calculating how to manage so that he can keep his spine still. If his disease be acute, he will probably give up the attempt, and say that he cannot stoop. If he persevere, he will probably place himself so that the object is at his side; he will then cautiously bring his hand towards the ground, not by bending or inclining his spine, but by flexing his knees, while his spine is kept rigid and nearly perpendicular; having at length succeeded in grasping the object, he will pause, so as to be sure of his balance, and will then raise himself by straightening his knees; while, as before, he keeps his spine rigid and upright.

In children, the spine may be further tested by watching how the patient rises from the recumbent posture. It may often be observed that he moves himself slowly round till he is on his hands and knees, and then carefully gets up. Another plan is to make the child climb upon a sofa, or from a chair on to a table; for the movements required in these acts are good tests as to the mobility of the spine. This description of what may be observed in these cases is intended to be general, and, as far as it can be made, typical. In practice, numerous differences will be met with; but, in almost every instance, some of the defects of movement here alluded to will be apparent. Thirdly: especially in children, in whom the diagnosis of disease must often be made, not by observing two or three conclusive signs, but by fitting together numerous small fragments of evidence derived from different sources; the suspicion that caries is present is strongly confirmed by the observation, that the patient has some device for relieving the spine of part of the work of supporting the weight of the head and trunk. Thus, in disease of the cervical spine, he may be seen to rest his chin on his hand, or to support his head with his hands, especially in the effort of rising from the recumbent posture. Some children, with cervical caries, will sit for hours with their elbows on a table, and with the hands supporting the head. Others, who have disease in the dorsal or the lumbar region, have the habit of making their way to a chair, on which they place the palms of their hands, and over which, with their arms straight, they lean—so as to give themselves "high shoulders"; and so that weight is taken off the spine and transmitted through the arms. Another posture, very suggestive of mischief, is that in which the patient, having slightly flexed one knee, so that his limb rests on the toe, places his hand on the middle of his thigh, and then leans over to that side—so as to convey weight from the shoulder through the arm, and so to the thigh. These schemes for the "collateral transmission of weight" are always worthy of very careful attention.

On the other hand, I should like to remark that there are some tests of spinal caries in use, which seem so untrustworthy, that I feel justified in offering a strong caution against their use. These are: (1) the plan of tapping with the knuckles, or dealing a slight but sudden blow with the closed hand, on the spinous processes of the suspected vertebrae. This proceeding is very likely to make a child or an hysterical adult shrink, even though the spine is perfectly sound; while, on the other hand, as the blow is struck at right angles to the long axis of the spine, it can have very little effect in bringing vertebrae which may happen to be tender into firmer contact with each other, so as to produce pain by their sudden mutual compression. Moreover, the force of the blow, as it is transmitted through the spinous processes, laminae, and articular processes, is apt to be dissipated before it reaches the bodies of the vertebrae—the parts in which disease is so commonly situated. Some surgeons, I am aware, deal the blow on the top of the head; but this may assuredly be dangerous in disease of the cervical vertebrae; while, owing to the formation of the spine as a series of blocks, and to the elasticity of the intervertebral discs, the effect of any slight concussion is lost before it can reach the lower regions of the spine. I have frequently seen patients wince under this test, although their spines were quite healthy. I have also often found that it produced no complaint in cases in which angular curvature was plainly marked. This test of jarring the spine is, in fact, as deceptive, and therefore as bad, as is that of tapping the knee or the heel in suspected disease of the hip-joint. Children, with hip-disease, may very often be seen, who make no complaint whatever when the hip is thus even forcibly jarred; while, on the other hand, the jar causes, in some cases, severe and quite unnecessary suffering—unnecessary, because painless and more reliable signs are within reach. (2). Another symptom, on which some observers lay much stress, is tenderness, or increased sensitiveness, found over the spinous processes, corresponding to the carious vertebrae; and I have seen this over-sensitiveness searched for by means of a hot sponge. I believe this test is quite untrustworthy. Tenderness, or over-sensitiveness, is a very common feature in cases of hysterical spine; and certainly tenderness is often absent when caries is distinctly in progress.

