cisely in these cases, wherein the blood-poison is retained, that the disease is the most rapidly fatal.

But Hahnemann repudiated the doctrine of ferments, and denounced as absurd the idea that minute and contagious substances can be absorbed and enter into our blood. The microscope, however, has revealed to us the yeast plant since his time; and that minute substances can, and do, enter into our blood is proved by the propagation of these zymotic diseases.

The influence of the atmospheric air in diffusing these infectious particles may be readily appreciated when it is understood that the lungs are constantly receiving, on an average, twenty cubic inches of air at each inspiration, or about four hundred cubic inches per minute, during which time as much as 150 ounces of blood are propelled through the lungs (366 cubic feet, or 36 hogsheds, of air, and 13,488 pounds, or 24 hogsheds of blood, per diem); and that the blood, as it circulates through these organs, has in itself no power of selection, but absorbs into itself poisons, if they happen to be present in the atmosphere.

Again, Hahnemann has stated in his "Organon," that "the cause of disease cannot possibly be material; since the least foreign substance introduced into the bloodvessels, however mild it might appear to us, is suddenly repulsed by the vital power, as a poison; or, where this does not take place, death ensues." Now, if his dogma be true, we may fairly assume the universality of its application; whereas it has been shown in many instances that substances, foreign to healthy blood, do find their way into the bloodvessels; and although chemistry has not yet answered our requirements to prove the same in all cases of disease, yet it is a circumstance of happy augury for the doctrine of a *materies morbi*, that it has a strong foundation in the conviction of every physiologist of any note who has ever committed his thoughts to paper.

Immaterial, dynamic agencies are the practical data of homœopathy, and condense, in the fewest possible words, the greatest amount of false doctrine; yet the time when Hahnemann lived was singularly favourable for the propagation of such a theory; for, as Dr. Wm. Gairdner has said, it was evolved in the natural course of things from the Sangrado school before it, "just as the curmudgeon of a father produces a spendthrift of a son, as the Puritans produced Charles II., or as the Grande Monarque produced the French revolution."

(To be concluded.)

ON ANÆSTHESIA BY MIXED VAPOURS.

By ROBERT ELLIS, Esq.,

OBSTETRIC SURGEON TO THE CHLSEA AND BELGRAVE DISPENSARY.

IN common with a majority of my professional brethren I share a feeling of insecurity, not to say dissatisfaction, in the use of unmixed chloroform for the induction of anæsthesia. I think probably few are in the habit of exhibiting chloroform, as it is now administered, without a sense of doubt as to the manner in which it will take effect on the person operated upon. The risk is, of course, small; all statistics go to exhibit that important and reassuring fact, but it exists notwithstanding, and I believe is due in great measure to the use of this anæsthetic agent pure and simple. Death by spasm and death by paralysis of the heart may probably be set down as the principal causes of a fatal issue arising out of the use of undiluted chloroform. Against other causes of death in anæsthesia, such as suffocation or coma, we can take precautions, and they may be successful; but against these two we have only a limited power to contend, so long as we continue to employ this powerful agent alone.

While engaged in obstetric practice it has long occurred to me how great would be the advantage of possessing a substance safe in the use, and at the same time capable of producing insensibility to pain. Such an agent is yet to be discovered. But I think I have found a method by which the same result may be obtained by a combination, in a certain manner, of those substances with which we are already familiar. Reflecting on the commoner causes of fatal chloroform accidents, the conviction is impressed on me that we commence our anæsthetic induction with the wrong agency. Chloroform, however diluted, is unsuitable for the *early stages* of inhalation, and it is in these especially—as, *e. g.*, in the recent fatal accident

at St. Mary's—that fatal results have been most frequent. At this period the emotional causes of danger are most active, the resistance greatest, and the danger also greatest. When I have heard of a patient being rendered quite insensible in three minutes it has always appeared to me—considering what must happen before insensibility can occur—that that particular patient has had a narrow escape. That all the natural emotion felt in submitting to an operation, with all its physical results, should be overwhelmed in this way, and the patient drowned in chloroform vapour in so rapid a manner, is in my opinion most unjustifiable and hazardous in no ordinary degree. But even when judiciously administered, chloroform, in my judgment, is the wrong thing to begin with. Its physiological action as a stimulant is brief, while the narcosis which follows is prolonged. Also, notwithstanding many assertions to the contrary, I think there is evidence to prove that occasionally chloroform vapour acts as a depressant from the first. What it seems to me we require, therefore, is to commence the anæsthetic operation with some of those substances which will give a gentle stimulus to the patient, sustaining the heart-power, tranquillizing the emotional condition, and thus gradually introducing to the stage of first partial, and then complete insensibility. In the method I would now introduce, this is effected by a means so simple and secure, that I have good hope it may commend itself to the judgment of many of our profession.

