anterior fontanelle is indicated, and on the right side of the head there is a groove running backwards from the supraorbital ridge to above the ear, corresponding to the os externum. Further, the beginning of a deep furrow is seen below the left arm, which furrow passes round the back and corresponds in position to the retraction ring. The occipito-frontal diameter of the head measures $4\frac{1}{2}$ inches, the occipito-mental $5\frac{1}{2}$ inches, and the suboccipito-bregmatic $4\frac{1}{4}$ inches; while the occipito-frontal circumference is $12\frac{1}{4}$ inches, and the suboccipito-bregmatic $12\frac{1}{4}$ inches. The head is rotated on the body towards the left side, and that to such an extent that, while the body of the child was transverse in the mother, the posterior fontanelle was somewhat in front of the anterior end of the right oblique diameter of the pelvis.

The most remarkable features of this cast are the length of the foetal mass and the disposition of the head. The trunk is distinctly more extended than that of the foetus *in utero* before labour. For the sake of comparison, I have given in Plate VI, Fig. 6, an exact reproduction of two foetuses taken out of the uterus at full time. These are both from preparations hardened in spirit, and the foetal mass is therefore reduced as a whole by the shrinking in spirit, and we must remember this in comparing them with the frozen foetus in Plate VI, Fig. 5. But the spirit does not affect the general contour, and great care was taken in lifting out these foetuses not to disturb their actual attitude. Putting alongside of them the frozen foetus in the second stage we are at once struck with the difference in contour, which, from being ovoid, has become that of an elongated cylinder. This extension of the trunk of the foetus in the second stage of labour has been recognised clinically, but this is the first direct anatomical demonstration of its occurrence.

The head of the foetus is partially rotated on the body, and also partially extended. The partial rotation is what we should expect from the mechanism of labour; but the slight extension is in direct opposition to the hitherto received view of the flexion of the head in labour. A study of other frozen sections made before the membranes had ruptured had led me to doubt the occurrence of flexion as a movement in the mechanism of labour; and I looked forward to what this preparation would show with peculiar interest, because it was quite possible that the rupture of the membranes might produce a different state of affairs; but in this foetus we have an undoing, not an increase, of the attitude in pregnancy. This might be ascribed to the position of the arms below the chin, and here the foetuses on Plate VI, Fig. 6, are of special interest, as showing how the attitude is influenced by the arms of the child being underneath the chin; in the lower one the arms are across the face, while in the upper one they have the same disposition underneath the chin as in the foetus from the second stage. Putting, then, this latter foetus alongside of the frozen one, we see in the frozen one a diminution instead of an increase of flexion. This frozen foetus, therefore, confirms my view that flexion of the head is the result of the normal attitude of the foetus *in utero*, and forms no part of the mechanism of labour in a pelvis of normal dimensions. That flexion occurs in a *justo minor* pelvis I think there is no doubt, but in the normal pelvis I believed the so-called flexion is the result of the rotation of the head bringing the occiput more into the axis of the canal and more within reach of the examining finger, thus making it appear to dip although it does not really do so.

Some of the results of the study of these sections and casts are entirely new, while others are a confirmation of what has been ascertained before. It must be remembered that conclusions drawn from a limited number of sections are by no means final; they must be revised and corrected as new sections are obtained. There are two general considerations I should mention before summing up these results: (1) Sectional anatomy is invaluable for teaching purposes; if we had a complete series, we could present the facts of labour to the student without any theorising, and he would commence his clinical work on a sure anatomical basis. (2) The difference between frozen sections and the living subject is not so great as one would imagine; there are changes after death, but these are not of such a nature as to invalidate the conclusions to be drawn. I shall not go into this question, but would refer you to the Laboratory Reports of the Royal College of Physicians of Edinburgh, in which Dr. Webster discusses the question fully.

To sum up, then, the results:

1. The shortening of the antero-posterior diameters of the bony pelvis by the soft parts is for the conjugate, at the brim $\frac{1}{2}$ inch, in the cavity $\frac{1}{2}$ inch, at the outlet $\frac{1}{2}$ inch; and for the oblique dia-

meter, at the brim almost 1 inch, and in the cavity still more, due to the projection of the obturator internus.¹⁵

2. The cellular tissue at the base of the broad ligaments is compressed by the sinking down of the uterus after delivery, so as practically to close the abundant sinuses.

3. The peritoneum is, during the second stage, lifted out of the pelvis anteriorly and somewhat elevated posteriorly, returning after labour to its original position.

4. The bladder is in part elevated, so that, while its neck does not change its position, a portion of the organ becomes abdominal.

5. The uterus in the interval between the pains shows a certain plasticity, like the uterus in pregnancy, but with this difference, that, while the uterus in pregnancy moulds itself on the spinal column and bony pelvis, the uterus during the second stage moulds itself on the foetus.

6. In retraction, the uterine wall becomes shorter and thicker, but not in the same ratio; while the vertical circumference of the walls is diminished by one-third, the thickness of the walls is increased to four times.

