-

pand by its own elasticity. During the steady performance of these movements the patient should take a full inspiration, and while holding the breath and pressing the lips together he should make an expiratory effort, just as if he were in the act of blowing through a tube. With many patients the entrance of air into the tympanic cavity is rendered easy by the act of deglutition, for the muscular movements of the pharynx act directly upon the open ends of the Eustachian tubes. As a general rule, my patients require very little instruction, and soon become very skilful with the instrument. The alternate method presents many advantages over other forms of tubal inflation. It promotes the drainage of the tympanum and the discharge of pent-up fluid into the pharynx. It also proves of material assistance in cases of collapsed and adherent membrane. Its daily application is especially useful in the treatment of tinnitus aurium caused by abnormal tension, and also in other forms of chronic middle ear disease.

The apparatus for alternate injection and evacuation with the Eustachian catheter is represented in Fig. 2. The tubes are

Fig. 2.

joined together, and near their junction a vulcanite terminal is fixed for the insertion of the catheter. The flexible catheter is a flattened tube of soft metal, and it can be readily bent to any shape by protecting the bore with the stilette (Fig. 2). For the successful application of the Eustachian catheter, it is often necessary to adapt the instrument to the curvatures of the nose and pharynx. Sometimes the nasal passages are by conformation irregular, or they become tortuous and obstructed by morbid changes in the bone or lining membrane; in other cases the position of the tubal orifices and mucous folds of the pharynx require a special flexion of the beak. For some patients I keep a catheter always bent and ready. The instrument must be carefully washed and deodorised after each operation.

In performing the operation of alternate injection and evacuation of the tympanic cavity, the hand ball must always be attached to the catheter after its introduction. The surgeon should elevate and compress the hand ball with the right hand, and hold the catheter and close the nostrils with the left; at the same time, he must direct the patient to practise the movements already described. During the expansion of the hand ball, the catheter should be drawn outwards for half an inch, for by this manoeuvre the evacuating power will be increased. Special care must be taken to prevent twisting or kinking of the india-rubber tubes. Sometimes the point of the catheter gets lodged in the folds of the pharynx, so that the injection of air is obstructed. When this occurs, the instrument should be rotated a little, and then replaced over the Eustachian orifice. If from any cause considerable difficulty is experienced in passing the flexible metallic catheter through the nasal meatus, I substitute for it a fine vulcanite instrument, which can be bent to any curve by gentle heat.

In conclusion, I desire to mention that all the instruments described in this paper have been made for me by Messrs. Maw, Son, and Thompson, of London.

THE ACTION OF POTABLE WATERS ON LEAD

By SURGEON GILBERT KIRKER, M.D., R.N.

[Communicated by THE DIRECTOR-GENERAL OF THE MEDICAL DEPARTMENT OF THE NAVY.]

WHILE engaged in some investigations in connection with the bacteriology of drinking water last summer, I read Mr. Power's memorandum on Lead Poisoning by Certain Public Water Supplies, etc., which is contained in the report of the medical officer of the Local Government Board for 1887. My interest was particularly aroused by Mr. Power's suggestion that the seasonal variations in the action of water on lead, which had been observed by Dr. Sinclair White at Sheffield, might be owing to low organic life;

¹ Exhibited in the Section of Otolaryngology at the Annual Meeting of the British Medical Association, held in Leeds, August, 1889.

² See JOURNALS of February 26th and March 26th, 1887.

and I at once made some experiments with the object of testing it. In some waters, under certain conditions of storage, a rapid and great multiplication of micro-organisms takes place; and these waters, while undergoing this process of fermentation, as I have pointed out elsewhere,¹ appear to be especially unwholesome. The change alluded to manifests itself by a great increase in the number of colonies obtained by a bacteriological examination, and by the appearance of a new chemical substance or substances, which particularly attests its presence by modifying the reaction between ammonia and Nessler's solution.

Into equal portions of three samples of rain water from the same underground tank I put similar pieces of lead. Though the three samples were originally from the same source, through different conditions of storage they had come to exhibit the process of fermentation and deterioration in different degrees. From cultivations of $\frac{1}{2}$ cubic centimetre of two, one was found to contain 2,310 microbes per cubic centimetre, and the other 8,823. The number of microbes in the third had not been actually determined, but 0.5 cubic centimetres of another sample, which had been treated the same way, yielded on cultivation an uncountable number of colonies. I have, therefore, no doubt that the number in this one was much higher than in either of the other two. Chemical examination also showed the samples to be affected by the process in the same order.

The pieces of lead were put into the waters on June 13th, and on the following day they were tested qualitatively. The result was that the degrees of indication of the presence of the metal were, in a marked manner, in the same order as the samples had manifested deterioration. It is not probable that the micro-organisms directly attacked the lead; the solvent action was most likely due to the chemical products which accompanied their multiplication.

Now I have noticed that in the course of the year waters generally suffer from deterioration in direct proportion to their increase of temperature; and as it was at the season when they are warmest that Dr. White found the Sheffield water to act most on lead, it appears to me probable that Mr. Power's suggestion is correct, and that my experiments point towards the explanation of the varying action of water supplies on lead pipes.

