

impaired. Pressure over the second and third cervical vertebrae was painful.

Roentgen examination disclosed a complete fracture of the laminae of the axis (see Fig.). An orthopedic support was applied by Dr. G. A. Moore. This was cut down after five weeks, at which time the writer made a second roentgen examination which revealed a union so excellent that one would feel inclined to doubt that there had ever been any solution of continuity. The child now is about playing quite as though nothing had happened.

## New Instruments.

### THE VACUUM FLUSHING LEECH.

By HERBERT SPENCER WHITE, M.D., ORWELL, ONTARIO.

THE name of this instrument is suggestive of its construction and one can readily appreciate its value, when once demonstrated, in aiding, in the treatment of special localities, and of the ultimate elimination of the infecting organism and repair of the parts.

This apparatus demonstrates the application of a very simple law of nature and how it can be used with success in the treatment of diseased tissues of the human body, where the process of extraction or drainage of toxic sera, and of inflammatory exudates and of germs themselves, is desired; where other objects in the treatment are to increase the vitality of the part; to soothe the part; and to use our most powerful germ destroying agents in as concentrated a form as possible, without injuring in any way but in aiding the effort nature is putting forward to clean up the diseased tissues.

For this purpose I have devised for the treatment of special localities, special leeches, or vacuum cleaners.

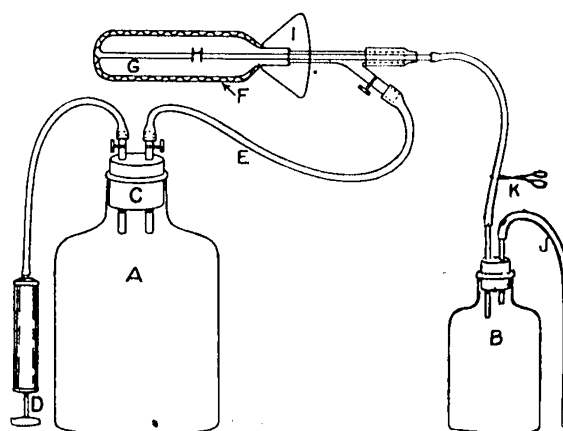
1. A vaginal leech for the treatment of vaginitis and to aid in the depletion of pelvic inflammatory conditions.

2. An intra-uterine leech for the treatment of the endometrium, the metrium and the uterine appendages.

3. A male urethral leech, to treat urethritis, either acute or chronic.

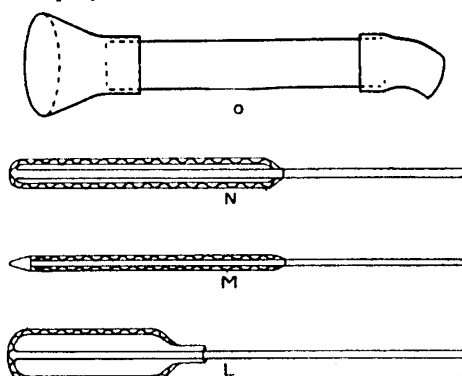
Our most powerful germ destroying agents are in the form of liquids, vapors and gases. Liquids are used generally as simple antiseptic cleansing solutions; some are very powerful corrosives and must be used with great care. Vapors and gases are used principally by boards of health and hospitals to disinfect the sick room. The objects of disinfecting are to destroy the germs of disease and to make the dust on the floors and walls as sterile as possible. To accomplish this an oxidizing or corrosive agent must be used, and to be effective, must be employed in the presence of moisture.

My vacuum flushing leech is devised to ac-



DRAWING REPRESENTING THE VAGINAL LEECH FULLY CONNECTED.

- A. Vacuum chamber.
- B. Vessel to hold any vapor, gas or solution.
- C. Perforated rubber cork.
- E. Tube connecting vacuum chamber with leech (H, I, F, G) and B.
- J. Tube to carry off excess of gas and vapors when they are used.
- K. Clamp to pulsate the leech and, when open, permits the contents of B to pass to the leech.
- D. Exhaust pump.



- O and N represent the intra-uterine leech.
- O. A very light tube large enough to admit N freely; the funnel at the end is of rubber, and fits over the cervix.
- N. The intra-uterine tip is made of flexible material, and porous to the extent of ten thousand openings to the square inch.
- M. Male urethral leech.
- L. Vaginal leech.

complish the above services for certain localities of the human body and it accomplishes this feat more or less completely. Any liquid vapor or gas may be made to come in contact with the surface under treatment. Vapors and gases have, heretofore, never been employed to fumigate or disinfect the cavities of the human body. With the aid of my leeches they can be used with perfect safety and yet with a thoroughness that is seldom accomplished at any outside fumigation; while at the same time the process of extraction and drainage is being carried on.