7. The lower portion of the anterior uterine wall is thinner than the rest before labour begins; this thinning is increased during labour. A corresponding thin part develops posteriorly. There is, therefore, in normal labour (that is, with no pathological resistance) a separation of the uterine wall into two parts.

8. The boundary line between these two parts persists when no contraction is present, and should therefore be called the "retraction," and not the "contraction" ring.

9. As a deduction from the foregoing it follows that once a body in the genital canal has passed below this ring, it will no longer have active muscle in the wall of the canal to operate upon it.

10. While the anterior vaginal wall retains, during labour, its usual length and thickness, the posterior extends to more than twice its former length and becomes very thin.

11. The foetus is elongated during the second stage by the straightening of the spinal column.

12. The flexion of the head becomes, during labour, less pronounced than it was during pregnancy.

13. Rotation of the head takes place before that of the shoulders, and is therefore independent of it.

14. The process of the moulding of the head consists in a pushing of the occiput underneath the parietal bones, and a distortion of the plastic head towards its unsupported part.

15. The placenta does not become separated as a result of the diminution of its site during the second stage.

16. The membranes become separated, during the second stage, up to the retraction ring but not above it.

[NOTE.—In the first portion of Dr. Barbour's paper (BRITISH MEDICAL JOURNAL, November 1st) the third line on p. 1004, col. 1, was, by a printer's error, misplaced. Its proper position is on p. 1003, between lines 2 and 3 from the bottom of col. 2.]

THE EMPLOYMENT OF THE ELECTRO-MAGNET IN OPHTHALMIC SURGERY: ADDITIONAL CASES AND REMARKS.

By SIMEON SNELL,

Ophthalmic Surgeon to the Sheffield General Infirmary and to the Institution for the Blind.

In previous communications¹ I have recorded thirty-seven cases in which the electro-magnet had been employed. I propose to add to this number another thirty-seven,² thus bringing the total up to seventy-four.

The instrument used by me, and which it is needless to describe afresh, is depicted in the woodcut. I can repeat what I have said before respecting it: "Increased experience has rendered more positive the opinion before expressed, that it meets well the objects we have in view."

The cases are described sufficiently in detail, and it is only in-

¹⁵ The measurements for the antero-posterior diameters represent the soft parts compressed as the second stage is in progress; those for the oblique diameter represent the uncompressed soft parts as in pregnancy.

¹ BRITISH MEDICAL JOURNAL, 1881, vol. i, p. 843; 1883, vol. II, p. 957; 1885, vol. I, p. 884; and *The Electro-Magnet and its Employment in Ophthalmic Surgery* (Churchill).

² The three cases recorded in addendum bring the number up to forty, and the total to seventy-seven.

tended to add brief general remarks respecting them, for I have dwelt at length on many points previously in my book and in different papers. Those instances in which failure to remove a piece of steel or iron occurred are reserved for separate consideration at the end of this article.

Half actual size.

Made by Cubley and Preston, High Street, Sheffield.

Lachrymal Sac (1).—This case is of special interest from the very unusual situation for a foreign body. G. B., aged 44, came to the infirmary on May 23rd, 1885. He was suffering from lachrymal obstruction. Two years and a half before he had been struck by a piece of steel. There was a small opening over the situation of the sac. This was enlarged, and, on introducing the electro-magnet, a "click" was heard. The opening was still further enlarged, and the fragment removed.

Conjunctiva (2).—E. B., aged 23. At 10.30 on August 31st, 1887, a piece from off a file which he was using as a punch hit the right eye. At 3.30 he was seen by me. There was then some ecchymosis over the insertion of the internal rectus, in which was a small projecting black point. The electro-magnet was advanced to this dark point and immediately removed a piece of steel, the size of a pin's head. It weighed 0.0005 gramme.

Sclerotic (3).—A. F. S., aged 37, a roll turner, was injured on July 31st, 1885, by the point of the punch, which he was striking, flying off and hitting the left eye. On August 14th, he attended at the infirmary, and a foreign body was discovered sticking in the sclerotic close to the inner sclero-corneal junction. The point of the electro-magnet was advanced to the fragment. The patient distinctly felt it drag. The conjunctiva was divided over it, and the piece of steel was then readily removed by the electro-magnet. It weighed 0.0002 gramme.

(4). G. H., aged 61, came to the infirmary on April 19th, 1886, with a piece of steel embedded in the sclerotic on the inner side of the right eye. It had been there for three weeks, but had not occasioned much discomfort. Cocaine was instilled, and the conjunctiva divided over the chip; the point of the electro-magnet was inserted, and the piece removed. It weighed 0.12 grain.

(5). W. M., aged 50, came to me on December 3rd, 1885. The day before he was using a machine for cutting up steel, and a piece from the "cutter" had hit the right eye. Surrounded by a band of ecchymosis was a dark mark on the inner side of the sclerotic; the interior of the eye was unaffected. The next day the orifice in the conjunctiva was enlarged, and a piece of steel readily removed with the magnet; it was sticking in the sclerotic, and was a narrow lance piece like the end of a needle. It weighed 0.002 gramme or 0.030 grain.