In conclusion, I may offer the suggestion regarding what appears to be the possession of abnormal and constant plumbosolvent action by the moorland water supplies of many of the northern towns of England, that the products of combustion, which in that part of the country are poured into the atmosphere in great quantity and variety, give them this power. These gain access to the waters by being washed by the rain out of the air and off the grass, where they have been deposited by the wind.

INJECTION AND ASPIRATION WITH HYPODERMIC SYRINGE FOR DIAGNOSTIC PURPOSES.

By FREDERIC TRUBY KING, M.B., B.Sc.,

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TENTATIVE aspiration by means of the hypodermic syringe has come to be so much employed of late years, that a simple suggestion of a means by which the result may be rendered more reliable seems worth noting. One of the strongest objections to the ordinary use of a hypodermic needle for diagnostic purposes is that a positive result can alone be regarded as of certain value. The fact of obtaining no pus or other fluid, even when several punctures have been made affords no reliable evidence as to the non-existence of a fluid-containing cavity. In the majority of cases pus will readily flow through a needle, but the lack of reasonable certainty in the event of a negative result is highly unsatisfactory. The suggestion I have to offer is as follows. Draw water into the syringe until it is about one third full, and, after puncturing, slowly expel a few minims into the supposed cavity, then gently withdraw the piston, and, if a collection of fluid exist, we are practically sure to obtain a specimen of it for naked eye or microscopic identification. I first tried this plan in a case where only a negative result could be obtained by the ordinary method, though the pus flowed freely when it was

diluted. Since then I have used it in a large number of cases with a view to testing its value, and have never failed to satisfy myself with a single puncture. There is rarely any necessity to expel more than about three minims of water, but, if this fails, the piston may be driven further home, or even worked in and out several times.

The advantages of this simple combination of injection and aspiration appear so obvious, that I am quite prepared to hear that the plan has been already adopted, but my excuse for drawing attention to the matter is that I have not come across anyone who has practised it. Through the finest needle fluids of ganglions, bursæ, hæmatomata, or any form of abscess flow readily when diluted. In order to see clearly the effect of passing a few drops of water into a viscid fluid some coloured water was injected into glycerine. Owing to the high specific gravity of the latter, the water rose to the surface too rapidly to allow of much mixing at the point of emission; but, in spite of this, it was found that by directing the needle to the surface more fluid could be withdrawn than there had been water injected.

Pure glycerine will not pass through a fine needle by the suction of an ordinary syringe unless pressure be exerted on the fluid. The effect of tension is obvious, and may be easily demonstrated as follows. Fill a bottle with glycerine, and cover with an india-rubber cap; puncture the cap with the needle of a hypodermic syringe which has been half filled with glycerine. Withdraw the piston and no fluid will follow; but, after injecting enough glycerine to render the cap moderately tense, a portion of the fluid will slowly flow back into the syringe if the piston be again withdrawn. This points to the value of increasing the tension of thick or viscid fluids by injecting into the containing cavity. The rapidity with which one fluid injected into another of different specific gravity rises or falls, as the case may be, is of some importance. A few degrees of difference in the case of a non-viscid fluid will almost prevent admixture at the point of injection, and, though movement is much slower in viscid fluids, it is desirable to approximate the density of the injecting fluid as nearly as may be to that of the medium into which it is to be thrown. For ordinary use, a solution of phosphate of soda or even sodium chloride, with a density of about 1030 to 1040 would probably be the most useful.

As previously stated, I have been in the habit of using water (boiled), and this has answered quite well, but it is an advantage to have a fluid which, when expelled, will remain at the point of the needle. The fluid which returns first into the syringe is then nearly pure; further suction draws in a larger proportion of morbid material until it may become so thick as to be incapable of passing through the needle. I may here summarise the principal factors in the certainty of the result when aspiration is preceded by injection. 1. The needle is cleared; 2, the tension of the fluid is increased; 3, the fluid is rendered thinner. Where a syringe is used both for injecting and aspirating, great care is necessary in the after cleansing and disinfecting of the cylinder of the syringe.

Recently I have made a few experiments with a view to ascertaining how far "injection and aspiration" might be valuable in determining the nature of solid tumours in doubtful cases, but my field of observation is at present too restricted to enable me to state much upon this subject. In dealing with solids, a precisely similar method to that described above may be used, only that in addition the structure should be broken up slightly at the point of the needle by a teasing and circumducting motion. If it be designed not to penetrate to the full depth, it is well to put a stop in the middle by thrusting it through a piece of cork, for by this means we are enabled to keep the point accurately in the region of disintegration and injection. The specimen may be readily stained by drawing into the cylinder a few drops of solution of hæmatoxylin or picricarmin, and allowing the fluid to stand for a few minutes before expelling a portion into the microscopic slide. The identification of a fatty tumour presents no difficulty, as an emulsion-like mixture of fat and water will readily pass into the syringe, and can be examined microscopically. Only a single drop may be got to flow back, but this is ample for diagnostic purposes. Sarcomata (unless very fibrous), soft cancers, etc., should be easily identified, for it will be found that liver cells can readily be withdrawn, and examined, indeed, some pieces of tissue large enough to cover half the field of a Hartnack microscope (Mag. 350) will come through the needle besides an abundance of smaller pieces of tissue and isolated cells. The operation is practically painless.

¹ *Sanitary Record*, April, 1889.