signs present, could leave no doubt whatever as to its nature. I do not venture upon any explanation of the mode of operation, but so striking was the relief afforded in this instance that, under similar circumstances, I should certainly have recourse to hypodermic atropine again.

ON THE TREATMENT OF FIBROIDS OF THE UTERUS BY ELECTRICITY: THE APPA- RATUS AND INSTRUMENTS.

By W. WOODHAM WEBB, M.D., M.R.C.P.LOND., Neuilly-sur-Seine, France.

"QUI UTI SCIT, EI BONA." So it always has been, and so it is now. Men knew something about the power of steam before Watt made it useful. Electricity was a matter of interest before Franklin raised his first conductor. The Hunters and Bell thought and wrote about ovariectomy, but it was not ventured upon till McDowell saw how to do it and dared to do it. Others, with the principle of electrolysis in their heads, have made only imperfect attempts to apply it to the reduction of fibromas. Apostoli, by devising a simple manœuvre, has succeeded in making it effectual. Knowing how to control the power in his hands, he does what others had tried to do. *Ei bona.*

What was the problem before him? To relieve the symptoms caused by uterine fibroids, to check their growth, and, if possible, to get rid of them. Therapeutics and surgery had met with but partial success from all that was tried and all that was done. It would be useless to go into details on this point.

The *clinique* of Dr. Apostoli, in Paris, is held three times a week, and is open to all surgeons on presentation of a card. It is situated in an old part of the city, with a dense population of working people around it; but many of the patients come from long distances, recommended by their home medical attendants. The applicants are all women, mostly with diseases peculiar to their sex, and diseases of the pelvic organs are the most common. The average attendance each day is from thirty to thirty-five, and minute observations are systematically recorded by a secretary, as oral reports are made while the examinations and operations go on.

Patients present themselves, as they do to other practitioners, with tumours of every variety. It would strain the pertinacity of a Hofmeier to describe and picture them all. There are simple cases of subinvolution, giving rise to a series of tormenting symptoms, and threatening future mischief if not corrected. Women, the victims of chronic metritis, with thickening, induration, consolidation of the pelvic tissues, tubal and ovarian pains, and all the attendant miseries so difficult to manage, come in numbers. In some cases the tumours are nothing more than a symmetrical overgrowth of the walls all round the uterine cavity, though such hypertrophies are seldom free from the accompaniment of other outgrowths. There are intra-uterine polypi, dismissed without much trouble; submucous ingrowths, both small and of enormous dimensions, causing danger from loss of blood, besides the inevitable distress. There are mural or interstitial fibromas, more or less isolated, either impacted in the pelvis and the source of repeated hæmorrhages and ceaseless pain, or rising up in the abdomen and offering perplexing difficulties to an operator. Not infrequently the pedunculated subperitoneal fibroids and other complicated cases with multiple and multiform tumours have to be dealt with. Incipient ovarian and broad-ligament cysts occasionally turn up, and in a short time are made to disappear. But it is curious to note how comparatively rare are the fashionable tubal diseases. There is no stereotyped specific way of operating upon these tumours; they are treated according to circumstances. But, as most of them are amenable to electricity in some form, it is the remedy chiefly resorted to.

No novelty is claimed for the fact of electricity being used; the novelty is in the way of using it. Others have proved by unregulated proceedings that some good could be done. The intensity of the current they put in action was insufficient, uncertain, and unmeasured, and it was directed to parts out of the uterine cavity. Some patients had their sufferings relieved, and some tumours were reduced in size, but in the hands of all who tried it the operation was painful, dangerous, and empirical. Now the current passed is of an intensity formerly impossible; its strength is exactly determined, and its application is always intra-uterine. What is done is done with a definite object, with a mastery over the agent employed, and a foresight of the results to be obtained.

The two ends proposed are, first, the relief of urgent symptoms, and secondly, the diminution of the size of the tumour. These are arrived at by repeated cauterisations of the uterine mucous membrane, and the modification of the nutritive action in the diseased mass by the powerful current which is sent through its tissues.