Cornea (6).—J. F., aged 53. He came to the infirmary on November 26th, 1886. A month before, the point of a penknife he was grinding had flown into the left eye. The chip of steel could be seen embedded in the centre of the cornea, surrounded with exudation. The eyelids were swollen. The point of the electro-magnet was applied to the cornea, and the chip was removed.

(7). H. S. First seen on October 27th, 1887. In the centre of the cornea was the black speck in the midst of greyish exudation. He had been struck by a splinter from a hammer eight days before. The electro-magnet was applied, and immediately effected its removal. It weighed 0.0001 gramme.

(8). Mr. L. came to me on April 6th, 1889, with a piece of steel embedded in the centre of cornea. It was removed by the electro-magnet; it weighed five milligrammes.

(9). C. R., aged 44, applied at the infirmary on May 17th, 1889, with a fragment of steel from the face of a hammer, for four days deeply embedded in the upper part of cornea. Could not be removed by spud. Point of electro-magnet used successfully. Weight of fragment 0.0002 gramme.

Anterior Lens Capsule. (10).—M. S., aged 33, a moulder, in June, 1886, whilst working at his trade, "a piece of boiling hot iron" flew into his right eye. He suffered no great inconvenience, but

vision gradually became dimmer. When seen on October 18th 1886 (four months after the accident) there was in the centre of the anterior capsule a little yellowish mark, which suggested the likelihood of a very minute foreign body. A small scar in the cornea, rather to the inner side of the centre, was discovered. The pupil was then dilated with atropine, and cocaine was instilled, and with a view to confirming the diagnosis the electro-magnet was held in close contact with the cornea. The mark on the capsule was noticed to gradually become darker. Suddenly a minute fragment flew forward to the posterior surface of the cornea. When, however, he lay on the couch for operation the fragment had vanished, nor could it be discovered in the dark room with focal illumination. He was again placed on the couch, and on the magnet being advanced to the cornea the fragment again sprang forward, and was guided to a convenient situation on the iris for removal, and the magnet was withdrawn. A small corneal wound was next made on the outer side, and the fine point of the electro-magnet was introduced, and the foreign body was removed with the greatest ease. He recovered well and left the infirmary in three days. On January 24th, 1887, the lens, which had become now completely opaque, was extracted without iridectomy, with a very satisfactory result. The fragment weighed 0.0001 grammes (0.0015 grain).

Iris and Anterior Chamber. (11).—A. L., aged 29, on July 21st, 1885, was punching a hole to make the bows of a pair of scissors, and a chip flew off the top of the punch and struck his left eye. He was admitted into the infirmary. The piece was lying in the iris. An incision in the cornea was made with an iridectomy knife. The point of electro-magnet was introduced, and the fragment immediately removed. There was little or no iritis; the pupil remained round and movable, and vision is stated later as $\frac{3}{8}$. The weight of the fragment was 0.0015 gramme.

Anterior Chamber (12).—H. O., aged 15, on August 6th, 1885, was striking a piece of iron with sharp edge tool, when a piece of this latter flew up hitting his right eye. He came to the infirmary immediately. The fragment was seen in the anterior chamber, having one end sticking in the iris. The next day (August 7th) the piece was seen to move on bringing the electro-magnet near the cornea. An incision was made in the cornea with an iris knife, and the point of the electro-magnet was introduced, and a small rod-shaped piece of steel, about an eighth of an inch in length, was removed. Recovery was perfect, and vision was as good as before accident. The piece weighed 0.0002 gramme. Thirteen months later it is noted that the lens is becoming opaque. He saw well up to within a few weeks. In 1887 the cataract was successfully operated upon.

(13). W. A., aged 33, struck by piece of steel from off hammer. Admitted into infirmary February 25th, 1886; accident previous day. Wound of cornea just below pupillary margin; splinter visible in iris at lower part. The puncture in the cornea was reopened and enlarged, and the piece of steel was removed by the smallest curved terminal of electro-magnet. Portion of iris protruding was removed. March 23rd. V= $\frac{3}{8}$. Weight of fragment, 0.005 grammes.

(14). I. P., aged 42. On March 5th, 1886, he was struck by a piece of steel in the right eye. When he came to the infirmary on April 12th, the fragment was seen lying in the iris at the outer side near the periphery. An incision was made in the cornea at the outer side, and the piece of steel was readily withdrawn on the point of the electro-magnet; it weighed 0.09 grain.

