

tions, I obtained results of which the following table gives an example :—

Rate of alternation.	Current in primary.	Electro-motive force in primary.	Total energy.	Effects (of secondary) on sensation and muscular contraction.
Per second.	Milliampères.	Volts.	(Watts).	
(a) 808	150	2 8	0·42	Well marked.
(b) 2428	120	„	0·34	Slight.
(c) 4432	100	„	0·28	Nil.

It thus appears that increase of rapidity of alternation brings down current strength.

*Control Experiment 1.*—A large coil was used which, when worked with its own spring and a current of 2 ampères at 8 volts, gave a spark of a quarter of an inch (5800 volts calculated by De la Rue and Müller's sparking tables). When the spring was screwed down and the motor<sup>2</sup> used to make contact and run at (my) medium speed—i.e., about 2428 alternations per second—the current in the primary fell to 0·75 ampère and the spark of the secondary to a little more than an eighth of an inch (say, 3000 volts), again showing the fall in current strength with a rise in frequency.

*Control Experiment 2.*—As a control experiment of both the above I went on to test the effect on sensation and muscular contraction of varying rates of alternation, but with the current in primary *kept constant*. Motor run as above, but coil worked by large Leclanché battery with a cell collector. Having obtained well-marked sensation effects and muscular contraction at a low speed, with a certain current strength, the speed was increased, with the effect that the current in primary was diminished. More cells were then thrown into circuit and the current brought up to its original value; the result was that the physiological effects became as marked as before. The inference therefore seemed tolerably clear that sensation and muscular contraction are not so much affected by rate of alternation as by the amount of current strength. Taken together, these experiments point as follows :—(1) That increased rapidity of alternation diminishes the current in primary, and therefore, of course, the induced current in secondary; (2) that with this increased rapidity and diminished current strength there is diminished physiological effect, but that if, with the increased frequency of alternation, current strength be kept up to its original point there is no such diminution apparent; (3) that therefore the current strength is one great immediate factor in producing these physiological effects. It seems that changing the frequency of alternation, by the motor method at least, is one way of influencing current strength.<sup>3</sup> How this may occur is a different question, but a highly interesting one, both from a medical and from an electrical point of view.

Norfolk-square, Brighton.

### CASE OF DRAINAGE OF THE BLADDER THROUGH THE PERINEUM, WITH COMPLICATION.

By ANDREW KEY, M.D. EDIN. &c.

THERE are some points of very great interest in connexion with this case which I think make it worth publishing. I have condensed my report of it as much as possible and do not enter into minute details. About nine years ago a gentleman, then aged fifty-four, consulted me. He had for a good many years suffered from an irritable condition of his bladder. On examination this was found to be due to enlargement of the prostate, producing the usual symptoms—increased frequency of micturition, some difficulty in the act, with much more than the usual pain; there was no stone in

