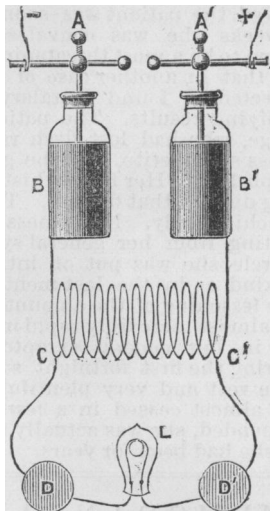


especially is this the case, where d'Arsonval has given much study to this difficult subject. The demonstrations which were given at the Royal Institution by Tesla in the spring of last year left an impression upon the minds of many people that enormous voltages were harmless to the human body if only they could be made to alternate with sufficient rapidity, and people were astounded at the spectacle of a lecturer placing himself in a circuit carrying a current alternating some hundreds of thousands of times per second, at a pressure of many thousands of volts. These experiments, coming not long after the accounts of the execution of criminals by electricity in America with pressures of 1,200 or 1,500 volts, and compared with the occasional notices in the newspapers of fatal accidents to workmen engaged upon electric light cables at 1,000 volts, made it seem as though the rapidity of alternation was the factor which protected Tesla from injury by the enormously high voltages which he was handling. The same view is taken by d'Arsonval in his papers before the Société de Biologie. He there describes an apparatus consisting of an induction coil supplying current to Leyden jars, the jars being made to discharge through a circuit including a helix of ten turns of thick wire and an air gap. In this way there is set up in the circuit a succession of sudden rushes of current, which oscillate hundreds of thousands or even millions of times per second, the rate being determined by the Leyden jars; and the wire helix becomes the seat of electro-magnetic induction effects, comparable exactly to the induced primary currents of a medical induction coil, but very much more intense. These induced currents of the helix



are the subject of d'Arsonval's experiments. By attaching wires to the beginning and end of the helix the induced currents or extra currents can be led off; their energy was sufficient to bring to full incandescence a lamp requiring two ampères to light it, and it was therefore assumed that they had a magnitude of two ampères. The electromotive force of the currents was at least 8,000 or 10,000 volts, because they were able to leap across an air gap of several millimetres, and yet their effect upon the tissues of the body was very slight; in fact, they were hardly felt.

Now it is certain that a current of far less than 1 ampère, either steady or alternating 20, 50, or 100 times per second, would produce unbearable and dangerous shocks in its passage through the tissues; and the inference drawn is that the extreme frequency of alternation can render a current of dangerous magnitude innocuous. But I am not satisfied that such an inference is a proper one, for the following reasons:

1. A Leyden jar discharging through the body produces effects which are painful and severe, as all who have felt them will agree; but yet this is a discharge of high frequency of alternation; in fact, it is by the Leyden jars in the circuit that the oscillatory character and the rapid rate of alternation of the discharge is determined. Oliver Lodge gives the rate of oscillation for a pint-sized Leyden jar at ten million per second; for jars of greater capacity the rate is less rapid.

2. The high frequency and high potential discharges of Tesla's apparatus are not altogether harmless, but can produce severe shocks and can kill small animals, as Elihu Thomson has shown. The discharges from the terminals of such an apparatus can produce severe muscular contractions even with the resistance of a considerable air space interposed in the circuit; so much so that in some recent experiments which the writer was enabled to make through the kindness of Mr. Campbell Swinton, it was considered prudent to proceed no further with the experiment of actually touching both the terminals of the coil at once.

3. It is very doubtful whether d'Arsonval's estimation of the magnitude of the current of his apparatus is correct. The incandescence of a lamp filament with currents of high frequency has been recently under discussion in some of the electrical journals, and a very satisfactory explanation of the phenomenon has been forthcoming.¹ It is well known that for alternating currents the resistance of a conductor is greater than it is for steady currents, and the increase of resistance rises rapidly as the rate of alternation becomes greater; and with frequencies approaching one million per second the effective resistance of the lamp used by d'Arsonval would be raised enormously; this would require the energy needed to bring it to incandescence to be applied at a proportionately higher voltage, while the magnitude of the current would be lessened in an equal degree. For example, the energy of 2 ampères at 100 volts is the same in amount as that of 0.02 of an ampère (20 milliamperes) at 10,000 volts.

We are therefore able to say that the current which raised d'Arsonval's two-ampère lamp to bright incandescence was very much less than two ampères, and was probably only a few milliamperes, and herein lies the pith of the whole question. The experiments with high frequency currents of high tension are harmless if the magnitude of the current is small, and as the high potential is in fact obtained at the expense of the current, this latter diminishes in proportion as the potential is raised by each successive step up in the transforming apparatus. For the present it may be taken as not yet proved that high frequency of alternation can render electrical currents harmless; and it may still be accepted that the effect produced by the passage of a current through living tissues depends primarily upon the magnitude of the current, as measured in ampères, which is made to traverse them, and upon its density or concentration therein.