The first point to be considered is the apparatus required for carrying out this treatment. It is necessary to have, and to understand the management of, a battery capable of generating a continuous uninterrupted current of electricity, rising from 10 to 200 or 300 milliamperes in strength, provided with a regulator by which the circuit is made to include any number of elements we may desire. It should also have both commutator and interrupter (or rheotome). Such an instrument is to be obtained without difficulty for the cabinet, from the best makers, such as Weiss. It is not so easy to find a satisfactory durable battery for transport, and the outdoor operator must be content with such as he can get till a battery combining the requisites of portability, small volume, and great development is perfected.

The instrument of next importance is the galvanometer for measuring the intensity of the current. It can no more be dispensed with in the use of electricity for the purpose in question than can be the scales in chemistry. It indicates by the deflection of the needle the passage of the current, and marks the smallest variation of intensity. Without it the attempt to estimate the strength by the number of cells engaged would lead to deception. The graduation should be extended to at least 250 milliamperes, since the essential point in this method of treatment is to secure the combined effects of the highest tolerable intensity.

After the galvanometer comes the sound, charged to convey the current into the uterine cavity. Actually, any metal will serve the purpose if properly modelled. But as the positive pole corrodes all other metals except gold, aluminium, and platinum, one of these must be chosen to avoid the double difficulty of a rough and injured instrument and the loss of power from the absorption of the electricity by the metal. Platinum is found to answer best. The usual form of the uterine sound is adopted, nearly straight or very slightly curved. The length must be such as to reach to the end of the cavity of an enlarged uterus. The sound or trocar must slide into an isolating handle, furnished with a screw for fixing it at various points, according to the penetration necessary, and an aperture for connecting the sound with the conducting wire. The end passed into the uterus is of course bare, while that part which extends from the mouth of the uterus through the vagina to the handle must be covered with a movable, insulating sheath of celluloid. Before being used the whole ought to be disinfected by plunging into boiling water or some antiseptic solution. By having one end of this sound sharpened, it is converted into a trocar for puncturing the presenting part of the mass, and forming an artificial channel for the current, when the uterine cavity is directly unattainable.

But the master point of this method of treatment—the key to the possibility of passing such strong currents of electricity through the body, lies in the modification of the external electrode. The intensity being the same at the two poles if they have the same surface, the cauterising power will be the same. The skin is a bad conductor, and the strong current employed, in escaping from the interior through it to the point of the electrode, will develop heat up to burning point. To overcome this obstacle, the surface of the cutaneous pole must be extended. The density of the current is thus diminished, and it is rendered inoffensive. If at the same time the resistance of the epidermis is lessened, by making it thoroughly wet, all fear of an eschar is removed. It was in 1882 that Dr. Apostoli devised the form of electrode which he still uses. Wet potter's earth, fine and free from sand, or the modelling clay of artists, is spread out into a layer, uniformly about half an inch thick, and large enough to cover the lower part of the abdomen. The form, which is best made in a mould, is preserved by its being enveloped in folds of large-meshed tarlatan. This allows the clay to exude sufficiently to apply itself closely to the skin, and to moisten it, without spreading too far and soiling the dress. Laid in its place when all is ready for the operation, it can be kept in perfect contact with the skin by slight pressure of the hands of the patient. The circuit is completed by partially imbedding in the clay a small plate of soft metal, properly connected with the conducting wire. This contrivance is not elegant, but it is efficient, and surpasses all that have been proposed as substitutes. It and the skin upon which it has been laid are quite cool to the touch, after the passage of a current of more than 200 milliamperes strength, for eight or ten minutes; and there is no blistering or subsequent peeling of the skin.

Ordinary telegraph-wire will answer the purpose as conductors, and is cheap and convenient, but it is not so pliant as the rheophores covered with silk. It is important to see that these conductors are

in perfect condition. If not in good order, especially at the points of attachment, the current is interfered with. A sudden rupture during the operation would cause a severe and painful shock to the patient. Her involuntary movement might dislodge the uterine trocar, and occasion a wound in some adjacent part.

