

frontier, about 2000 feet above sea-level, sheltered on three sides by hills 400 and 600 feet above level of station; exposed to S.W.; opening up a view of the Terai and the level countries of Cooch, Behar, and Julpigoree; pleasantly cold in winter (temperature 48° to 66° F.); punkahs not required in hot season; very damp in rainy months, rainfall 250 to 280 inches per annum; water derived from springs. Surface composed of boulder-drift; detached masses of sandstone abundant; little granite; some gneiss-quartz rock, principally in veins. The strata consist of mica slate and schist, talcose slate, hornblende slate, and clay-slate. Serpentine is to be found in the beds of streams.

Malarial fever is not common in Baxa; people suffering from it in the station contract it in the Terai and plains.

(b) There are about 500 Bhootas who inhabit the villages around Baxa. It is the exception to see a Bhoota without a bronchocele. The young and aged are affected alike. These tumours may be seen in all stages of growth, from a size just perceptible, to the dimensions of an adult human head. The inhabitants of the villages in the heart of the Terai are comparatively exempt from goitre. In Cooch, Behar, and Julpigoree I saw very little of it.

The Bhootas are well developed and muscular men and women. They keep very good health and work hard, eat coarse food, drink any sort of water, whether clear or turbid with organic and inorganic impurities, live in huts raised above the ground, and rear pigs and poultry under them; they never wash their bodies, and do not change their garments until the texture rots and drops off. The Bhootas who do not descend into the plains are free from fever. Thus, under the worst hygienic conditions, they are in good health, do not present the malarial cachexy, and yet it is the exception to find a person not suffering from goitre. The people in the plains are, of course, "depraved in health and cachectic;" they live under better hygiene, wash daily, change their clothes frequently, and eat better food; they, moreover, drink the water drunk by the Bhootas, but which has gathered more impurities in its course through the Terai; and yet goitre is not so frequent and general amongst them. Can, then, malaria have much to do with the production of goitre?

(c) The general geological conformation of Baxa has been already given. It is very interesting to compare with this the following table, compiled by Dr. Parkes, from Dr. McClellan's work:—

Goitre and Cretinism in Kumaon (Oude).

Water derived from	Percentage of population affected	
	With goitre.	With cretinism.
Granite and gneiss	0.2	0
Mica, slate, and hornblende	0	0
Clay-slate	0.54	0
Green sandstone	0	0
Limestone rocks	33	3.1

This table gives only 56 per cent. of population as affected by goitre produced by water derived from granite, gneiss, mica, slate, hornblende, and clay-slate. Now, the water drunk by people at Baxa must be derived from nearly all the above-mentioned rocks. At some early part of its course the water might traverse limestone rocks, but of this I have no definite knowledge. There is no limestone near Baxa; there are some limestone rocks a good way to the west of Baxa and below its elevation. I heard an engineer remark that there is much difficulty in procuring it.

If the spring water that has percolated through the above metamorphic rocks is the cause of the goitre, then it is very strange that the sepoys of the regiment stationed there do not become affected with bronchocele. Dr. Courtney, of the 38th Regt. N.I., informed me that when his regiment first arrived at Baxa, he observed slight enlargements of the thyroid gland in some sepoys, and that these swellings disappeared without treatment. After a residence of three years, the men of his regiment left Baxa perfectly free from goitre. During my stay of three months with the 18th Regt. N.I. at Baxa, I carefully watched for signs of enlargement of the thyroid amongst the sepoys, who drank freely of the spring water, but I did not observe even that temporary effect of the water mentioned to me by Dr. Courtney.

In concluding, I wish to point to the fact that magnesia

enters largely into the chemical composition of the rocks in and about Baxa. I state this simply as a fact, for I have no theory regarding the causation of goitre.

ELECTRO-THERAPEUTICS.

By J. DIXON MANN, L.K.Q.C.P.I.

II.—ON INDUCTION COILS.

In order to determine the best form of induction apparatus it will be necessary briefly to explain the theory involved in its construction.

