

**On the employment of the magnet and electro-magnet in the removal of iron & steel fragments from the interior of the eye / by Simeon Snell.**

**Contributors**

Snell, Simeon, 1851-1909.  
University College, London. Library Services

**Publication/Creation**

[London] : [Office of the British Medical Association], [1881]

**Persistent URL**

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*16.*

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AND

ELECTRO-MAGNET

IN THE REMOVAL OF

Iron & Steel Fragments from the Interior of the Eye.

BY SIMEON SNELL,

*Ophthalmic Surgeon to the Sheffield General Infirmary and to the  
Institution for the Blind, and Lecturer on Diseases of the Eye  
at the Sheffield School of Medicine*

REPRINTED FROM THE "BRITISH MEDICAL JOURNAL,"

*May 28th, 1881.*

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IN THE TREATMENT OF

Iron & Steel Fragments from the Interior of the Eye.

By SIMON SHERIDAN

Author of "The Principles and Practice of the Treatment of the Eye," and "The Principles and Practice of the Treatment of the Ear," published by the Medical and Surgical Society of London.

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LONDON: 1881.

PRINTED BY THE MEDICAL AND SURGICAL SOCIETY, 11, BEDFORD SQUARE, LONDON, W.C.

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ON THE EMPLOYMENT OF THE

# MAGNET AND ELECTRO-MAGNET

IN THE REMOVAL OF IRON AND STEEL  
FRAGMENTS FROM THE INTERIOR  
OF THE EYE.\*

By SIMEON SNELL,

Ophthalmic Surgeon to the Sheffield General Infirmary, and Lecturer on  
Ophthalmic Surgery, &c.

THE employment of the magnet was advocated, according to Manché, as long ago as 1646 by Fabricius Hildanus, and he used it apparently at the suggestion of his wife, but confined its application to the removal of splinters of iron from the cornea. In the BRITISH MEDICAL JOURNAL of last year (vol. ii, p. 83), I recorded an extract from a work published in 1745 by a Dr. S. Milhes, giving a case where a "piece of iron or steel stuck in the iris," and, failing to remove it with a small spatula, he "applied a loadstone to it, and immediately it flew out."

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\* Read before the Sheffield Medico-Chirurgical Society, February 24th, 1881.



It is, however, to Dr. McKeown of Belfast that we are indebted for drawing attention to the great value of this procedure in the removal of fragments of steel or iron from the interior of the eye. He recorded, in 1874 (*BRITISH MEDICAL JOURNAL*, 1874, vol. i, p. 800), a case in which, by its aid, a piece of metal was removed from the vitreous humour; and more recently has published two other cases (*BRITISH MEDICAL JOURNAL*, 1878, vol. i, p. 644). Hirschberg (*Berliner Klin. Wochenschrift*, 1879, No. 46, and *BRITISH MEDICAL JOURNAL*, 1880, vol. i, p. 778) has since related a case in which, with the electro-magnet, he removed a fragment of iron from the vitreous body; and Knapp has also recorded a case in which he employed it successfully (*Knapp's Archives of Ophthalmology*, vol. ix, No. 2). Mr. McHardy, before the Clinical Society, in 1878, mentioned a case of interest, where a piece of metal, sticking in the lens capsule, was drawn into the anterior chamber by a powerful magnet held at some little distance from the eye, its removal being thereby facilitated.

It will thus be seen, that the number of cases recorded in which this plan has been adopted are few; but there can be little doubt that it is a procedure of the highest value, and destined to preserve vision to many eyes, whilst in others it may at least secure a presentable organ, and one free from fear of irritation.

There are two modes in which we may apply the magnetic force, either in some form of simple permanent magnet, or as the electro-magnet. Dr. McKeown used the first of these in his cases, and employed a bar-magnet tapered at each extremity; but the electro-magnet is a much more efficient instrument. The difficulty is to get a bar magnet, exhibiting sufficient power at an extremity small enough for our purpose to serve practically in the detection and removal of a piece of steel or iron. That, however, one of this character possesses sufficient power for many instances, is proved by McKeown's cases. My experiments also in this direction have shown me that considerable attractive force can be effected by different kinds of bar-magnets. One magnet I had made was a single steel bar, thirteen inches long, and tapered at one extremity to a point a line and a half wide, and three-quarters of a line thick. A few coils of soft iron-



wire passed round the bar kept the magnetic current intact. This magnet possessed considerable power; and I almost immediately had an opportunity of testing its efficiency, or one somewhat smaller, though unsuccessfully, in the following case.