CASES OF LUPUS TREATED BY MEANS OF TUBERCULIN, COMBINED WITH OTHER MEASURES.

By JAMES DONELAN, M.B., M.Ch.,
Physician to the Italian Hospital, London.

THE publication in the BRITISH MEDICAL JOURNAL of June 3rd of Mr. Malcolm Morris's cases of lupus treated by means of Koch's lymph combined with surgical measures, and his appeal for the experiences of others with similar treatment, induces me to send the notes of the following cases, in which a sufficient time has elapsed to allow some idea to be formed of the value of this method as a means of cure:

CASE I.—A strumous-looking youth, aged 19, came under my observation in September, 1890, some months before the announcement of Koch's remedy. He had a small patch of lupus involving the right ala of the nose, and extending for about an inch outwards on the cheek and down to the angle of the mouth. There was no evidence of deeper disease in the nose, pharynx, or larynx, and a careful examination failed to detect any signs of pulmonary mischief. I scraped the patch, removing the greater part of the ala of the nose, and freely cauterised the bleeding surface with the electro-cautery. The wound healed without trouble, and for some months the patient remained free from any outward sign of the return of the disease. He went to the South of France in January, 1891, and returned to London in the middle of April, when I saw him again. The cicatrix appeared firm and sound, but at two or three points in the outer margin of the scar there were signs of renewed activity. The ala of the nose, pharynx, larynx, and lungs appeared to be as healthy as before. On April 18th he had an injection of 0.01 c.c. of Koch's lymph. No immediate effect was produced, but when 0.03 c.c. was injected on the 20th a marked local reaction took place. His temperature rose to 101° F. The patch became red, and was surrounded by a bright red areola, with several little red spots outside it like the eruption in scarlet fever. After two or three days some of these little spots became pustular. The areola extended down on the upper lip, and it became evident that the inferior turbinated body and part of the outer wall of the right nasal fossa were

Electrician, December, 1892.

also affected. A general anæsthetic was now administered, and every place that showed signs of reaction was carefully scraped and cauterised with the electro-cautery. The wounds quickly healed, and the patient seemed well for over eighteen months, when shortly before Christmas, 1892, slight redness and scaling occurred at the outer margin of the scar. A single injection of 0.05 c.c. of tuberculin was given, which was followed by a slight rise in temperature, which I have unfortunately omitted to record. The local reaction was confined to the outer margin of the patch. This was again carefully scraped and cauterised, and for the past six months there has been no sign of any recurrence of the trouble.

CASE II.—A young lady of 17 was brought to me in May, 1891, during the progress of the preceding case. She had a patch of lupus about the size of a shilling over the inner third of the left eyebrow, and extending for about half an inch down the nose, with a tendency towards the left orbit. A minute isolated point was placed below the middle of the eyebrow. About a year before, when the patch was only half the size, it had been scraped and cauterised by a leading surgeon in Paris, and for several months there were no signs of a recurrence of the disease. The consent of the patient's friends to the use of the then new remedy having been obtained with some difficulty, a first injection of 0.01 c.c. of tuberculin was administered on May 4th, 1892. This having been followed by no reaction whatever, the quantity was gradually increased up to 0.03 c.c., when there was a marked local, but no constitutional reaction, other than slight headache and a feeling of prostration. At this point the treatment was interrupted, and was not resumed for some reason until the beginning of July. A single injection of 0.05 c.c. was then given, when a decided local reaction occurred. A general anæsthetic was administered, and everyone of the inflamed spots was carefully cauterised with the electro-cautery. A few points like the "scarlatina" rash in the former case which had appeared outside the areola were destroyed by means of a fine cautery point introduced into each of them. The patient made a speedy recovery, and at the present moment, that is, over two years from the time of treatment, she is perfectly free from any sign of recurrence.

Though it would be unwise to form a positive opinion of the value of this treatment from a few instances, I think from the experience of this method in Mr. Malcolm Morris's cases and in those referred to here that it is an important aid to curing this disease, and that, under certain conditions, a very satisfactory result may be obtained. The most important condition is that treatment should be commenced early, and this is all the more necessary if the first outbreak of the disease is in a situation where it is difficult to get at, or where it may easily extend by continuity of surface to deeper structures.

I think it may also be said that where the extent of the lupus tissue is very small, as in my second case, a prolonged course of injections is unnecessary. In such a case, after excluding the possibility of other latent tuberculous mischief by a few injections of gradually increasing strength, a dose sufficient to bring about a decided local reaction should be given, and the diseased tissues removed by spoon and cautery.

ON INTRALARYNGEAL INJECTIONS OF GUAIACOL AND MENTHOL IN FŒTID CONDITIONS OF THE SPUTA.

By JAMES McNAUGHT, M.D., M.R.C.S.,
Waterfoot, near Manchester.

THE cases reported by Dr. Grainger Stewart in the BRITISH MEDICAL JOURNAL of June 3rd remind me of one under my care in February and March of this year, in which intralaryngeal injections proved marvellously successful after other remedies had failed, and when the case seemed well-nigh hopeless.