(15). J. W., aged 33, first seen on June 7th, 1887. Nine years before he had been hit in the right eye by a piece of steel from another man's chisel. He was then an inmate of a hospital for three weeks, and the eye became quiet. Eight months later he had a recurrence of pain and inflammation. Since then, up to a few days before being seen, the eye had remained quiet; now he was suffering great pain, and the surface of the eye was much reddened. Lying on the iris below was a dark body, irregular on its surface. The pupil was small, and did not dilate to atropine; it was filled with the remains of opaque lens. It was thought that the dark body on the iris was a fragment of steel surrounded by old exudation. The diagnosis was at once made positive, for, on advancing the electro-magnet to the cornea, the foreign body followed the course of the magnet in all directions. It was finally deposited on the iris at a convenient place for removal. This was effected by the electro-magnet through a small corneal incision on the outer and lower side. He made an excellent recovery, and vision is just the same as before, namely, good light perception. He remained in the infirmary a few days. The chip weighed 0.01 gramme. It seems not improbable that in the first instance the

chipping was located in the lens, and that it had fallen later—perhaps quite recently—into the anterior chamber.

(16). C., aged 16. On August 27th, 1887, was struck in the right eye with a piece from off a chisel. He applied at the infirmary; and it was seen sticking in the iris on the outer side. Mr. Priestley, assistant house-surgeon, slightly enlarged and reopened the wound in the cornea, and inserted the point of the electro-magnet and removed the fragment. It was about the size of a small pin's head.

(17). A. M., aged 23. Admitted into infirmary on June 1st, 1888. Accident occurred twenty hours previously. Was engaged cutting iron with shears when a small piece struck right eye, penetrating cornea, and lodging in the iris. The fragment was seen lying partly embedded in the iris close to the margin of the pupil (outer side). On applying electro-magnet to the cornea the foreign body at once sprang forwards, dragging the iris with it. A small puncture was then made with a broad needle and the fine point of electro-magnet introduced, and by this means the piece of metal was at once removed. June 22nd. Discharged quite well: V = $\frac{2}{3}$. Fragment weighed 0.0004 gramme.

(18). J. J., aged 48; from Nottingham. Admitted April 6th, 1889. Accident two days previously; piece of steel from chisel hit left eye. Fragment embedded in iris above and to outer side; covered with exudation; some hypopyon. Nature of foreign body at once evident by the movements occasioned by approaching the magnet. It was removed through a small corneal opening with the electro-magnet. He left the infirmary on April 13th, and wrote letter testifying to the satisfactory result obtained. The piece weighed 1.8 milligramme.

(19). T. H., aged 44; was struck on the left eye by a splinter whilst rivetting. A few hours after he applied at the infirmary—May 30th, 1890—a rather large flat piece of steel was seen lying in and under the iris at the outer side and projecting into the pupillary space. On approaching the magnet it very distinctly moved about. It was extracted through a corneal wound, and the iris in which it was entangled was also excised. The lens capsule had been opened. The fragment weighed 0.40 grain. Lens removed: V = $\frac{2}{3}$.

The cases of foreign body in the anterior chamber, and lying on or embedded in the iris, constitute a large proportion of those now recorded, being nine out of the total of thirty-one in which pieces were extracted. They are very satisfactory cases, and are, in my opinion, eminently a class for which the electro-magnet is fitted to render distinct aid. All these instances were successful in recovery of vision, except the case of the man who had had the foreign body located in his eye for nine years, and he remained as he was before. In only two cases was the iris excised. In both these the portion of steel was so entangled that after it had been removed from the eye it was necessary to cut off the iris to free it from that membrane. The aid derived for diagnosis in these cases is clearly shown by the action on the suspected foreign body of bringing the electro-magnet into contact with the eye. A further advantage is illustrated in these cases, namely, of guiding, in some instances, by the electro-magnet a splinter from one part to another, and then by withdrawing the instrument the piece may be allowed to drop on the iris again at a situation more suitable for removal. As indicating the time that elapses before such cases come under observation, it may be mentioned that four presented themselves at once or shortly after the accident, two after the lapse of one day, one after two days, another after thirty-eight days, and another after nine years.

Vitreous. (20).—G. C., aged 19. On May 29th, 1885, he was using a joiner's chisel, which broke in the middle of the edge, and a piece flew into his left eye. He was admitted into the infirmary next day. At this time the point of the electro-magnet was pressed into the wound, but no very diligent search was made, because, though it was thought possible a piece of steel was inside the eye, it was not certain, hence the electro-magnet was used cautiously so as not to do harm. There was hæmorrhage into the vitreous, but no foreign body could be seen. The wound was situated in the sclerotic at the inner side; in the palpebral fissure it commenced external to the ciliary region, and extended horizontally outwards. Later the hæmorrhage cleared very slowly, and in the vitreous at its posterior and lower part behind the lens was noticed a yellowish object. This was supposed to be the piece of steel coated, but on approaching the electro-magnet to the globe no appreciable movement was detected, though it seemed when looked at as if its situation had been changed a little. On August 31st, consent was given for an endeavour to

remove the foreign body, or to enucleate if it was deemed necessary. Cocaine was freely instilled. A flap of conjunctiva was dissected up below so as to expose the sclerotic between the internal and inferior recti towards the equator. The old wound was reopened, and joined by another, forming a T-shaped opening. The point of the electro-magnet was introduced, a lot of greenish fluid escaped, and the globe greatly collapsed. The electro-magnet attracted the piece of steel, but the wound had to be enlarged still more before it could be withdrawn. The conjunctival wound was closed by sutures; the globe recovered its fulness, and he was soon discharged, with a painless and good-looking eyeball. The fragment of steel weighed 0.0597 gramme, and was a long pointed piece.