A miner, in one of the Derbyshire mines, was engaged in boring for the purpose of blasting, and a piece of the drilling instrument had flown off and struck his eye. The medical man who saw him advised his coming to the Sheffield General Infirmary. There was then a large wound in the cornea, the lens was opaque, and the foreign body appeared to have lodged in the vitreous humour. After the opaque and softened lens-matter was removed, the magnet above-mentioned was passed into the vitreous body, but failed to detect the piece of steel, though the subsequent removal of the eyeball demonstrated the fragment lying at the fundus oculi. I have not the slightest doubt that, had I only had by me the electro-magnet described further on, the portion of steel would have been removed with the prospect of at least a presentable organ being preserved.

Of course, in the bar-magnet referred to, the size of the extremity is somewhat larger than convenient for ordinary use, and a further tapering would reduce its attractive force. Gruening of New York, after various experiments, devised a magnet, formed of a number of cylinders joined together and united with a cap at each end; and at one extremity he inserted a needle 52 millimètres long, 1 millimètre wide, and 0.3 thick. This instrument will support from the point a key weighing twenty-eight grammes (nearly one ounce). The attractive force of this magnet seems hardly greater than the simple bar-magnet I have described, and, as will be noticed further on, is very little compared to a well-made electro-magnet. Hirschberg and Knapp employed electro-magnets in their cases, and I have myself made use of them in two cases\* successfully. The first was the following.

James C., aged 33, whilst engaged, on September 10th, 1880, in striking an iron plate with a hammer, was hit in the right eye by a piece of metal. This happened in the course of the forenoon, and he lost no time in applying at the

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\* I have now used the electro-magnet in four cases. In addition to the case mentioned in Addendum, on June 13th, I employed it in the case of a young man with a fragment of metal in his lens, and treated him in a similar manner to C. S.



Sheffield General Infirmary, where I happened to be, so that I saw him immediately. On the inner side of the sclerotic, at some little distance from the cornea, and in the middle of the palpebral fissure, was a small horizontal wound. Examination with a fine probe at once disclosed the fact that the greater portion of the foreign body was lying in the vitreous humour, but that it clung to the inner sclerotic wall sufficiently to enable one to detect it with the probe. The situation of this piece of steel was such, that it appeared only too evident that any attempts to move it, with forceps or otherwise, would most probably result in its being pushed further into the interior of the globe. The only electro-magnet at hand was one which was too large to introduce into the wound, and therefore it was decided to place it at the surface of the wound, which at the same time was carefully a little enlarged, in order to enable the fragment of metal to find a passage outwards more easily. After the electro-magnet had been applied a little time, the foreign body was found to be fairly in the wound, and it was readily removed with a fine pair of forceps. The patient remained in the infirmary for a few days, and the sclerotic wound healed immediately; and on a later date it was noted that vision was perfect ( $\frac{2}{20}$ ). On February 24th, 1881, I showed the patient before the Sheffield Medico-Chirurgical Society. With the ophthalmoscope, a faint scar was visible, corresponding to the wound in the ocular tunics.

I now set to work to make an electro-magnet, which, whilst of sufficient force, should be one which could be conveniently used. After various experiments, the one depicted in the woodcut was arrived at (fig. 1), which answers admirably the purposes for which it is intended.\* The magnet is tapped, and into it screws a needle which fits closely on the extremity of the magnet by a projecting cap. Several of these needles are provided, some longer or shorter, and straight or curved at the end; and I have used them of steel or iron. The facility with which these needles may be inserted allows one to use a longer or shorter one, as may be desired (fig. 2). Practically, the needle, screwed in with the cap fitting closely on the extremity in

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\* Improved Electro-Magnets of equal efficiency, but reduced in size, can be obtained of the makers, Messrs. Cubley and Preston, Sheffield.



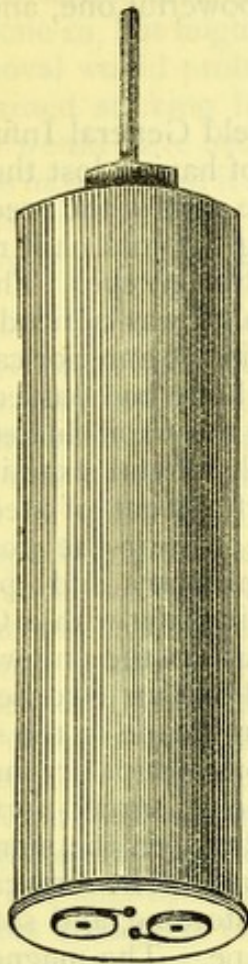


Fig. 1.