This is all accomplished in an air tight vacuum chamber and thus is not only free from the dangers of outside contamination but is absolutely aseptic and antiseptic, as is easily seen from the diagram of my vaginal leech.

When the leech is applied and as soon as sufficient exhaustion is reached,—any degree of exhaustion may be obtained up to fifteen pounds to the square inch, the atmospheric pressure,—ten thousand suckers to every square inch of surface are set to work. Now, since the average

sized leech covers about twelve square inches, there are 120,000 suckers at work all discharging into the vacuum space between the cylinder and the outside covering.

The inflammatory exudates and toxic sera, which are held in the tissues only because the atmospheric pressure is the same upon all sides of them, both inside the tissues and outside, will, as soon as the outside pressure is taken away, move in the direction of the least resistance, namely, toward the leech.

The instant any product of extraction reaches the surface of the leech it becomes powerless, and is at the mercy of our antiseptic and oxidizing agents and can be flushed away. Thus the leech may be maintained indefinitely in contact with the tissues and always in a state of antiseptis. It can be fumigated frequently without any inconvenience or suffering whatever, on the part of the patient.

If equilibrium is maintained in the tissues the infecting organisms will remain there and work and continue active until they are gradually forced out or destroyed by the vital forces of the body. Drained by nature, we say, and in reality the physiological forces of the body, fought away the infecting organism with the outside forces of nature as a handicap.

If they gradually work deeper and deeper into the tissues they meet a strong defensive barrier in the form of a pyogenic membrane and engage in conflict with the resisting forces of the body, with the result that an abscess is formed. The germ process may be vanquished and immunity established. My leeches are designed to avert or lessen the danger of the foregoing calamity.

So long as equilibrium is maintained, just so long will the forces of the body be taxed to their fullest capacity to ward off the attacking germs.

By the action of the vacuum leech the equilibrium is disturbed, the pressure outside the tissues is lessened, and the toxic substances are gradually forced from the invaded territory into the leech and, once there, are quickly dealt with by our antiseptic agents and flushed away to a sealed retainer. Now the tissues may be bathed with any soothing lotion. Reinforcements are constantly reaching the site of conflict through the hyperemia that is induced. Heat is made to contract the tissues *ad libitum* and the process of repair is rapidly carried on.

Unlike Bier's hyperemia, produced by cupping, there is no stasis of the blood stream, but a mild hyperemia is produced under forces fully as powerful as any Bier has suggested.

The treatment is carried on while the patient is in bed in a recumbent position, and, without any inconvenience whatever, no pain or disturbance of sleep. The use of the bed-pan is dispensed with and yet any quantity of bathing solution may be used, up to many gallons.

My intra-uterine leech is provided with a flexible tip which is easily made to conform to any

position; it is also made adjustable to any depth of uterine cavity. Being less than a half inch in diameter it can be used in the majority of infected uteri without any degree of dilatation.

My male urethral leech is a demonstration in contra-distinction to Bier's hyperemia treatment. The mucous lining of the male urethra being extremely sensitive and tender, is very prone to injury unless treated with extreme caution. The application of my leech is absolutely free from pain or discomfort of any kind while in action. The only pain experienced is in its introduction and withdrawal, which is readily overcome by the use of a mild solution of cocaine. Its application must be used at the discretion of the operator.

Some might infer that it is impossible to remove or abstract, mechanically, living germs from their associations with the tissues, while others are just as frank in their statement and belief that nothing within reason is impossible.

If germs can be removed mechanically they must be free in the lymph spaces and be able to travel with the lymph. Where the phagocytic cells of the blood are able to attack a germ there must be a space, however small. It is in this space that the germs, in their active state, are able to produce an effect upon the tissues, and it is from this space that they must be removed and are removed successfully by the activity of the white corpuscles. We have microscopical proof that the leucocytes do engulf and carry germs from the tissues. This act is just as truly mechanical in its science as would be the act of carrying a load from one room to another.

Again, one might say that it is impossible to act upon them by any outside force. The inside tissues, being in communication with the outside through the lymph spaces and scarified external surface, become acted upon the moment the atmospheric pressure outside is removed. The equilibrium inside the tissues by virtue of the expansive or volatile nature of the liquids and gases associated with them is also disturbed. In the endeavor to re-establish equilibrium again these forces must of necessity move towards the outside, the direction of least resistance. The germs which are occupying these lymph spaces must likewise of necessity, be forced to follow the lymph current.