(21). G. A., aged 24, was at his work at the Birley Colliery, and was hit by a piece of steel in the left eye, at 8 A.M., on May 24th, 1886. He was seen by me the next day. The lens was then partly opaque, and there was hæmorrhage into the vitreous, so that no reflex could be obtained with the ophthalmoscope, nor could a foreign body be seen. There was a horizontal wound in the sclerotic running up to the cornea. A small-sized point was attached to the electro-magnet and introduced through the wound. Resistance was felt, and the patient complained of a "dragging sensation." The wound was enlarged, and a large end attached to the magnet. This was again introduced. A "click" was heard, and with little difficulty a large piece of steel weighing 3.2 grains, was withdrawn. The eyeball was thoroughly disorganised, but a few days later, on the suggestion of the propriety of enucleation, the patient decamped.

(22). J. B., aged 33. Four days before admission into the infirmary, on June 8th, 1886, he was struck in the right eye by a piece of steel. The wound was situated at the lower and inner portion of the sclerotic, reaching to the periphery of the cornea. The anterior chamber was filled with exudation; no foreign body was visible. Cocaine was instilled; the old wound was reopened; the point of the electro-magnet was pressed into the vitreous chamber, a "click" was heard, and a piece of steel weighing 1.342 grain was removed. A presentable eye with good light perception was the result.

(23). J. C., aged 38, a puncher. On November 2nd, 1886, he was punching some steel plates at a press, when a chip from one of the plates flew off and struck him on the outer side of the left eye. He came immediately to the infirmary, and was seen by me three-quarters of an hour after the accident. On the outer side of the sclerotic was a jagged wound just a quarter of an inch long. Just in the wound could be seen what appeared to be the end of a piece of steel. The electro-magnet, armed with the largest attachment, was placed against the wound, and a large piece of steel measuring more than one inch in length, and weighing 9.018 grains was withdrawn with the greatest facility. The sclerotic wound was closed by uniting the conjunctiva over it. The wound healed immediately. The vitreous was filled with blood, which gradually cleared, and in January, 1887, he could see the time by a watch.

(24). W. B., aged 37, a forger, came to the infirmary on November 15th, 1886. Three days previously a chip from off a hammer head struck his left eye. There was a tiny scar in the cornea (inner side); an indentation of the iris, and behind the lens a small apparently movable opacity. The electro-magnet was advanced to the front of the globe without any appreciable effect on this whitish mark. November 21st. Cocaine having been instilled, an incision was made through the sclerotic between the inferior and internal recti, and a fine point of the electro-magnet inserted with no effect. The curved extremity which was here indicated was misplaced and the straight one could not reach the desired spot in the vitreous. A second incision was then made between the superior and internal recti, and on the electro-magnet being introduced and advanced towards the opacity the chip of steel was extracted. It weighed 0.041 grain. The final result was a somewhat shrunken, but presentable and painless globe.

(25). W. S., aged 32. He and a mate were striking a piece of steel, and a portion from his mate's hammer flew off, striking the left eye. It passed through the upper eyelid, and sclerotic, and became lodged in the vitreous deep down and backwards, surrounded with hæmorrhage, and seemed entangled in the tissues. He was admitted into the infirmary on the day of accident, July 30th, 1888. Vitreous had freely escaped, and the globe was collapsed. The wound in sclerotic above was some-

³ This case is recorded in my paper in *Transactions of Ophthalmological Society* for 1887 on Suturing of Sclerotic Wound.

what enlarged, and the electro-magnet was inserted and passed down to the supposed situation of foreign body. It did not immediately extract the splinter, but on being reintroduced it was detected and removed. The conjunctiva was united over the scleral wound by sutures. Shrinking of globe took place. The fragment weighed 0.560 grain.

(26). S. C., aged 29, admitted into infirmary on September 3rd, 1888. Portion of steel from punch had penetrated upper part of cornea of left eye. No foreign body visible, but a streak of blood was seen leading to back of lens. The electro-magnet was introduced, and the fragment removed. The eye continued painful and inflamed. September 10th, softened lens matter let out through corneal wound. Subsequently the eyeball shrank. The fragment weighed 1.11 grain. A similar unfortunate accident befell the right eye six years before, and the case is recorded in my book on the *Electro-Magnet in Ophthalmic Surgery*, p. 39.