the bladder and the urine was in all respects healthy. These symptoms gradually increased in severity until, during the last three months of 1889, his life became miserable. His business engagements were very numerous, necessitating his presence frequently in Edinburgh, Dundee &c.; but his bladder symptoms had become so much intensified that he was almost unable to leave home. At this time, three months before he underwent the operation, he began to pass more urine than the normal quantity and on examination this was found to be of low specific gravity. In addition to an enlarged prostate he was found to have further trouble from diabetes insipidus. He was passing from 90 oz. to 100 oz. of urine in the twenty-four hours, of a density of 1006. As usual in such cases, he suffered greatly from thirst. No treatment had any effect upon this state of matters. During the last month of 1889 his sufferings were very great—he had to micturate every half hour, with great difficulty and increased pain. I had advised him to pass a soft catheter night and morning, or at least every night, as it was very evident that he never emptied his bladder. He could manage this well enough, but the urethra was so irritable that he had to abandon the attempt. The prostate was now so enormously enlarged that mere palliative treatment was evidently useless. The only mode of relief seemed to be by establishing an outlet for the urine through the perineum. He consented to this and the operation was performed by Professor Annandale of Edinburgh on Jan. 11th, 1890. Chloroform having been administered by me, the ordinary lithotomy staff was introduced and the bladder opened into in the middle line of the perineum. This staff was then withdrawn, a straight grooved one was passed through this opening in the perineum into the bladder and by means of it the opening was enlarged. Although he had micturated immediately before the operation, quite a pint of urine escaped into a basin. On passing the finger into the bladder the prostate was found to be enormously enlarged, Professor Annandale remarking that it was the largest, or one of the largest, he had ever seen. The operation was easily and quickly done and without a hitch. It was now clearly seen that a deep pouch had been formed behind the enlarged prostate which no catheter could have emptied and which at all times contained about a pint of urine, accounting for the frequent desire to micturate and the unsatisfactory result thereof. A strong stiff gutta-percha tube, smoothly rounded at the internal end and perforated, was tied into the bladder, which was washed out twice a day with a warm solution of boracic acid. As the patient resided twelve miles from Montrose, my son, then assisting me, remained with him for the first four days and nights; all had gone well and he was enjoying freedom from pain and quiet rest. But exactly a week after the operation—at 4 A.M. on the morning of the 18th—a messenger arrived at my house stating that Mr. S— had been wakened suddenly with most acute pain in his left leg and that it had become rapidly greatly swollen. I went at once and diagnosed embolic clot in the femoral artery. I found the leg already double the girth of the other and the suffering intense. I administered a large dose of morphia subcutaneously and put up the leg in cotton-wool with a flannel bandage. Sleep soon followed and by morning the pain was much relieved. It was now evident that the case would be a tedious one, requiring much care. A thoroughly qualified nurse was got and the patient placed on a large water pillow. The embolic clot was a very serious complication, possibly due to the vitiated condition of the blood of one suffering from polyuria. But the case became more grave when exactly a week after, on the 25th, the right leg went in the same way as the left had done, the treatment being of necessity the same. Dr. Johnston of Kair repeatedly saw the patient with me and the prognosis was a very grave one. Phlebitis did supervene, however, all over the superficial veins of the legs, thighs and lower abdominal region. The patient was now very ill and utterly unable to help himself in any way. Fortunately the temperature did not rise and the constitutional symptoms were not so severe as might have been expected. He had excessive thirst, due to the polyuria, which still persisted. He could take plenty of food and a sufficient amount of stimulants—claret, occasionally a little champagne, but chiefly whisky and potash water. The legs were carefully looked after, well wrapped in cotton wool and no symptom of gangrene ever showed itself. Another week having passed without any further complication I was beginning to hope that my patient, who had been an exceedingly temperate, healthy man with a splendid constitution, would pull through,

<sup>2</sup> Driven with a current of 1·2 ampères from a bichromate battery.  
<sup>3</sup> It is evident, therefore, that in all such experiments attention ought to be paid to the possible reduction of the initial electrical energy by reason of increased frequency. It is possible, although so far as I know nowhere stated in the published records of other experiments, that instruments were used which enabled these high frequencies to be obtained without diminution of current strength.

when he was seized on the morning of Feb. 1st with a most intense rigor, followed by the usual very hot stage and excessively profuse perspiration. For the first week after this rigor he had two rigors quite as severe every twenty-four hours, but without any marked periodicity, and was then left so exceedingly weak and ill that recovery appeared utterly hopeless. Dr. Johnston consulted with me repeatedly and at the end of this week of misery we concluded that he must certainly die. When the first rigor seized him he was put upon large doses of quinine and his allowance of stimulants was increased. Fortunately he could still take a fair amount of nourishment. His stomach retained everything, and this gave us a little hope. Another point in his favour was that even during the highest state of fever the temperature did not go much beyond 103°, falling to almost normal after the sweating stage. At the end of a week the rigors diminished in frequency to one a day, then one in two days, and before they finally left, which they did at the end of three weeks, one every third day, also gradually lessening in intensity. His weakness was now extreme. During all this time the wound in the perineum was perfectly healthy; no abscess, either external or internal, was formed. It was three or four months before any diminution of the circumference of the legs was apparent. All this time the urine had been daily carefully measured and the density taken. During the rigors, and when the profuse perspiration existed, the quantity had diminished. It certainly increased again, but never was so much as 90 oz. or 100 oz. in the twenty-four hours, and the density began to rise. In short, the blood got rid of the poison and the urine gradually became normal in quantity and quality. It was so at the end of three months after the operation and has remained so until now. I do not think the operation had anything whatever to do with the prolonged and varied illness; the blame must be attached to the state of the system, whatever that might be, caused by the polyuria. After the rigors had quite passed away, a long flexible indiarubber tube, with a stopcock at the end of it, was attached to the stiff tube in the bladder, and as his urine could be retained for about four hours the stopcock was then turned and the bladder emptied. The stiff tube had so completely accommodated itself to the perineal opening that there was little or no leakage. This tube was easily removed and a fresh one put in about every ten days.

At the end of seven months after the operation the patient was able to be out of bed and lie on a couch, and was soon afterwards assisted daily into another room. His health was now perfectly restored and he gradually recovered the use of his legs. In the month of December, nearly twelve months after the operation, he was able to go to Edinburgh and attend to business, doing so ever since, with frequent journeys elsewhere. The only pain or inconvenience he suffers from, and which he has always had since the operation, is a spasmodic contraction of the bladder, more or less daily, with the passage of a little urine through the urethra.