If two straight wires are placed side by side without touching, and a battery-current is transmitted through one, a momentary wave of electricity darts through the other; so long as the battery-current continues to flow, no further effect is produced, but on detaching the battery another impulse is induced in the free wire. It is important to bear in mind that the induced current is never, from the nature of its causation, continuous, but occurs only momentarily at each make and break of battery contact, whence the synonym "interrupted current." The alternate currents thus induced are opposed in direction; on making battery-contact the induced current flows in a contrary direction to the battery-current; on breaking battery-contact, the induced current flows in the same direction as the battery-current. The two currents differ also in intensity; the electro-motive force of the current induced by make of battery-contact is much feebler than that induced by break of contact. It is considered by many medical electricians, with whom I coincide, that the direct induced current only should be used; the method of obtaining a uni-direction-current will presently be described. In the induction coil the wires are insulated, and instead of being straight are wound in spirals round a core of iron wires, the battery or primary wire being next the core, with the secondary superimposed upon it. An additional phenomenon is thereby produced in the primary wire, called the "extra" current, which is caused partly by the inductive influence of the spirals on each other, and partly by the magnetic induction of the core of iron wires; the "extra" current constitutes what is known therapeutically as the "primary" current.

The electro-motive force and the "quantity" of a coil are respectively in direct proportion to the length and to the transverse section of the wire; that is, the greater the number of spirals the greater the intensity of the current, and the thicker the wire the greater the quantity. In the induction coils used by physicists the secondary wire is as thin as possible, and is of great length, intensity being mostly required. For medical purposes quantity is equally necessary, as beyond a certain limit intensity is mischievous, and even dangerous; therefore a proportionally shorter and thicker wire should be used. In order still further to increase the "quantity" the "extra" current of the primary wire should be included with the secondary circuit by connecting the initial end of the secondary to the primary wire; or, what comes to the same thing, the coil should consist of one continuous wire, the battery circuit being made through the first two layers, which are equivalent to the primary wire in the ordinary form of coil, and are therefore much thicker than the rest of the wire in order to reduce the resistance to a minimum. Duchenne attributed different physiological effects to the primary and to the secondary currents, but there can be no doubt that the results he obtained were due simply to the difference in the electro-motive force of the two currents, and not to any special properties possessed by one or the other. Another advantage is derived by taking up the "extra" current along with the secondary circuit; in ordinary coils, where this is not done, the spark of the "extra" current causes rapid oxidation of the platinum contacts of the vibrator, and is a frequent source of failure in the working of the coil; this, to a great extent, is obviated by absorbing the "extra" current in the general circuit.

The intensity of the induced current is regulated in a

variety of ways. In ordinary coils a brass tube slides over the core, absorbing the induced current proportionally to the amount of core covered by it. In Stöhrer's induction apparatus the secondary coil slides over the primary, thereby increasing or diminishing the inductive influence of the latter. For still greater delicacy of gradation an arrangement known as the water regulator is sometimes included in the secondary circuit, which, by interposing a layer of water capable of being varied in thickness, offers a proportional resistance to the current. I consider the following the most perfect method of constructing an induction instrument which will afford every requisite gradation of uni-direction current. The wire forming the coil is divided into three sections, which diminish in thickness from the centre to the circumference of the coil; the first three or four layers may be No. 18, the next four No. 22, and the remaining four or six layers No. 26. The outer ends of the first and second sections are respectively joined to the inner ends of the second and third, so that the coil virtually consists of one continuous wire. The outer end of each section is placed in communication with a commutator so as to enable the operator to bring either a portion or the whole of the coil into use. The finer adjustment is made by means of the ordinary brass core cover. This duplex mode of regulation renders the use of a water regulator unnecessary, even when operating on sensitive parts, such as the facial muscles. As previously stated, the induced current alternates in direction; a uni-direction current, however, can be obtained in this form of coil in the following manner. The + pole of the battery is connected to the screw of the vibrator; the inner end of the first section of the coil is connected to the vibrator itself, and also to the terminal of the induced circuit; the outer end of the first section is joined both to the - pole of the battery, and through the commutator (along with the outer ends of the other two sections of the coil) to the + terminal of the induced circuit. By this arrangement the *inverse* current induced by make of contact passes through the battery, the resistance there encountered being much less than that of the human body; the *direct* induced current alone is thereby obtained. This is in accordance with the law that a current divides itself between two circuits in inverse proportion to their respective resistance; and when the relative resistance of the circuits is very disproportionate, as in the present instance, the entire current for all practical purposes takes the path of the lesser resistance. The current from the first section of the coil is equivalent to the "primary" current; that from the last two corresponds to the "secondary" current of the double-coil system, with the advantage of having the "extra" current combined with it.