The period at which angular curvature becomes apparent, in the course of spinal disease, varies with the form that caries takes. In instances in which inflammation involves the general substance of the

body of one or more of the vertebrae, and is attended with rapid softening and absorption, angular curvature very soon results. But, in some cases, inflammation is limited to the external surface of the bodies of the vertebrae and their investing ligaments. Here, extensive ulceration may take place, and even lead to the formation of a large abscess, before angular curvature ensues. Several examples have lately been seen, in which iliac abscess, due to caries of the vertebrae, was present before angular curvature was perceptible, although it was developed at a later stage.

FAURE'S SECONDARY OR STORAGE BATTERY ALSO, SWAN'S ELECTRIC LIGHT, IN SURGERY.

By GEORGE BUCHANAN,

Professor of Clinical Surgery in the University of Glasgow.

THE recent invention of M. Faure has rendered electricity available for surgical use, in a way it has not been before. The secondary battery as he calls it, might better be called a storage battery; seeing that it stores up or accumulates electricity generated in an active battery, to almost any amount. It consists of a cylindrical vessel of lead, nine inches high and five inches in diameter, with a leaden bottom, but open at the top; into this is packed a kind of cushion, of a material which has the power of absorbing electricity. To this vessel are attached the two poles of a working battery; and, as long as the connection is maintained, the vessel accumulates the electricity flowing into it. When charged, it can be detached from its connection and kept for a long time, or carried from place to place, like the jars of compressed carbonic oxide, used for anæsthetic purposes.

When required for use, the cushion, which should always be kept moist, is wetted with dilute sulphuric acid; and wires connecting are attached to its poles, when it is converted into a powerful battery.

On June 3rd, I removed a naevoid tumour from the tongue. The naevus was situated on the anterior half of the right side of the tongue of a young gentleman 11 years of age. It had been in existence for many years, but latterly it had frequently been scratched, and then bled freely. As the growth was very vascular and invaded the tongue almost to the middle line, I determined to remove it by the thermocautery. Having occasion to see Sir William Thomson the day before the operation, he offered me the use of a Faure's battery, which had been sent from Paris only a few days before, and on which he was engaged in experimenting to test its value. He was so enamoured of its powers that he said, "It is a witch". And now it has the name of the "Electrical witch" at the University.

In diving to my patient, I called at Sir William's laboratory, and got with me a battery which can easily be carried in one hand, and without the least difficulty. After having put the patient under chloroform, I attached its poles to a platinum wire-écraseur, and removed the tumour without a drop of blood.

This contrivance, which enables one to carry stores of powerful electricity in a jar no bigger than an ordinary preserved meat tin, will render the use of electricity much more extended than heretofore.

Supplies of these cumulative jars are being sent from Paris, and can be charged by any kind of battery to which they are attached.

Swan's Light.—This light is specially useful in examining parts of the body or tumours, which we wish to test by transmitted light. I have under my care, just now, a man who is compelled to be in the recumbent posture, from a severe fracture of the thigh. He has also a tumour in the scrotum with all the characteristics of a hydrocele; but it was almost impossible to judge of its translucency in consequence of its being bound down to the groin; and being of very old growth, was intersected by bands which made it more or less opaque. It was impossible, in the man's fixed position, to get a candle or lamp placed so as to judge of its translucency. At the same time as Sir William Thomson offered me the battery before alluded to he suggested that Swan's Light might be used for surgical investigations. He kindly provided me with a very powerful battery of the ordinary kind; sent his mechanic assistant to fit it up in my ward, and gave me a Swan's electric light lamp. This is a globe of glass about 1½ inches in diameter, containing a filament of carbon wire twisted into a loop, which, when rendered incandescent by the battery, gives out a powerful light. This globe, which is held by a handle of glass tube about four inches long, can be placed in any position, and, as it is not heated beyond what can be

Notices of this extraordinary invention will be found in *Nature* for 19th May and June; also, in the *London Times* of 16th May, and in a letter from Sir William Thomson in the *Times* of June 8th.

easily borne by the skin, it can be placed in actual contact with the tumour in any place without danger of setting fire to the bed-clothes.

It proved most successful, for, even in a ward of the hospital, where the bright sun could not be effectually shut out, the translucency of the hydrocele was made apparent to every student.