Would it be possible to extract pus from a cavity within the tissues? This would be possible from the above argument, but the pus would, of necessity, have to diffuse through the tissue lymph spaces which would require a long continued disturbance of the equilibrium. It would not be possible if the pus were walled off by a pyogenic membrane unless it were possible to scarify or puncture this membrane,—if punctured from the outside the process of evacuation is made very simple.

Some are not sure but that pus is a beneficial agent in the repair of the tissues and ought not to be removed. It is true this was the accepted theory a few years ago, and surgeons were in

the habit of inoculating their wounds to assure a goodly supply of pus. If there is anyone who still maintains that pus is a good thing for the tissues, for him I have no argument, and will keep as far from him as possible.

My contentions are that the products of germ growth are gas, the same as any other end product in metabolism. This gas is immediately dissolved in the tissue plasma, producing the toxic sera. The inflammatory exudate quickly follows, and we have what is commonly called an infection. An inactive germ in the tissues would produce no symptoms and again if the products of germ metabolism could be removed immediately, there would be no symptoms. This would not interfere in any way with the phagocytic action of the white blood corpuscles and any germ that might be entangled in the connective tissues could easily be taken care of by them. The symptoms of disease, if any at all, would be greatly ameliorated.

Can a disturbance of the equilibrium which is maintained within the tissues be produced through the unbroken skin or mucous membrane? It can, with the result that stasis of the blood stream is produced which may or may not be of any value in the process of eliminating the infection.

Surfaces which are already discharging pus and toxic sera, as in vaginitis and urethritis and in infected uterus, are already in a state of scarification and in communication with the lymph spaces throughout the tissues.

Is it possible for a mechanical device to act similarly to a live leech? A comparison of my simple device with the action and construction of a live leech will amply illustrate that it is possible.

A live leech placed upon the skin immediately perforates the skin to communicate with the lymph spaces from which it extracts the serous fluids and conducts them to its own interior until further suction is impossible, owing to the filling of the leech, when it immediately drops off.

My artificial leech is furnished with ten thousand suckers to the square inch, all communicating with the lymph spaces in the tissues, providing the surfaces be scarified. It sucks from the tissues and when filled will drop off. But unlike a live leech, and a great advantage over the live leech, it may be repeatedly filled, flushed, and sterilized and maintain its hold on the tissues for an indefinite period, at the discretion of the operator.

Would it be justifiable to scarify a surface before applying an artificial leech? The answer to this is in the affirmative, since there is no danger of introducing infection through the leech.

Would microscopic petechiae result from application of an artificial leech? They would on unscarified surfaces if the application were long continued but not on scarified surfaces.

I have endeavored thus far to make my leeches

speak for themselves. Being my own invention, and a system that is absolutely new to the profession, I have refrained as much as possible from making any bravado statements.

If after reading the article one understands thoroughly the principle involved, the simplicity of the apparatus, its neatness,—no manipulation or fussing in its employment,—and then is skeptical as to its merits, I am afraid that any testimonial one might give would be of very little value. However, I have demonstrated the principle with instruments very crude compared with my present leeches, and obtained very gratifying results,—results that guarantee success for its future.

## Medical Progress.

### RECENT PROGRESS IN OPHTHALMOLOGY.

BY EDMUND W. CLAP, M.D., BOSTON.

#### THE HETEROPHORIA QUESTION.

WENDELL REBER<sup>1</sup> sums up interestingly the present status of the heterophoria question. The author believes that no case of heterophoria should be viewed from the muscular standpoint until the refraction has been dealt with thoroughly, and a proper correction worn for from one to two months at least. In 1000 cases 70% were relieved of their symptoms by refractive correction alone. But some individuals reveal insufficiency in their relative accommodation or relative convergence. Anatomical anomalies in the insertion or in the relative power of the muscles produce symptoms not relieved by correction of the refractive errors. The general health of the individual has a most important bearing on the development of symptoms from a heterophoria, as does also occupation. Heredity has some influence in strabismus, and the little that has been done indicates that there are family tendencies to heterophoria. If a patient presents two degrees of esophoria for infinity and anywhere from balance to two degrees exophoria for the reading distance he may be said to have euphoria and to have a pair of eyes well adapted to prolonged use either at infinity or at the reading distance, as far as his eye muscles are concerned. In esophoria not relieved by glasses correcting an associated hypermetropia, the author gives the usual prism exercises and also has found benefit in what he calls lateral rotation, viz: the patient looks straight ahead—then rolls the eyes as far as possible to the right, then back to the primary position and then as far as possible to the left and then back again. This may be done in cycles of four, as many times as can be comfortably borne. Failing exercises, perma-