

## REPORT

ON

## MODERN MEDICAL ELECTRIC AND GALVANIC INSTRUMENTS, AND RECENT IMPROVEMENTS IN THEIR APPLICATION:

WITH SPECIAL REGARD TO THE REQUIREMENTS OF THE MEDICAL PRACTITIONER.

## IV.

WE have now considered all the principal portable constant batteries which are at the present time in use, both in Europe and America; and it only remains for us to say that, with all their excellent qualities, they are nevertheless, one and all, much inferior in therapeutical virtues to that modification of Daniell's battery which is in England known as Becker-Muirhead, and in Germany as Siemens-Meidinger or Remak. This is the only really constant battery, scientifically speaking, in existence, as polarisation in it has been reduced to an imperceptible minimum. Polarisation is avoided by using no acid, but only water for the zinc, and a solution of cupric sulphate for the copper. The chemical changes, therefore, which must always go on in the battery, are infinitely retarded, and no perceptible diminution of the intensity of the current occurs for weeks and months, even if the instrument be freely used.

This battery, which we have had in use for the last ten years,\* has

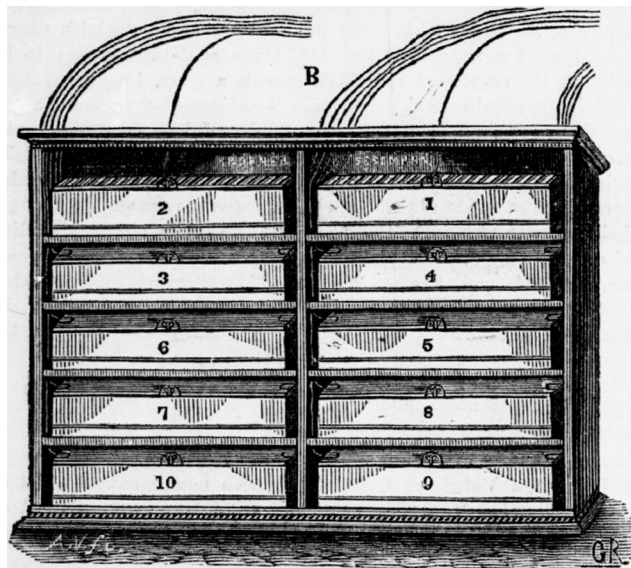


Fig. 15.

been put up for us by Mr. Becker, of the firm of Elliott Brothers. It consists of ten teak boxes superposed upon each other in two rows, as shown in the diagram (Fig. 15), and furnished with wires so as to enable us to collect the current of every five cells. The wires are carried from the basement of the house to the ground-floor, and joined to a pole-board fixed on one of the walls of the consulting-room. *bw* (Fig. 16) are the battery wires, which are insulated except at their extremities, which are soldered to a silver plate hidden in the dials *d d'*. The dial on the left-hand side will give the current of from 5 to 45, and that on the right the current of from 45 to 100 cells. *cw* are the conducting wires connected with the polestuds *n p*, and furnished at their other ends with directors, *D*. *b'w* is the wire connecting the circuit of the battery with the tangent galvanometer *g*, which indicates the strength of the battery-current. Under ordinary circumstances, the current does not pass through the galvanometer; but it may be made to do so by connecting *n* and *p* with a conducting wire, and unscrewing the knob *k*, whereupon the deflection of the needle gives us an indication of the condition of the battery which is out of sight. The ordinary galvanometer is really not much more than a galvanoscope. It will indicate the existence of a current, and also give an approximative idea of its strength by the magnitude of the angle to which it is deflected; but the latter is not really proportionate to the intensity of the current.

For accurate measurement, the tangent galvanometer (Fig. 16 *g*) is necessary. The current is here made to pass through a broad circular band

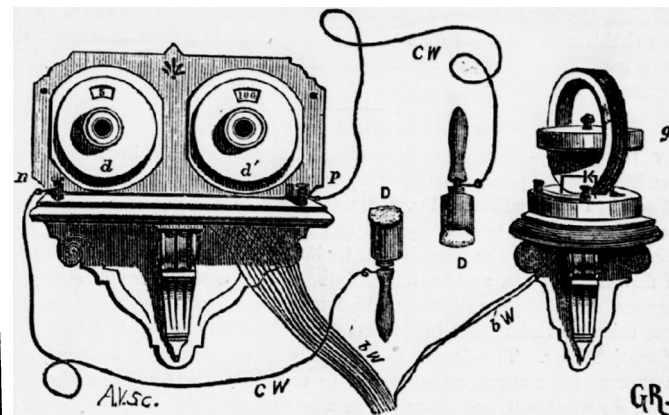


Fig. 16.

of copper, in the centre of which is the magnetic needle. The length of the needle is so proportionate to the diameter of the band, that the distance of the end of the needle from the band, and consequently the action of the current upon it, is the same at all angles of deflection. This instrument is so placed that the plane of the band coincides with the magnetic meridian.