The only other important feature in an induction apparatus is the vibrator or contact-breaker. Excess of thickness in the spring is its most common fault, rendering slow and rhythmic vibrations impossible. The spring should be very flexible, so that when fully relaxed it will vibrate with any required degree of slowness. In addition to the ordinary platinum-tipped screw against which the vibrator beats, there should be a bearing screw to stiffen the spring when very rapid vibrations are required. Nothing is more disagreeable to a patient than the unnecessarily coarse and irregular interruptions of a badly constructed coil. Magneto-electric machines in which the current is evolved by the revolutions of an armature across the poles of a series of permanent magnets are for the same reason objectionable. Magneto-electric machines, as at present constructed, are, in my opinion, totally unfitted for therapeutic use. When a well constructed vibrator is in action, a continuous, smooth musical note is produced, free from jerks and sudden variations in pitch; the vibrator of Stöhrer's large induction apparatus is a model in this respect.

Various batteries are used for exciting induction coils. For ordinary coils the battery should have a low internal resistance. Smee's cell, or the bichromate of potash cell, with an arrangement for withdrawing the zinc element from the exciting fluid when not in use, are convenient, and are easily recharged. If the primary wire is specially arranged, one or two large-sized Leclanché cells make an excellent excitor. Gaiffe's small induction instrument has two chloride of silver cells; it is very compact and convenient to carry in the pocket; the coil, however, is too small for any but diagnostic purposes.

Manchester.

A Mirror OF HOSPITAL PRACTICE, BRITISH AND FOREIGN.

Nulla autem est alia pro certo noscendi via, nisi quamplurimas et morborum et dissectionum historias, tum aliorum, tum proprias collectas habere, et inter se comparare.—MORGAGNI *De Sed. et Caus. Morb.*, lib. iv. Proœmium.

GUY'S HOSPITAL.

CASES OF DYSPHAGIA.

(Under the care of Mr. BRYANT.)

THE following is a continuation of the interesting series of cases of dysphagia which we commenced last week.

CASE 4. *Cancerous stricture of œsophagus; relieved.* (Reported by Mr. C. H. Hayes.)—H. William H—, aged sixty-four, was admitted into Job ward on July 26th, 1873. He had always been a healthy man until twelve weeks before admission. He then felt his gullet getting narrower, but without pain or swelling. The stricture got gradually worse.

When admitted, he was thin and pale; unable to swallow solids, but able to take liquids, such as beef-tea, although slowly. He was troubled with a slight cough, and frequently brought up a quantity of phlegm.

On the 28th attempts were made to pass some œsophageal bougies, but unsuccessfully excepting in the case of a very thin one, which was passed once, but could not be passed a second time. Next day he was able to take milk, wine, and beef-tea, the latter being swallowed with greater ease than when he was admitted.

On examining the throat externally, on August 1st, the thyroid cartilages seemed wide from side to side, and just below it in the median line there was a decided fulness. The trachea was pushed forward as if by something behind. The man swallowed fluids leisurely, and did not vomit anything. He had very slight laryngeal disturbance when he swallowed, and no dyspœa. His voice was rather husky.

On August 4th the patient took beef-tea easily, and swallowed half a pint of milk a day. On the 8th he was ordered two eggs daily, a pint of beef-tea, half a pint of milk, and four ounces of wine. He had a good deal of frothy expectoration. On examining his chest carefully, no dulness could be detected on auscultation. On the 11th he was able to swallow some meat, cut very fine, without difficulty; and on the 15th he ate a chop, and swallowed half a pint of tea at a draught. On the 18th he left the hospital, exactly the same weight as he was ten days before.

The question of gastrostomy was discussed, and the operation consented to by the patient, but it was thought well to postpone it for a time; so the man left the hospital, only, however, to die, about Sept. 20th, from exhaustion. It is a matter of regret that the operation was not performed.

CASE 5. *Dysphagia from cancerous disease; enlarged glands in neck; slight improvement.* (Reported by Mr. C. E. Parry.)—Mary Ann E—, aged fifty, a married woman with four children, was admitted into Lydia ward on the 23rd November, 1874. Her father was a healthy man, but her mother was the subject of scrofulous disease. The patient herself had suffered from inflammation of the glands in the neck six years previously, and was under medical treatment, but got very little relief. She therefore went into Colchester Hospital, where she remained a month, and then came away, having received no benefit. She went home, where she remained under the care of a medical man, who ultimately advised her admission into Guy's Hospital.

When admitted, she lay on her back, being more comfortable in that position. She was unable to move her head in any direction except slightly forward. She complained of pain in the right side of her neck, extending through to the sixth cervical vertebra. She had headache, generally confined to the left side of her forehead, and got but little sleep at night. There was great enlargement of the upper cervical glands on the left side. Her appetite was bad, and she was unable to swallow any solid food. She had suffered with bad teeth for years, and had a molar extracted three