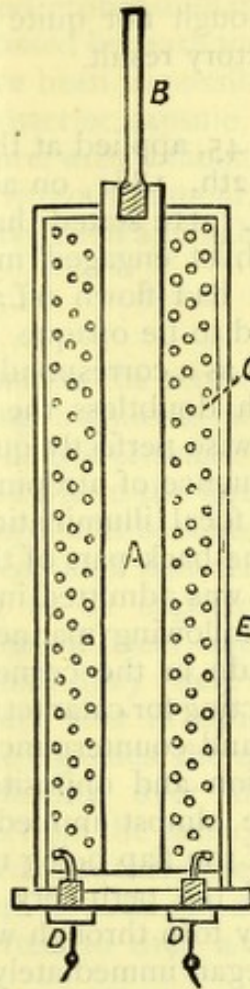


Fig. 2.

A. Soft Iron Bar, 5 in. long, 7-16 in. diameter. B. Steel Needle, 1½ in. long, tapped into end. C. Coil of No. 16 Silk covered Copper Wire, each coil insulated with gutta percha tissue. D D. Terminal Screws to receive Battery Connections. E. Ebonite Case.

the way I have mentioned, conducts the magnetic force perfectly. Attached to a quart bichromate battery, and with a needle affixed two inches long, and in size corresponding to a little under a bore of two millimètres, the electro-magnet represented in the woodcut is able to pick up and hold suspended from the point a bunch of keys or other object equal to six ounces, or one hundred and seventy-five grammes. The makers assure me that, in consequence of the size of the copper coil, the power of the instrument would greatly increase with additional battery-force, and that it would probably be able to suspend as much as a pound.

Quite recently, I had an opportunity, in a case which presented itself, of using an electro-magnet of the description



just given, though not quite such a powerful one, and with a very satisfactory result.

C. S., aged 45, applied at the Sheffield General Infirmary, on January 12th, 1881, on account of having lost the sight of the left eye. He stated that on the 21st of the preceding December, whilst engaged in turning a "cold chill roll," a piece of steel had flown off and hit his left eye. The lens was now found to be opaque, and a mark was noticed in the cornea, as well as a corresponding one in the anterior capsule, through which doubtless the foreign body had passed; the eye was otherwise perfectly quiet, and the pupil dilated well under the influence of atropine. With careful examination by means of focal illumination, the fragment of steel was observed at the back part of the lens, on or in the posterior capsule. He was admitted into the infirmary, and operated upon in the following manner. An incision with a Gräfe's knife was made in the cornea, similar to the one which I adopt in extracting for cataract by a shallow flap lower section; the puncture and counterpuncture being made in the sclero-corneal junction and opposite the lower pupillary margin, and the knife almost immediately being turned forwards, the summit of the flap being midway between the margin of the pupil and the periphery of the iris. The lens-capsule was next freely torn through with a cystotome, and softened lens matter began immediately to escape. The magnet was next introduced and withdrawn without having caught the foreign body; but, on its being again passed in and a second time withdrawn, the piece of steel was found attached to the needle. The remainder of the lens-matter was then removed; a pad of wet lint was placed over the eye, and a dry one over the sound organ, a light bandage being next applied. The lint over the left eye was ordered to be kept moist, and the case was treated as an ordinary cataract-extraction. The after-progress was unexceptionally good. He remained in the Infirmary for about a fortnight. On February 24th, I showed the patient, with the previous case, to the members of the Sheffield Medico-Chirurgical Society, and it was then noted that the pupil was round and free, and that with  $+ \frac{1}{3} \frac{1}{2}$  vision was  $= \frac{2}{6}$ , and with a  $2 \frac{1}{2}$  inch lens he saw J 1 easily.

Respecting this case, I would remark that, though possibly the fragment of steel might have found its way out with the



softened lens-matter, it is far too probable that it would not have done so, but might have passed beneath the iris, whence its removal would probably have been impossible; and, had it remained sticking in the posterior capsule, efforts to get it away would have been attended with difficulty, and would perhaps have pushed it into the vitreous humour. Extracting the lens in its capsule would have been a possible procedure, but I believe, a hazardous one.