We have already seen that, in the Becker-Muirhead battery, polarisation is, to all intents and purposes, reduced to zero; but it has other important advantages. It is very easy to nurse, and never gets out of order. We have used it almost daily for the last ten years, and have never on any occasion been disappointed with its effects. On the whole, it is best to have the apparatus nursed once a month; and this can be easily done by an intelligent mechanic in less than an hour. The plates and porous vases must be renewed once in every three or four years; but all the other parts of the instrument remain permanently useful.

It is, however, not only the constancy, the ease with which the apparatus is nursed, and its conservative qualities generally, which must recommend the use of this instrument; but there are several other considerations which are somewhat more difficult to explain, and which yet go far towards establishing its absolute superiority over other smaller machines. The current produced by the portable batteries is more painful than that produced by the large stationary battery. Now it is very important, in the treatment of most nervous disorders, to avoid giving pain. If much pain be produced by the application, it is often necessary to change the places where the electrodes are applied. Moreover, involuntary muscular contractions will occur in consequence, and the really constant flow of the current through the organs is thus impeded. This is one of the reasons why the therapeutical results obtained with the large battery are better than those obtained with the portable batteries, more especially in affections of the nervous centres and in the different forms of neuralgia. The characteristic feature of Becker's battery is the large surface of the metals composing it, and the absence of acids. Now the power of decomposing water, and the magnetic properties of the two currents produced by a large and a small battery, may be the same, and yet there is a difference in their physiological and therapeutical effects. The same electro-motive force which, in a portable battery, is crammed into a square inch, has perhaps the space of ten or twenty square inches to spread over in the large battery. Again, in a short time after being put in action, the metals of the portable battery become irregular in their production of electricity, and local currents are formed, which interfere with the flow of the principal current. These circumstances serve to account, at least to some extent, for the superiority of the large over the small batteries. It is, however, more the province of the physicist than that of the physician to analyse the minutiae of these matters. As practitioners, we have simply to register the fact that the large stationary Becker-Muirhead is better than all the portable batteries which have been constructed. It should, therefore, be the hospital battery, and is indispensable to all those who occupy themselves more particularly with the study of the influence of electricity upon neurotic conditions.

The price of this battery, which may be procured from Messrs. Elliott, 112, St. Martin's Lane, and 449, Strand, is as follows. Set of ten cells in teak box, £2:2; set of one hundred with dial, £25; shell for ditto, £1:10; set of fifty, £15; ditto on movable carriage,

£17:10; pair of handles, 15s.; galvanometer, £2:5. The price of the arrangement, as figured in Figs. 12 and 13, is therefore about £30.

We now proceed to notice recent improvements in the batteries used for the galvanic cautery.

In France, Grenet's, and in Germany and England, Middeldorff's battery, is chiefly used. Their description will be found in Dr. Althaus's *Treatise on Medical Electricity*, p. 328 and 331. Suffice it to say here that both are objectionable—Grenet's, because it has to be

to the air-passages, and easily enters into ebullition. In both these instruments, it is not easy to regulate the degree of heat produced, which is, nevertheless, of the greatest importance; because, if white heat be attained, there is danger of hæmorrhage; and, if too little heat be evolved, the instrument is more or less inert.

Professor von Bruns of Tübingen uses a battery composed of zinc and iron, and charged with strong nitric acid. It is very powerful, but wants close watching, as the acid easily enters into ebullition, and destroys all the furniture and other things with which it may happen to come in contact. Stöhrer's galvanic cautery battery consists of six pairs of zinc and carbon, charged with diluted sulphuric and nitric acids, and is much more manageable than Grenet's, Middeldorff's, or Bruns's.