The patient, a woman between 50 and 60 years of age, had previously had one or two attacks of bronchitis, but could not be said to be the subject of chronic bronchitis. Her present illness began with the usual symptoms of influenza, a febrile temperature, aching pains all over, herpes about the lips, and in a day or two there were coarse bronchial rales universally heard over the chest, back and front and a patch of dulness developed at the left base with crepitation. The sputa were chiefly frothy, but at times slightly rusty, and the cough was of a very harassing, hacking character. At the end of about ten days the dulness at base cleared up, but the patient remained very prostrate, the temperature ranged up to about 103° F.; there was complete anorexia, and the bronchitis and cough continued. This condition of things persisted until the fourth week of her illness, and then for the first time the breath was noticed to be fœtid. On inquiry, she said that every morning after a severe fit of coughing she brought up a quantity of greenish-yellow, stinking sputa, but rarely any more during the day, the remaining sputa being frothy and rather watery. Careful examination of the chest, back and front, failed to detect any dulness, and no bubbling crepitus could be anywhere heard. The continued high temperature and profuse sweat led to the suspicion of acute tuberculous softening, and the sputa were closely examined for the bacillus, but without success. The microscope showed chiefly pus cells, but one or two pieces of elastic tissue having an alveolar arrangement were observed.

I was inclined to look upon the case as one of abscess of the lung, so deep in its substance and covered by such an amount of resonant lung tissue as to prevent any dulness being detected, having some years ago had a case where fœtid expectoration existed for some weeks before dulness and bubbling sounds could be detected externally, although a large, easily detected cavity ultimately formed at the surface of the lung. The existence of a dilatation of the bronchi sufficiently large to account for the symptoms seemed less probable because the patient had not suffered severely from chronic bronchitis and the whole process seemed to be of an acute character. The subsequent recovery of the case without leaving any of the usual signs of bronchiectasis seems to lend probability to this view. There is of course room for differences of opinion as to the diagnosis, but, whatever the condition, the treatment of the fœtid expectoration by intralaryngeal injections was most successful, not only in reducing the fœtor and lessening the expectoration, but in reducing temperature and improving the general state. For a few days previous to beginning the injections inhalation of iodine from a Roberts's respirator-inhaler had been tried without benefit. Then 30 minims of a solution consisting of guaiacol ℥iiss, menthol ℥x, ol. olivæ ℥viiij, were injected into the larynx once a day, and three pills containing iodoform, creasote, aa gr. j; croton choral hydrate, gr. ij, were given daily. After the use of two or three injections the fœtor almost ceased and the amount of expectoration was markedly lessened, and in a fortnight the fœtor was gone and the purulent expectoration almost so. Simultaneously the temperature went down and the appetite improved, the patient was soon able to get up, and in five or six weeks she was convalescent, from what seemed for some time to be a most threatening condition.

I may mention that in another case of bronchitis, where phthisis was suspected, I found intralaryngeal injections produce most gratifying results. The patient was a woman about 40 years of age, who had lost flesh rapidly, had night sweats, complete loss of appetite, and the general symptoms and appearance of phthisis. Her family history was very bad, three sisters having died of that disease. The physical signs were those of bronchitis only. No dulness being anywhere found, but suspecting from her general symptoms the development of tubercle, she was put on intralaryngeal injections of the same kind as in the last mentioned case. The result was a speedy lessening of the amount of expectoration, and cough, and an almost incredibly rapid increase in weight, and improvement in her general symptoms. She gained 8 lbs. in weight during the first fortnight, some of this being no doubt due to the rest and very plentiful nutriment supplied. The cough almost ceased in a few weeks, and when treatment was suspended, she was actually stouter and apparently better than she had been for years.

MEMORANDA:

MEDICAL, SURGICAL, OBSTETRICAL, THERAPEUTICAL, PATHOLOGICAL, ETC.

ANOTHER CASE OF ACONITE POISONING.

DR. HUGH SMITH'S case reminded me of my notes of the following case:

On July 18th, 1877, Miss M.A.H., aged 24, about 10.45 P.M. went to a cupboard for some "lumbago drops," but by mistake she got hold of a bottle of lin. aconiti B.P., and dropping out 30 or 40 drops into a teaspoonful of water took there and then the whole of the same. Two or three other people were present and witnessed the whole proceeding, but the error was not discovered. In about ten minutes she felt a tingling in the hands and fingers, which felt as if drawn up, then the same sensation was experienced in the lips, tongue, and cheeks, and they also felt as if drawn up; besides the tingling, numbness was also felt. A short time after, the tingling and numbness were felt in the feet and legs, and by about 11.40 she felt queer all over. Felt as if bed clothes were a dreadful weight and was chilled all over. Breathed all right, but felt as if she was losing her senses at times, and at other times was all right as far as this was concerned. She did not sweat, nor pass water, nor defæcate. She had gone to bed after