ON WOOLSORTERS' DISEASE.

By JOHN HENRY BELL, M.D., Bradford.

DURING the investigation which has been made into the cause and nature of this disease, the following facts have been elicited.

First: It is not confined to wool-sorters, but affects other classes of workpeople who manipulate the wool or hair after it has been sorted. Fatal cases have been observed in packers, washers, preparers, carders, overlookers, and buyers. Until recently, it was not known that wool-sorters were more liable to have external anthrax than other persons. This form of the disease has also been met with in persons who have accidentally come into contact with infective material. A case has been reported of a boy having anthrax on the temple, from lying for a short time upon a bale of mohair; and another, of a gentleman having anthrax on the right temple, from touching some "Van" mohair with his right hand at the warehouse of a friend.

Second: Alpaca and mohair are not the only infective materials. Many fatal cases have occurred from the manipulation of other dry and dusty hairs and wools. "Greasy" wools are less dangerous; it is probable that the "yolk" in them fixes the infective particles. All hairs and wools (excepting Algerian) may at times contain uncleansed fleeces from animals which have died from anthrax, and may occasionally communicate the disease to those who come in contact with them. I have seen such cases from the sorting of British wools, and have heard from my medical friends of others; but the proof is not yet complete.

Third: The disease is not confined to this district; fatal cases have been reported at Leicester, Norwich, Glasgow, Constantinople, and in Massachusetts. I think it will yet be found in other places; and certainly in Peru and Asia Minor, and at the Cape.

Twelve months ago, employers and representatives of woolsorters met Her Majesty's Inspector of Factories, and representatives of the Sanitary Authority, at Bradford, to consider what precautions should be taken to minimise the evils of dealing with foreign hair and wool. Certain regulations were agreed upon. Particular kinds of hair and wool, which were generally believed to be the most dangerous, were to be steeped in water, washed, and otherwise dealt with, before they were sorted. This regulation has been generally acted upon. The result has been most gratifying. Excepting one case, I have not heard of any illness from sorting materials thus dealt with. If "sorted while still damp, as early as possible after washing", as was agreed upon, there will be no risk (some months ago I wrote); "but, if dried too much, I should be afraid of a case cropping up occasionally, because I know the infective germs are not all destroyed by washing in water at 100° to 120° Fahr." The cases I have now to report are of this kind.

Within three weeks, three men, who worked in the same room, have recently died from this disease. These cases deserve particular notice, as each case differs in some respect from those previously published.

CASE I. *Anthraxæmia*.—J. Gill, aged 72, a back-washer, had never been a day from work on account of illness, and had worked for the same firm over twenty-three years. On Saturday, May 14th, 1881, he complained of feeling tired (indeed he had not been very well for several days), but continued his work till giving-up time, about noon. When he returned home, he went to bed, and slept most of the afternoon; during the evening he felt rather cold, had some cramp in the fingers, and noticed that some of them were bloodless and numb. He slept well through the night. On Sunday morning, he complained of a feeling of oppression across the chest, for which he took an emetic. His appetite was not good, but he took some meat and vegetables for dinner. I visited him at 11 o'clock P.M. He complained of nothing except some uneasiness, as if he "had something on his lungs". He did not appear ill, and said he did not feel too ill much, except that, when he raised himself in bed, he felt weak and weary. Pulse 82, soft and full; temperature 97.2°, axilla; respirations 24. No pain or cough; skin moist; tongue slightly coated.

On Monday, May 16th, 10.30 A.M., he had passed a restless night, sleeping occasionally half an hour at a time. The uneasiness and weariness continued. He felt faint if he raised his head from the pillow. He had some thirst, but neither pain nor cough. The percussion-sound on both sides of the chest was clear; the vesicular murmur was on the right side inaudible, on the left side distinct. There were some

bronchial sounds. Respirations 40; temperature in the axilla 93°; in the rectum 101°; pulse imperceptible. The extremities were cold; the blood was stagnating. He died at 11 A.M., in my presence, forty-seven hours after leaving work.

I have attended many cases of this disease when the cough was slight; this is the first case I have known without cough.