(27). F. C., aged 16, an apprentice at ironworks, was "chipping" on September 28th, 1888, when a piece of steel struck the right eye. He came to me immediately. A wound was noticed in the cornea on the inner side, rather above the edge of pupil; the lens was opaque, and the anterior capsule was opened. Reaching through the lens, downwards, backwards, and outwards, was the fragment of steel. The wound in cornea was a little enlarged, and the splinter immediately removed with electro-magnet. The piece of steel was extracted in about an hour after the accident. No vitreous escaped, but the size and direction clearly indicated that a portion of it had penetrated that cavity. Progress was excellent; lens cleared and $V. = \frac{3}{8}$ (with glass) and he read J 1.

(28). G. T. H., aged 19, on February 18th, 1889, was struck with piece of steel from anvil or hammer. Admitted into infirmary an hour after accident. There was a wound of cornea at its lower and inner margin, and perforation of iris, the direction indicated of foreign body being upwards, backwards, and slightly outwards. Neither by focal illumination nor by ophthalmoscope could the foreign body be seen. A wound was made in the sclerotic towards the equator, below and in; through this the electro-magnet was introduced. After several trials a bit of steel was removed; it had been lying in the vitreous below, and was possibly somewhat entangled in the tissues. The result was a painless shrunken globe. Weight of fragment 0.0072 gramme.

(29). G. H., aged 31, came to the infirmary May 21st, 1889, an hour and a half after a piece of steel from a planing machine striking the right eye. A wound was situated at the upper and inner corneal margin; iris prolapsed; and there was hæmorrhage into the anterior and vitreous chambers. No foreign body could be seen. The electro-magnet was introduced through the wound, at first without result, but a second time, on passing the terminal behind the lens, a "click" was heard, and a small piece of steel was easily extracted. The prolapsed iris was excised. The lens became opaque and the globe shrank. The piece of steel weighed 0.0858 gramme. Mr. H. Rhodes, assistant house-surgeon, treated this case.

(30). H. N., aged 18. On October 23rd, 1889, he was breaking steel, and, as usual, fragments were flying in all directions; one piece struck his nose, another below left eye, a third on the forehead, and fourth flew into right eye. The next day he came to the infirmary. At the upper part of cornea was a transverse wound about a quarter of an inch long. The electro-magnet held at the wound failed to detect a piece of steel. The next day (25th) the wound was reopened, and the electro-magnet introduced and passed through the lens into vitreous; immediately a "click" was heard, and the fragment extracted without difficulty. On December 12th the globe was enucleated. Weight of fragment 0.05 gramme.

(31). — B., aged 27, admitted into infirmary on February 18th, 1890. Piece of steel from face of hammer had struck the left eye, causing a wound half an inch long, reaching from the cornea through the ciliary region. The anterior chamber was filled with blood. The electro-magnet was passed in at wound and through broken-up lens into vitreous, and a piece of steel was removed weighing 4.10 grains. The eyeball was enucleated on February 25th.

In twelve cases foreign bodies were lodged in the vitreous. These are an unfortunate class, because, although success may attend the use of the electro-magnet, and the portion of steel or iron be removed, recovery of sight only occurs in a minority of the cases. In many the nature of the injuries, size and situation of the wounds are such that, quite independently of the location of

a foreign body in the interior of the globe, the hope of recovery of vision is but little. The importance of almost immediate removal of the particles of metal cannot be too strongly urged. The two cases which recovered sight applied at once after the accident. Half the cases were not seen until the next day, and in two instances not until the third and fourth day. Two eyes were enucleated; in one or two others the same procedure was suggested, but not performed. Other cases retained painless and presentable globes.

An inquiry has been sometimes made as to how the vision recovered in these vitreous cases lasts. To this I would reply that five cases which I have in my mind, mentioned in this paper and in previous ones, have lasted well. One man, the first in which the electro-magnet was employed, I constantly meet, and he possesses as good sight now as he did before the accident.

Let us now proceed to consider the cases in which failure to remove a foreign body with the electro-magnet has resulted. I do not refer to the many doubtful cases in which the electro-magnet has been advanced to or into the wound; those have afterwards recovered well, and given no further evidence of the presence of a foreign body. No record has been kept by me of these cases. In those to be now mentioned the presence of a splinter of steel or iron was recognised. In the first two it will be seen, after enucleation, that the foreign bodies were proved to have been so situated as to be beyond the capacity of the electro-magnet. In the next two, the fragments were fixed in the retina, and one case was better after incision of the sclerotic for using the magnet. Cases like these demonstrate how the electro-magnet will often fail to remove splinters which are in any way fixed, and the same remark applies to fragments coated over or surrounded with effusion. In my previous articles I have dealt with this subject, and space prevents my going into detail again now. The last two cases are, however, examples.

Sclerotic.—(32). G. B. In March, 1884, whilst at work, a piece of steel flew from his hammer into the left eye. He came to the infirmary with a wound of the cornea and traumatic cataract. The softened lens was let out, and the electro-magnet was introduced, but no foreign body was detected. The patient did not think there was a piece of steel in the eye, nor was there any decided evidence then of its presence. The eye continued painful, but he declined to submit to enucleation. In October, 1885, he gave his consent, and on the 25th the eyeball was enucleated, cocaine being used instead of a general anæsthetic. The chip of steel was now found embedded in the outer side of the sclerotic at the back, quite beyond the reach of a magnet.