The cases I have related illustrate the service the electro-magnet may afford in removing fragments of steel or iron from the interior of the eye. They were cases in which the injury was recent; but in those where the foreign body has lodged for some time in the eye, and become coated over, and especially when encapsuled, and adherent to adjacent parts, such results are hardly to be expected. In some experiments made with portions of steel and iron coated over with gelatine, it was found they were very readily attracted by the electro-magnet; and in other fragments, which were enclosed in gelatine capsules, the electro-magnet still exerted considerable influence over the contained particles, if they were not too far from the surface. Whatever effect the electro-magnet might have, therefore, on pieces of metal but slightly coated over, it does not seem likely for sufficient attraction to be exerted to drag a particle away from its adhesions.

The electro-magnet I have described is made by Messrs. Cubley and Preston, of Sheffield; and to the former gentleman, in particular, I am much indebted for the interest he has exhibited in it, and the skill and ingenuity with which he has aided me. It is a much more efficient instrument than a simple magnet; and, now that electric batteries are in such general employment that almost every practitioner possesses one, its use is rendered easy. One advantage, among others, that the electro-magnet has is, that, in a case where the portion of metal is visible, the needle may be advanced to it before the magnetic influence is brought into force.

In conclusion, I would briefly refer to a case which may perhaps indicate that the magnet may have uses in general,



as well as in ocular, surgery. Towards the close of last year (1880), a man applied at the Sheffield Infirmary, stating that a few weeks previously he had been hit on the (left?) eye by two or three pieces of metal. He feared that his eye had been perhaps injured. Beyond, however, a slight nebula, there was no evidence of any ocular mischief; but an elevation in the upper lid was noticed. It was rounded, of firm feeling, and about the size of a pea; and, on being questioned, he asserted it had only existed since the time of the accident, though he had no distinct recollection of his lid having been injured. Thinking it very likely that a particle of iron was embedded in this little tumour, I cut across it with a scalpel, and, as the electro-magnet was at hand, the needle was inserted into the wound, and withdrawn immediately with the portion of metal attached.

*Addendum.*—Since sending the foregoing for publication, a very similar case to the one described above, with the foreign body in the lens, has come under my notice, and with an equally satisfactory result.

On March 17th, a little boy, H. A., aged 6, was brought to me from the country under the following circumstances. Six weeks previously, whilst striking two hammers together, a "spark" had flown off one and hit the left eye. For a few days, it appeared a little bloodshot; his parents, however, paid little attention to it until they noticed that the pupil was losing its normal appearance, and becoming filled with a white substance, and this, for the last two weeks, had completely occupied it. Vision was now reduced to shadows, and examination disclosed a faint linear scar in the cornea just below the pupil and on the inner side. The lens was opaque, and on the front, just below the pupillary margin, was a yellowish mark, not showing, however, a distinct reflex; and it was particularly noticeable when the pupil was dilated with atropine. Judging this lymphoid mass to contain the piece of metal, its removal with the cataractous lens was suggested. It was not, however, until April 6th, that he was brought into Sheffield with a view to operation. A powerful electro-magnet was at first held in front of the eye, to endeavour to displace the fragment forwards. It, however, produced no effect except that the little patient complained

of pain in the eye, indicating, I believe, the presence of a fragment of steel or iron, and that it had become magnetised. Ether was now administered, and a small lower flap was made in the cornea, as in the last case, but not passing thoroughly across it; the capsule was next opened, and the needle of the electro-magnet inserted, and immediately withdrawn with the fragment of steel attached. The lens-matter was then gently pressed out, with the mass of lymph which had enclosed the foreign body; a piece of iris, which appeared inclined to remain entangled in the wound, was excised. The case was treated in the same manner as the former one, and the little boy returned to his home in ten days. I have seen him since, and ascertained that he possesses excellent vision. The fragment of steel was about as big as a fair-sized pin-head. The electro-magnet described above was used in this case.



of pain in the eye indicating, I believe, the presence of a  
 fragment of steel in man, and that it had become magnetized.  
 It was now administered, and a small ivory flap was made  
 in the tunica, as in the last case, but not passing thoroughly  
 across the canal, was next opened, and the needle of the  
 electro-magnet inserted and immediately withdrawn with the  
 fragment of steel attached. The iron matter was then gently  
 pressed out with the mass of ivory which had enclosed the  
 foreign body, a piece of the which appeared inclined to  
 remain entangled in the wound, was excised. The case was  
 treated in the same manner as the former one, and the little  
 boy returned to his home in six days. I have seen him  
 since, and ascertained that he possesses excellent vision.  
 The fragment of steel was about as big as a lavender pin  
 head. The electro-magnet described above was used in  
 the case.

Continued for several months, and I believe, the presence of a  
 fragment of steel in man, and that it had become magnetized.  
 It was now administered, and a small ivory flap was made  
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