A nice galvanic cautery battery on Stöhrer's principle has been recently manufactured by Messrs. Mayer and Meltzer, of 59, Great Portland Street. (Fig. 17). It combines lightness and portability with great

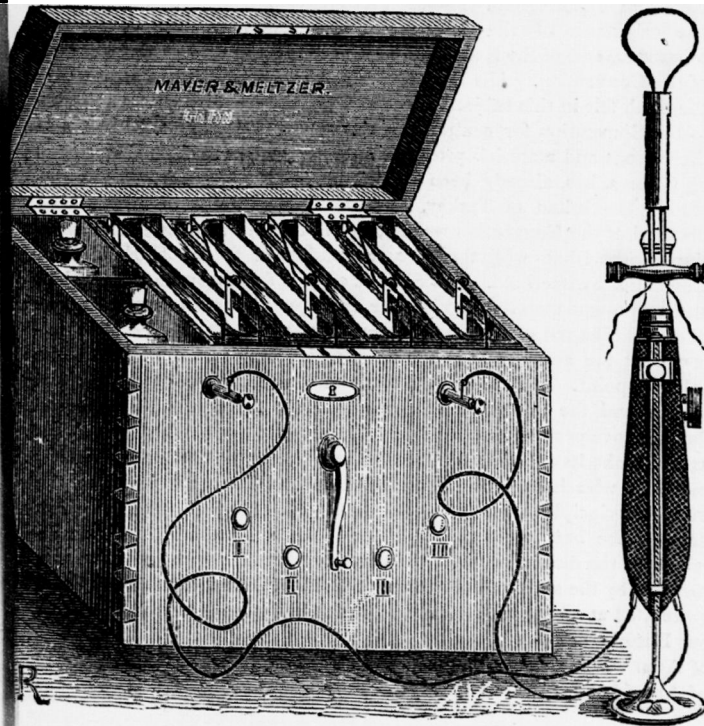


Fig. 17.

worked by a pair of bellows, which nearly paralyses the assistant whenever a prolonged operation is performed, the instrument being,

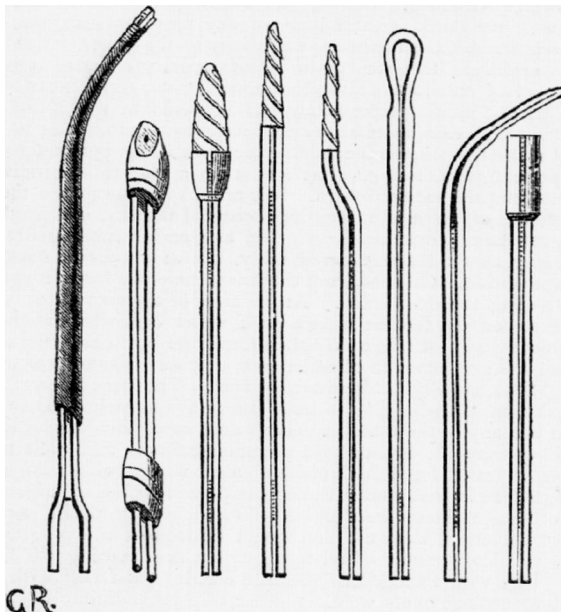


Fig. 18.

moreover, uncertain in its action; and Middeldorff's, because pure nitric acid is used for its charge, which gives off fumes most irritating