I examined blood taken from the finger ten minutes before death, and failed to detect any bacilli. A small quantity, given to a mouse, produced death in thirty-six hours. Non-mobile bacilli were numerous in its spleen.

No *sectio cadaveris* was allowed. Forty-eight hours after death, I saw the body; it did not present the appearances of rapid discoloration and decomposition, which are sometimes seen within twenty-four hours after death from this disease. The left side of the chest did not yield fluid. I removed some from the right side by a hypodermic syringe for examination; it contained numerous long motionless bacilli.

I visited the mill where the deceased had worked, and was shown the various processes to which the wool was subjected before arriving at the machine which he tended. I was told, that, during the last six weeks, a lot of 250 bales of "Van" mohair, which was considered of good quality, had been used. When taken out of the bales, the hair was washed in soap-suds at 120° to 130° Fahr.; then passed through rollers; dried by hot air; sorted; washed, and dried again as before; passed through five preparing machines (or carded), then combed, before it arrived at the back-washing machine, where it passed through soap-suds at a temperature of about 100° Fahr. (at the time of my visit 130° Fahr.). The hair had been manipulated by more than a dozen workpeople before it reached the deceased. At each stage, its infective powers would be weakened. Those who handled it most, when it was most virulent, did not suffer. From this, and many other corroborative instances, it appears probable that the virus may gain access to the blood through some accidental abrasion of the mucous membrane. It is important to notice, also, that twice washing in soap-suds at 130° Fahr. is not sufficient to destroy or remove all the infective particles.

CASE II. *External Anthrax*.—J. R. Baker, aged 58, machine wool-comber, on Monday, May 16th, tended the back-washing machine at which the deceased J. Gill had worked on the previous Saturday. He had always enjoyed good health, was very temperate, and had worked for the same firm nine years. Soon after he commenced work, his left forearm was touched by one of the cog-wheels of the machine—a small portion of skin on the outer surface was nipped and torn; he thought nothing of it, but washed the blood and dirt off with a little wool, which he wet in the warm soap-suds through which the "Van" mohair was passing in his machine. Three days afterwards (May 19th), his forearm was swollen; he was surprised at this, as he "had excellent healing flesh", and went in the evening to consult Mr. Kenyon. On May 20th, he discontinued work at noon; and I saw him immediately afterwards. He said he did not feel ill, but was afraid that he had got his arm poisoned. The forearm was swollen to the hand and the elbow, and pitted on pressure; the injured part was one and a half inches in length, of a crescentic form, and half an inch in breadth at its broadest part; it was not painful, and there was no redness of skin excepting at the edge of the wound. Blood taken from the margin did not appear to contain bacilli.

On May 21st, I saw him at 10.30 A.M., with Dr. Rabagliati and Mr. Kenyon. He had passed a moderate night; slept well, had no pain or feeling of general illness; appetite good, tongue natural. The arm was swollen to its upper third; the swelling of the forearm was very hard, and did not pit on pressure. There was a raised-vesicular rim along the margin of the skin around the wound. Pulse 72; temperature, left axilla 97.5°, rectum 101.2°. Serum from vesicles, examined at 2.30 P.M., contained a few bacilli. Two tubes of this, given to a rabbit, had no apparent effect.

May 22nd, 12.30 P.M. He had rested well through the night; his appetite was good; he had no feeling of illness, no pain, except of fullness from swelling of the back of the hand, which was very tense, and did not pit on pressure. The swelling extended to the shoulder; the upper third of the arm was not so hard as the lower part. Pulse 84; temperature in the left axilla 98.2°, in the rectum 100.7°. Serum from vesicles contained one bacillus in about a score of fields. A small quantity, given to a rabbit, produced no perceptible result.

May 23rd, 10.30 A.M. He had a good night, and felt well; he had no pain, except fullness from swelling of the hand. Soft swelling had advanced over the clavicle and pectoral muscles. His appetite was not so good; he was more inclined to drink. Tongue natural; no cough. Pulse 104; temperature in the left axilla 101.4°, in the rectum 105°. The circumference of the left forearm was 3¾ inches more than the right; of the arm, 4½ inches more than the other. There was no redness of skin beyond the vesicular margin of the wound, the surface