A contrivance for irrigating the vagina, both before and after the operation, must be provided. The fluid used is a solution of the sublimate or of phenol. This is also to be employed for washing the hands; and the speculum, sounds, and trocars, with the handles, should be immersed in it when prepared for use. The celluloid sheath of the sound or trocar especially requires cleaning after every service, and its canal must be scrubbed out with a pipe-brush in boiling water or the phenol solution. The sounds and trocars, instead of being much rubbed, are better purified by boiling water or the flame of a spirit lamp. So much for the appliances; at another time, the operations and the cases for which they are fitted will be described.

ON SOME LATER EFFECTS OF RICKETS.

By J. A. COUTTS, M.B. CANTAB., M.R.C.P.,

Assistant-Physician to the East London Hospital for Children.

IN a disease like rickets, presenting such marked and obvious effects in the osseous system, it is scarce matter for surprise that the constitutional symptoms are often, or generally, overlooked and under-estimated. Looked upon and described by the older writers, from the time of Glisson and Whistler downwards, as a purely local affection, it was close upon the middle of the present century before the general and, in my opinion, more important symptoms came to be recognised. But, even then, attention was almost entirely directed to such matters as splenic and hepatic enlargements and derangements of the pulmonary and digestive organs, and, beyond the casual recognition that rickety children were more liable to convulsions than others, but little stress was laid upon the important evidences of suffering furnished by the nervous system. As proofs of this suffering, besides convulsions, might be instanced the frequent occurrences of such complaints as hyperæsthesia, mental backwardness, tetany, laryngismus stridulus, muscular weakness, loss of cremasteric reflex, etc. When the number and frequency of these complaints is taken into consideration—and it is remembered that some of them, such as laryngismus and tetany, are seldom seen apart from it—there can remain but little doubt as to the implication of the central nervous system in rickets. Now the reason of this involvement is not far to seek. Rickets is a disease of malnutrition, produced either by improper feeding or by some cause, inherited or otherwise, which prevents the proper digestion and assimilation of food, which may be perfectly correct in quality and quantity for the time of life in question. It may seem to some that I place the digestive factor in too high a place as regards the causation of rickets, but few, I take it, will doubt the prominent part played by it in most cases of the disease. In the effects of this malnutrition almost every organ and tissue of the body may be implicated, and it would be strange if so complex and delicate a structure as the infantile brain should suffer no damage. That it does not escape this damage is evidenced by the neuroses so common amongst rachitic children, and they may be regarded as the natural outcome or expression of the cerebral malnutrition. Assuming, then, that the infantile brain suffers damage during the rachitic period from the general malnutrition, it may be asked: Is this damage only a temporary one, restricted to the rachitic period, or does it ever render itself evident by any signs in later years? The answer in most cases, no doubt, will be of the first kind, and, just as enlargements of the bony epiphysis, spleen, etc., may all disappear and leave no trace of their former presence, so any marks of cerebral disturbance may vanish, and the child grow up as intelligent and free from neuroses as one that has never suffered from rickets. That the answer should be in all cases of this favourable character is, I would contend, hardly to be expected from the nature of the case. It must be remembered that the period of the rachitic suffering is that of the greatest physiological activity and evolution of the brain, and that damage or malnutrition is more likely to be resented and prove harmful than at any subsequent time. The amount of harm done, and its evidences, are hard to estimate and to recognise in so complicated an organism as a young child, but simpler yet strictly analogous examples are to be found if we turn from the animal to the vegetable kingdom; probably the amount of harm done to a growing plant by the withholding of nutriment or by malnutrition is inversely proportional to the age of the plant. But just as in rickets our chief guides to diagnosis are the changes produced in the bones, so, it may be, the disappearance of them may possibly conceal the origin of some of the

sequelæ of the disease. It is well known that children may be profoundly rachitic in infancy, and yet present no traces of it in the bones a few years later on.