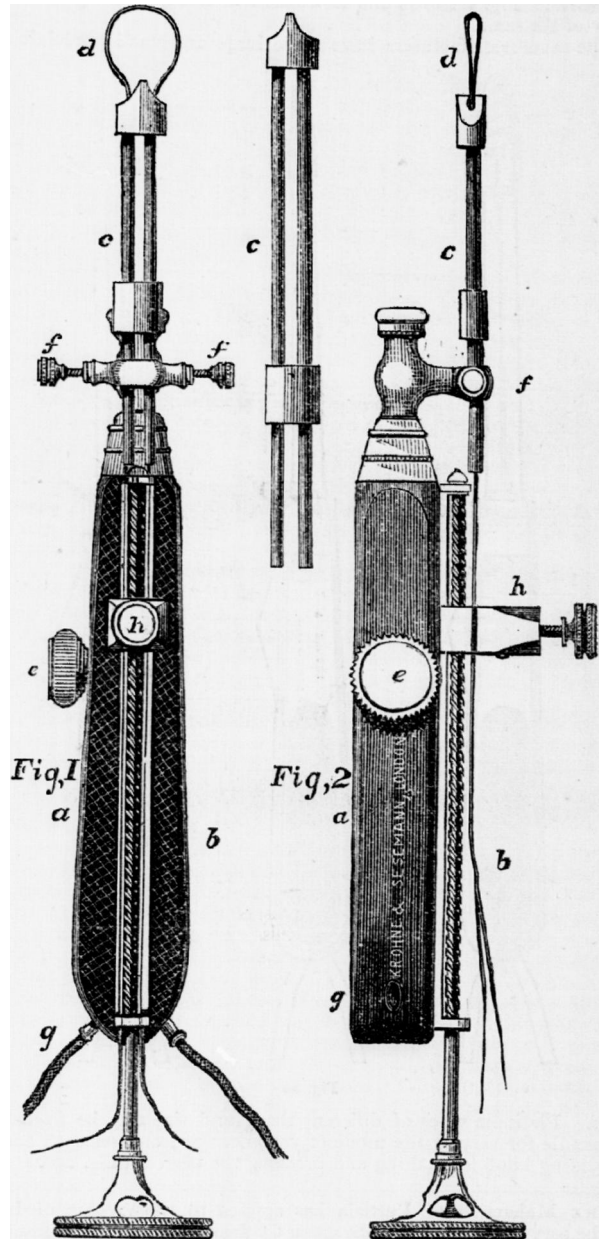


Fig. 19.

power, and is much more easily adjusted than the other batteries. The box in which it is contained is fourteen inches long, nine inches wide,

and seven deep. This contains not only the plates and electrodes (Fig. 18), but also two stoppered bottles for the acids with which the battery is charged, and which are diluted sulphuric acid (1 in 8) and nitric acid. A lever with dial plate in front of the box allows the use of the battery while the box is closed, thus effectually preventing the escape of nitrous acid fumes. The electrodes are an *écraseur*, cutting loops, and porcelain cauteries. The price of this battery is five guineas.

Messrs. Krohne and Sesemann, of 8, Duke Street, Manchester Square, have lately constructed a galvanic *écraseur* (Fig. 19), which is very highly spoken of by those surgeons who have used it. It consists of the handle *a*, which carries the two wires that have to transmit the thermic influence to the platinum loop *d*, and are at their other end connected with the battery wires *g*. *c* are the cannulæ through which the wires pass after they have left the handle; *f*, the sockets to which the cannulæ are screwed; *e* is the contact-breaker, and *h* the clamp for fixing the wires. Fig. 1 shows the instrument in front, and 2 gives a side view of the same.

The same manufacturers have made large and small porcelain cau-

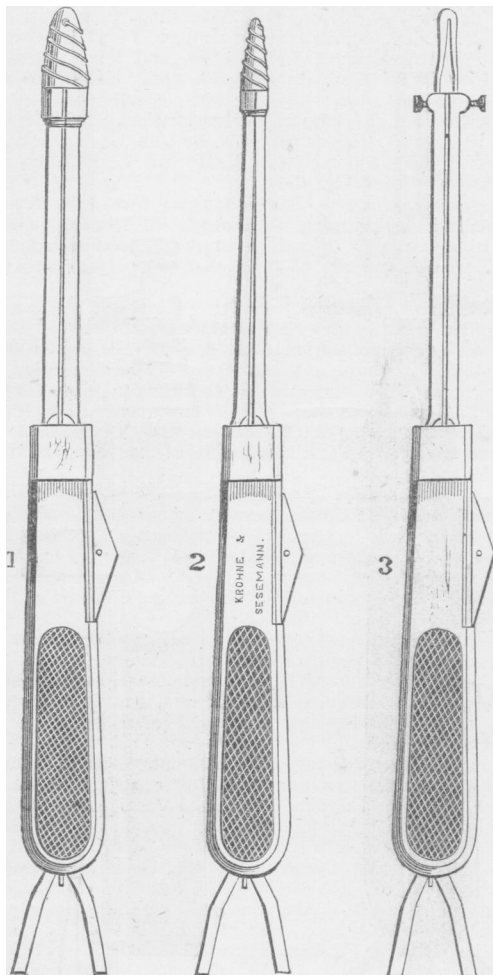


Fig. 20

teries. Platinum wires of different shape and size may be fixed into the handle for varying the mode of cauterisation; and on each handle is a sliding knob for making and breaking the current (Fig. 20).