There are one or two points in connexion with this case which I should like to bring prominently forward. For many years before suffering from his bladder trouble the patient conducted a very large business. He had often very little opportunity for micturating and gradually accustomed himself to do without emptying his bladder for ten or twelve hours. I think one of the functions of the prostate gland is to assist the vesical sphincter. The prostate began to enlarge at an unusually early age, when the patient was not much over forty. Professor Annandale was astonished at its size. Then the irritation of the enlarged prostate or that of the urine, constantly retained in the bladder, had in some way produced the polyuria, which disappeared with the trouble caused by the enlarged prostate. Again the polyuria was disposed of in the same way as any other form of blood poisoning, but without any tangible manifestation, by severe rigors and intense diaphoresis.

High-street, Montrose.

**ILKESTON COTTAGE HOSPITAL.**—At the annual meeting of the friends of this institution, held a few days ago, the chairman was able to give a very satisfactory account of the success which has attended the work accomplished during the past year. Its finances also bear a similarly favourable aspect. One pleasing feature in the career of the hospital has been the practical appreciation shown by the working classes in the progress of the charity. Reference was also made to the proposal to build a new hospital, for which funds are already to some extent available.

## AN OBSCURE CASE OF CANCER OF THE PYLORUS UNDETECTED DURING LIFE.

By J. BALMAIN MACLEOD, M.D. ABERD.,  
SENIOR VISITING PHYSICIAN, DUNDEE ROYAL INFIRMARY.

MISS C—, aged fifty years, consulted me for the first time on April 4th, 1890, for indigestion. She stated that she had always enjoyed good health till towards the end of 1889, when she had a sharp attack of influenza, from which she made a very slow recovery, and then, for the first time, symptoms of indigestion set in. The patient was a thin, wiry, pale-complexioned person. She complained of pain over the region of the stomach about an hour after taking food, which passed off in about half an hour, leaving her entirely free from pain till the next meal. Tongue very much furred; bowels constipated; appetite poor; stomach and bowels distended with flatulence. Nothing abnormal could be detected on examining the stomach. She had had no vomiting, but complained of acidity. I put her on a course of bismuth, rhubarb and soda, and carefully dieted her. On this treatment she seemed to improve, and left Dundee on May 6th for a change of air. On June 18th she again reported herself; she appeared to have improved by the change, but still suffered more or less from a fixed pain in the stomach; referred to a spot towards the left of the epigastric region. After seeing her for a few days she went to the Highlands for a further change, where she remained for about six weeks. Towards the middle of September, however, the pain appeared to increase, and was more constant than before, and now was not influenced by food; the pain was of a dull aching character, referred to a spot in the left epigastric region. She also complained very much of flatulence, with fetid eructations. Various remedies were tried, peptonised foods prescribed, but the pain persisted. Bismuth and morphia in powder were ordered, which had a decided effect in dulling the pain. About the middle of December Professor Grainger Stewart of Edinburgh saw her in consultation, and after a careful examination could detect no organic lesion, although by this time she had emaciated very much and had a cachectic appearance. He gave as his opinion that the dyspepsia was of a neurotic nature, and advised very much the same treatment to be continued. For a few weeks she appeared to rally and kept comparatively free of pain while taking the bismuth and morphia. Her appetite was wonderfully good and the food well digested, but she steadily emaciated from week to week and died on May 19th without any pain or suffering during the last fortnight of her life, and was calm and collected to the end.

On May 20th Dr. Stalker, for some time pathologist to the Dundee Royal Infirmary and my junior colleague there, kindly conducted the post-mortem examination along with me, and we found as follows: The body was extremely emaciated and anæmic, with commencing cedema of the extremities. On opening the abdomen the stomach was found adherent to the under surface of the left lobe of the liver, and was held well back. The adhesion took place all along the line of the lesser curvature of the stomach, from the pylorus to the cardiac end. The pylorus itself was surrounded by a thick hard band or ring of scirrhus cancer, interrupted only at the posterior part, where for about half an inch the ring was almost absent. A finger could very easily be passed through the pylorus. There was no dilatation of the stomach and no secondary deposit anywhere.

*Remarks.*—The great interest attaching to this case is the difficulty of diagnosis met with during life. I all along entertained a strong suspicion of malignancy (and expressed it) based upon the steady emaciation of the patient, her cachectic appearance, her period of life, and a family history of cancer, an aunt having died of the disease; but the fact that there were no symptoms of vomiting, and never had been, combined with the position of the painful spot well toward the left of the epigastrium, militated against and obscured a diagnosis of cancer of the pylorus. It is probable that there was some consecutive atrophy of the glands of the stomach,