I take a drachm of *pure and strong alcohol*, sp. gr. 810 to 815, and pour it into one part of the instrument described below; this will last for four or five minutes. Into another division I pour a drachm of *pure ether*, sp. gr. 725, which lasts, perhaps, a couple of minutes; and I keep supplying this in small quantities as required. The patient begins to inhale, and receives into his lungs a mixed vapour of alcohol and ether, the evaporating surfaces being so adjusted as to keep a tolerable equilibrium between these two ingredients. By the simple act of rotating the apparatus, the quantity inhaled is increased, and is measured off on a scale to which the index points. The operator thus sees at a glance what amount is passing into the lungs, and adjusts it to the requirements of the patient. There is no coughing, or struggling, or resistance at this stage. Very gradually the pulse begins to rise, the surface becomes warm, (it is often cold from mere fright,) and the patient comes under the full influence of the mixed vapours; this I have called the stimulo-sedative stage of the operation. Then, when the heart and the nervous system have fully experienced the power of this excitant, a little turn further brings in the chloroform vapour, by such gentle gradations that the patient passes insensibly from the milder influence of the one agent into the anæsthetic power of the other; and by still further rotating the instrument, he is made to breathe only chloroform vapour just at the time when he is ready for the further proceeding of the surgeon. I think that in this method of inducing anæsthesia are combined the conditions of the greatest security with those of complete abolition of pain. I do not, indeed, make any kind of claim to novelty in the use of substances so familiar. I would only urge upon my professional brethren to avail themselves of the principle which I here seek to bring before them, so simple in its nature that it has probably occurred to many of them before this. I would also help those who wish to put it, as I have done, into actual practice, by describing the instrument I have made, and used with success, and an engraving of which is appended. I may say in its favour, that it is really a *working* instrument, without complication of parts, easily understood, quickly cleansed, and not very difficult to manufacture, my own having been made by myself out of a few bits of brass tubing, and then electro-plated.

For prolonged anæsthesia, as in obstetric practice, I think this apparatus admirably adapted. After a partial anæsthetic effect is produced by the mixed vapours, it is then easy to turn on a little more chloroform with each wave of uterine effort, and to turn it off to the safer vapour back again as the "pain" subsides. By this means we obtain all the advantages claimed by the Chloroform Committee for their anæsthetic mixtures, with the additional one of having the potent agent most completely under our control. So far as I am able to judge, the use of the mixed vapour is followed by much less depression than sometimes ensues after chloroform. It has also this advantage, that, whereas the use of chloroform alone (probably from its sweet, sickly odour) often leaves behind on the mind of the patient an excessive repugnance to the future use, or even the smell, of this substance, the same effect will not follow the employment of the vapours here recommended. In actual practice, I find it a slight good to dissolve a small quantity of some aromatic substances in the alcohol or ether,

and none better can be had than the aromatics used in sal volatile—namely, the oil of lemons and the volatile oil of nutmegs. It is useful also to colour the fluids slightly, so that they may be at once recognised, and mistakes for chloroform prevented. But I must very carefully recommend the operator to make sure that he is using *pure absolute* ether and *absolute* alcohol, perfectly free from the abominable contamination of methyl and its compounds. By care in this respect he will secure constant uniformity in his operations, and avoid the ill effects of those adulterations to which alcohol and ether are too subject. It is also important to observe that the ether and alcohol are really absolute. For this purpose the ether should be washed in distilled water, and then drawn off by a water-bath. The strongest commercial alcohol should also be procured and redistilled from chloride of calcium, drawing off three-fourths of the amount held by the still. The advantages are these, that definite fluids of known strength are employed, the results of the use of which will always be comparable with each other, and the inhaler does not become charged with water or the heavier parts of the spirit. By proceeding thus, a highly stimulating, easily vaporisable, and a very agreeably smelling spirit is obtained—very different from the ether and alcohol of the shops.