Optic Disc.—(33). The patient, a middle-aged man, met with an accident to the right eye on Christmas Day, 1886. There was a large corneal wound, and the lens was opaque. The day following the lens was removed, through the original wound enlarged, and the interior searched with the electro-magnet without result. Later the eyeball was enucleated. The piece of steel was found embedded in the optic papilla, and projecting into the interior, and was visible at the point of section of the optic nerve. The

condition is depicted in woodcut. A case with a large fragment similarly situated in the optic disc is described in my book, *Electro-Magnet*, p. 48.

Retina.—(34). S. T., aged 14, came to the infirmary on July 19th, 1886. He had been struck with a splinter of metal in the right eye seventeen days previously. At this time there was a small scar on the outer side of the cornea in the palpebral fissure. Corresponding to this scar was a depression of iris, and a fixing of it to the lens capsule. A little streak of cloudiness ran through the lens at its periphery, and there was hæmorrhage in the vitreous. This indicated the course the fragment of steel had taken. Vision was little more than light perception. In the vitreous was observed a somewhat glistening spot. This was thought possibly to be the foreign body. It may be mentioned that the boy suffered a good deal of pain, and the surface of the eye was somewhat inflamed. A conjunctival flap was first separated, and then the sclerotic was incised between the external and lower recti. The point of the electro-magnet was advanced once up to the situation of the glistening spot, and withdrawn without any foreign body being

attached. The wound in conjunctiva was then closed with sutures. Relief to pain followed, and the condition of eye improved. On October 19th it is noted: "The eye has gradually cleared up and the vitreous has now become clear; the opacity of lens has not become greater and tension of eyeball is good. In the fundus, to the outer side of the disc, at a little distance from it, is a whitish spot of exudation nearly as large as the disc. This appears to be the foreign body, although no fragment is definitely visible. $V. = \frac{1}{2} \phi$."

(35). J. R., aged 31, was struck by a piece of steel, which had passed through the cornea and lens into the vitreous. The piece of steel was seen in the vitreous close to the retina. The vitreous was a little turbid, and it could not be positively affirmed whether the fragment was fixed in the retina or not. The case was explained to the patient, and it was decided to attempt removal with the electro-magnet. This was introduced, after separating the conjunctiva as in the preceding cases, through an incision between the inner and lower recti. It was passed up towards the position indicated, but without success. In a day or two he was as well as before the operation.

(36). G. W., aged 27, admitted into infirmary October 4th, 1888. Four days previously left eye injured by piece of steel from cutter for forks. On admission, suffering acute pain; severe iritis, hypopyon; penetrating wound in ciliary region, above and a little to inner side. Electro-magnet introduced without success. Enucleation on October 29th. Minute fragment found embedded in effusion at the back of vitreous.

Vitreous. (37).—N., whilst at his work on August 12th, 1885, and using a hammer and chisel, was struck by a piece of steel in the left eye. He immediately came to the infirmary, when a wound was found in the upper and inner portion of the sclerotic. The vitreous was filled with blood and no foreign body was visible. The magnet was advanced to the wound, but no search was made. The hæmorrhage in the vitreous gradually cleared up, and the foreign body was observed coated over with yellowish white matter in the vitreous behind and below the lens. On October 6th the electro-magnet was introduced through an incision in the sclerotic, between the external and inferior recti. It was advanced up to the whitish mass and was felt to push it in front of it, but no sufficient attraction to move the fragment was detected. Enucleation was advised, and performed on October 26th. The fragment was found in the situation named surrounded with a dense mass, almost organised exudation, and the piece itself was thickly coated.

ADDENDUM.

Retina-Vitreous (38).—J. W. C., aged 21, first seen June 21st, 1890, six weeks after injury to left eye; fragment fixed in retina below disc, vision $\frac{2}{3}$. Some months later the foreign body had shifted its position and could not be seen, vision gradually deteriorated, and in consequence of pain, iritis, etc., sclerotic was punctured (August 4th, 1890), and fragment extracted with point of electro-magnet. Now $V =$ fingers, and is improving. Fragment weighed 0.188 grain.

Optic Nerve-Orbit (39).—J. W., aged 17, accident to left eye September 26th, 1890. Splinter passed through edge of cornea and iris and lens. September 27th. Electro-magnet passed into vitreous, "clicked" fragment at back of eye but did not extract it. October 7th. Globe enucleated; scissors pressed splinter out of nerve at time of section, and it was removed loose from orbit with electro-magnet. Splinter weighed 1.01 grain.

Cornea (40).—J. C., splinter embedded in cornea three days. August 26th, 1890. Tissue raised over it and removed with magnet. Weight 4 milligrammes.