THE Maharajah of Puttiala has applied to the Viceroy of India for the services of Assistant-Surgeon Calthrop, at present Professor of Anatomy and Physiology in the Medical College at Lahore, and Meteorological Observer to Government. His Highness wishes to make Dr. Calthrop his private physician, and to place him in general charge of all the dispensaries of his State. A liberal salary has been offered.

## THE SHAH OF PERSIA AND THE CONVENTION OF GENEVA.

WE are authorised to state that the visit of His Majesty the Shah of Persia to this country has resulted in an act which will be highly agreeable to lovers of humanity. On Tuesday last, His Excellency Malcolm Khan, Persian Minister, at the instance of Sir Arnold Kemball, received at Buckingham Palace M. Henry Dunant, of Switzerland, the originator of the Diplomatic Convention of Geneva for the Wounded, and of the Red Cross organisation; and discussed the objects of the Convention. His Excellency expressed the warm interest which the Shah felt in this subject, and his desire to give diplomatic adhesion to the Convention for neutralising the sick and wounded in war, and the persons and materials provided for their succour. The Convention of Geneva has already been signed by all European monarchs, including the Sultan of Turkey, who gave his adhesion in 1865. The protocol of the Convention was left open in 1864 at Berne. The adhesion of the Shah will, therefore, be addressed to the High Federal Council of Switzerland. The Shah is already familiar with the emblem and its present merciful significance amongst European troops in time of war. The red cross was flying on Tuesday, at the review at Windsor, over the ambulance in the rear, which was drawn up facing the saluting-point. In Austria, in Switzerland, and in Sweden, all medical officers and the hospital staff corps bear the *brassard* on parade and during movements of troops in peace, in order to popularise the emblem and to make its meaning familiar. The Shah is the first purely Asiatic monarch who has given his adhesion to the Convention and to the merciful principles which it establishes. M. Henry Dunant, who has devoted the best years of his life and has sacrificed all his private interests to the development of the humanitarian idea with which he was inspired by the sight of the horrors of Solferino, must be earnestly congratulated at seeing the fertile idea, which has taken firm root throughout Europe, and has borne noble fruit there, now planted in the soil of Asia. It is strange that, of all civilised powers, the United States of America has alone withheld its assent from the Convention.

## THE UNITED HOSPITAL ATHLETIC SPORTS.

NOT even the great attractions of Spithead and "Lord's," were apparently sufficient, in any way, to affect the attendance on Monday, at Lillie Bridge Grounds. Indeed, the number of students and their friends was, we think, greater than on any previous occasion. The lovely weather and the increasing popularity of the sports, indeed, sufficiently explained the sometimes inconveniently crowded grounds. The number of entries was altogether considerable, eight out of eleven medical schools sending representatives. It would be well if the committee compelled each hospital to adopt a common uniform for its members; it would make the programme intelligible, practically not so according to the present plan, and give the spectators a clue to the individual men contesting the various events. We arrived in time to see the one-mile race, one of the most interesting events of the day, contested. A young gentleman, conspicuous in green and amber running drawers, was pegging away, leading considerably, but at a pace he could evidently not sustain. On consulting the programme, we found no gentleman answering the description. At the close of the race we observed, on close inspection, that he wore a dark violet cap, which at the distance appeared almost black. We then found, on again referring to the card, that the gentleman in question (we suppose), was entered on the card as "Sherman Biggs, Middlesex—violet." The same impossibility, or difficulty, in "spotting" the men, but to a less marked extent, was common in many of the contests. Guy's men were, however, an exception. They were all dressed in a common uniform, and their representatives, at least, if not the individual men, were at once recognised. The programme in many other respects required revision. Surgeons on the list of vice-presidents were promiscuously dubbed "M.D.," and the typographical errors were not infrequent throughout the programme. There were also rumours of mismanagement in preparing the list of entries. But, with these exceptions, the meeting passed off with great *éclat*. The arrangements were, in other respects, admirable, and reflected credit on the committee, and Mr. Hicks, the secretary. A strong wing of the finest military band in the service, that of the Royal Regiment of Artillery, added very materially to the enjoyment of the meeting.