The question will be asked as to the value of using these anæsthetics in a separate form, when all can be had combined in the mixtures so strongly recommended by the Chloroform Committee. The principal and most important advantages are these: that we thus isolate and have under our control a perfectly safe stimulant and mild anæsthetic, while in the same instrument we have at command a most valued and powerful agent for the abolition of pain. And these are capable of being so united and blended together in any desired quantities as to give us such control over the individual case operated on as that may seem to require. We are able to produce any degree of anæsthesia by this means, from the slight dreamy unconsciousness to the deepest coma; and by aid of the index we can at any moment observe what is the precise amount of either or of both agents which is being employed. Anæsthesia may, in fact, be procured more quickly than by any of the anæsthetic mixtures, and it may then be graduated to the varying condition of the individual—in the paroxysm of labour pain and in the interval of comparative freedom, in the division of skin and sensitive structures and in the dissection of less nerve-endowed parts. Another and most important advantage is, that whereas anæsthetic mixtures all vary in composition by prolonged employment, and clog the instrument with unevaporated heavy fluid, no such effect occurs in this method.

For the mouth-piece I employ Snow's, or any other with a similar valve arrangement. The part of my instrument which is peculiar is the receptacle for chloroform and the corresponding one for the alcohol and ether. This part consists of two separate pieces, an upper and a lower (Figs. 1 and 2); the

upper fitting as in a socket into the vertical part of the lower tube. The upper part consists of a tube (a) of a little more than two inches diameter, and is three in height. It is fitted with a perforated lid (b), at each side of which is a small

funnel (c). This tube is divided through its whole length by a metal diaphragm (e), which also runs down into the smaller tube fitted into it at the bottom. The whole forms one compact piece from top to bottom, and enclosing two entirely distinct spaces, one of which is reserved for the chloroform, and the other for the alcohol and ether. These have no communication with each other, but have a common opening of an elliptical figure at the bottom (e) of the smaller tube. This smaller tube (d) is accurately fitted, so as to work easily round in the vertical piece of the other part (Fig. 2) of the instrument. In so doing it necessarily exposes, according to the direction in which the larger tube is turned, first one side of the opening (say that leading to the alcohol and ether compartment), and then the other, leading to the chloroform. It is thus seen that we can perfectly control the nature of the vapour allowed to pass into the other part of the instrument, according as we cause it to turn to the right or to the left.

The second part (Fig. 2) of my instrument forms the receptacle for the socket (a) of the first, and carries the vapour up to the mouth-piece. But in order thoroughly to mix the separate vapours before they are breathed, a piece (c) of perforated gilt metal is fixed inside the horizontal arm (b) of this piece, and the diffusion thus caused effects a complete mixture before the vapours rise to the mouth. This same horizontal arm carries the index-finger, which points to the scale engraved at the upper part of the receptacle, and by its means (the scale having been carefully adjusted by experiment to the openings below) the quantity and the quality of the vapour are at once read off. What is told by this scale is represented below in the diagram. The rise of the lines exhibits the gradual increase of aperture. The graduated marks answer the double purpose of an index and a safeguard; for the index-finger fits into them with a spring, and holds the apparatus at the required degree until it be desirable to shift it farther. The instrument may thus be consigned to a nurse for a time, and the operator feel secure that no excess of chloroform can be accidentally administered.

I may add, that Mr. Blaise (of Messrs. Savigny's) has taken great interest in this instrument, and has produced an apparatus from my designs most complete in its parts, and, as I have publicly proved at one of our great hospitals, most successful in operation.

In actual practice the instrument is more simple and handy to use than could be believed from this account; and it will be no little pleasure to me if, in its adoption, life be saved while suffering is abolished.

Sloane-street, January, 1866.

MULBERRY CALCULUS OF LARGE SIZE REMOVED FROM THE FEMALE BLADDER BY LITHOTRITY.

GOOD RECOVERY.

By CHRISTOPHER HEATH, Esq., F.R.C.S.,
ASSISTANT-SURGEON TO THE WESTMINSTER HOSPITAL.

THE occurrence of calculus in the female bladder is rare as compared with the male; and the existence of a *mulberry* calculus in the female is so uncommon as to lead me to record the following case of the kind. Most surgeons are agreed as to the propriety of applying lithotripsy to calculus in the female when the condition of the urinary organs and the nature and size of the calculus do not forbid the operation.

In THE LANCET for October 11th, 1862, is a series of three cases of stone in the female, occurring in the practice of Sir William Fergusson, which is very instructive, since each case serves to illustrate different modes of treatment, and two of them, curiously, were instances of mulberry calculus. In one case a mulberry stone was extracted through an incision into the vagina, which was immediately closed with sutures, but unfortunately resulted in a vesico-vaginal fistula; in the second, the mulberry calculus was so excessively hard as to defy litho-