DR. GUSTAVE MONOD, some time Professor in the Faculté de Médecine, Paris, died on October 16th, at the age of 86. He belonged to a highly respected family of Swiss origin, several members of which have been prominent pastors in the French Protestant Church. Dr. Monod leaves a son who is an *agrégé* of the Paris Medical Faculty and surgeon of the St. Antoine Hospital.

FACTORY MEDICAL SERVICE IN RUSSIA.—The Russian Government is about to issue an order according to which: 1, every factory or mill situated at 8 *versts* (about $8\frac{1}{2}$ kilometres) or more from a town shall have a hospital of its own, containing from ten to seventy beds, according to the number of hands employed by the proprietor, as well as its own dispensary; 2, a special doctor and a medical assistant (*Feldsher*) must also be in attendance; 3, the district medical officer must exercise sanitary control of all factories and mills existing in his district,

THE TREATMENT OF PERFORATING ULCER IN LEPROSY.

Presented to the Section of Surgery at the Annual Meeting of the British Medical Association at Birmingham, July, 1890.

By BEAVER RAKE, M.D. LOND.,
Medical Superintendent of the Trinidad Leper Asylum.

I HAVE spoken elsewhere¹ of the treatment of perforating ulcer by stretching the external popliteal or great sciatic. This is followed by good results in many cases, especially when the ulcer is accompanied by pain in the course of the nerves.

During the past year I have tried in several cases another mode of treatment which is simpler, and is often efficacious. It consists in passing a bistoury through from the ulcer on the sole of the foot to the dorsum, and cutting straight forwards through all tissues, bringing the bistoury out between the toes. The incision is then stuffed with lint to arrest hæmorrhage and prevent immediate closure of the wound, which is then left to granulate up from the bottom. If the ulcer should happen to be near the inner or outer side of the foot the knife can be brought out on either of these surfaces as the case may be. Subjoined are a few examples:—

CASE I.—I., Hindu, aged 49; has suffered from anæsthetic leprosy for thirteen years. January 3rd, 1890. Perforating ulcer of right foot. Bistoury passed through to dorsum and all tissues slit up forward to between toes. Wound stuffed. January 8th. A little swelling of dorsum. January 27th. Wound opened up again and some dead tissue scraped away. February 1st. Incision granulating up from bottom; still some pain in foot.

CASE II.—K., Hindu, aged 40; suffering from anæsthetic leprosy for two years. May 8th, 1889. Left foot swollen. Sinus between fourth and fifth toes incised. Much granulation tissue scraped away. Bone too firm to come away. May 22nd. Foot still swollen. Loose head of metatarsal removed from between last two toes. Wound plugged with lint. May 24th. Abscess has burst on dorsum. Probe passed from this to sinus between toes and all tissues slit up. Wound stuffed with lint. February 1st, 1890. Incision firmly healed, with exception of small ulcer on third toe. No pain or swelling.

CASE III.—K., Hindu, aged 35; suffering from anæsthetic leprosy for five years. January 8th, 1890. Left great toe amputated. January 13th. Sinus opening on sole near stump; probe passed through to dorsum and all tissues slit forward. Incision stuffed with lint. February 1st. Incision nearly healed. Granulating surface where toe was amputated. No sinus or dead bone.

CASE IV.—B., Hindu, aged 42, suffering from anæsthetic leprosy for six years. August 21st, 1889. Two perforating ulcers on left sole, one between first and second toes, the other between third and fourth. Bistoury passed through to dorsum in each case, and tissues slit forward. Incision stuffed with lint. August 28th. Head of first metatarsal removed. August 30th. Left great toe amputated circularly. September 9th. Fragment of bone removed. October 2nd. Fragments of second metatarsal removed. November 1st. More fragments removed. February 1st, 1890. Both incisions firmly healed; thick cicatrix. No pain.

CASE V.—S., Hindu, aged 44, suffering from anæsthetic leprosy for seven years. June 15th, 1889. Perforating ulcer of right foot. Probe passed through to dorsum and counter-opening made. July 29th. Bistoury passed through, and all tissues slit forwards to between toes. Incision stuffed with lint. August 5th. Granulating well; no pain. Another sinus slit up. August 16th. Necrosed head of bone loose; removed. Granulations look healthy. August 21st. Incision healing well from bottom. February 1st, 1890. Incision firmly healed; long thin cicatrix. Chronic ulcer still on sole in old place; not perforating; no pain.

CASE VI.—E. R., negro, aged 30, suffering from anæsthetic leprosy for five years. August 16th, 1889. Perforating ulcer of left foot. Bistoury passed through to dorsum and tissues slit forward. Fragments of bone removed; wound stuffed. September 13th. Incision granulating at bottom; sides cicatrising. December 6th. Perforating ulcer of right foot. Probe passed to dorsum, and all tissues slit forward with bistoury. Incision in left foot has healed well; deep groove and firm cicatrix at bottom.

¹ Report on the Trinidad Leper Asylum for 1887, and *Lancet*, September 17th, 1887, p. 593.