Of the later effects of rickets, it is my intention to deal only with those that concern the nervous system. Most others, but not all, come under the province of the surgeon. Some of these neuroses are directly connected with the actual time of suffering from the disease, and are continuous into later life; others are separated from it by varying intervals of time.

This question as to the connection of neuroses in later life with a past rickets is not a new one. Dr. Gowers, in his book on *Epilepsy*, page 23, out of a large number of cases, ascribes at least 10 per cent. of them to this cause. Nearly two-thirds of his cases beginning in infancy, the conditions of origin of which could be ascertained, arose from so-called dentition-convulsions. "Few persons," he writes, "who have attended closely to the diseases of children can fail to be convinced of the truth of the opinion, long ago urged by Jenner and now widely accepted, that almost all convulsions associated with dentition are really due to the constitutional condition of retarded development which we call rickets—that is, to the irritability of the nervous system which accompanies this condition. The further details of the cases I am considering fully confirm this; for in a large number of cases there was a history of late walking, late teething, and in many of crooked limbs. But these facts do not fully represent the influence of rickets in the production of epilepsy. In many of the cases just described the course of the attacks was continuous from infancy to adult life. In others, however, there were intermissions, especially during the period of childhood. In several, for instance, the fits ceased at 7, to commence again at 10 or 11 years. Now, in twenty-seven other cases which commenced after the period of childhood was over, repeated convulsions had occurred during the first dentition, accompanied, in many, with other signs of rickets. It seems reasonable to ascribe to these convulsions of infancy a share in predisposing to the convulsions of later life, and the addition of these cases raises the number in which a causal influence may with probability be ascribed to rickets to nearly 10 per cent. of the whole."

With these words of Dr. Gowers I cordially agree. My own experience of epilepsy, founded almost entirely on cases in childhood, gives as high a percentage as 17 which had been preceded by rickets in infancy. This larger percentage of mine is possibly due to the age of the subjects with whom I have chiefly had to deal, or is accidentally connected with my much smaller number of cases. In these cases there was a history of rickets, with infantile convulsions, followed by epilepsy in later life; but it is an allowable hypothesis that a similar state of cerebral irritability or malnutrition may exist in many cases, and yet convulsions be absent owing to absence of a direct exciting cause. Then, if such a condition, when accompanied by convulsions, is responsible for epilepsy in later life, it is quite conceivable that without this accompaniment it may be the cause of epilepsy or other neuroses at times of greatest stress upon the nervous system—that is, at second dentition or puberty. It is the associated cerebral condition and not the mere convulsions, its outward and visible signs, which must be held the responsible agent for any after-neuroses. Thus, had Dr. Gowers chosen to extend his cases of epilepsy due to rickets beyond those in which convulsions were present in infancy, he might have fairly ascribed a larger percentage even than 10 to this causal influence.

I have taken epilepsy in the first place, not as being the most frequent of these possible sequelæ of past rickets, but because, on such good authority as that of Dr. Gowers, its connection with infantile convulsions allies it more immediately with its cause than any other neurosis.

Turning next to chorea, one of the most frequent and well-marked neuroses of childhood. It has been for some time past my custom to inquire in cases of chorea as to a history of rickets in earlier life, and the search has not been unproductive. Out of fifty-one cases of chorea, in which such inquiry was made, in eleven there was a fairly reasonable history to warrant an assumption of earlier rickets. This, in several of the cases, was confirmed by the permanent bony changes produced in the head, chest, or limbs. Thus, assuming my deductions as to the past history to be correct, this would give as high a percentage as 21 for cases of chorea which had been preceded by rickets. The rheumatic hypothesis to account for chorea has, I fear, been urged by its adherents too far at the present day to admit of any other possible cause receiving favour. But a past rickets as a predisposing one would not exclude rheumatism as an immediate exciting cause in many cases. Moreover, the most enthusiastic advocates of the rheumatic theory have to admit that, in many instances, some other factor besides it is necessary to explain the origin of the complaint.