fragments, and which, if left, would effectually prevent osseous union taking place between the fragments.

3. The dangers inseparable from punctured wounds of the deeper structures of the joint being made in passing a sharp-pointed curved needle between the condyles and the articular surface of the patella.

4. The undoubted danger that must attend leaving a foreign body permanently in the interior of the knee-joint.

I see no reason to deviate from the original suggestion of making a vertical incision in preference to making a flap. It is the simplest method, and, as Professor Annandale has recently urged, simplicity is what we should aim at in all our operative measures.

It has also been stated that in drilling the bones for the introduction of the sutures the bone fragments are apt to split. But when such a calamity occurs it must, I think, be due to the employment of a faulty instrument or to a want of ordinary dexterity on the part of the operator. A bayonet-pointed drill should be employed. Although I can only speak from an experience of the operation based on five cases, I may say that in none of them have I seen this mishap occur.

In future I purpose using a drill worked by an electro-motor, which I have recently employed with very satisfactory results in suturing the bones in a case of resection of the knee. By the employment of this method of drilling and suturing it is hard to see how splitting could occur, as the drill passes through the bone so smoothly, swiftly, and easily.

The circumferential patellary suture, whether carried out by a subcutaneous or an open method, appears to me to be open to the objection of probably interfering by pressure with the nutrition of the bone. The external circumferential pressure, such as is used in Lonsdale's apparatus, undoubtedly acts injuriously in that way.

REMARKS ON THE VALUE OF STEREOSCOPIC PHOTOGRAPHY AND SKIAGRAPHY: RECORDS OF CLINICAL AND PATHOLOGICAL APPEARANCES.

[WITH STEREOSCOPIC ILLUSTRATIONS.]

BY JAS. MACKENZIE DAVIDSON, M.B., C.M.,

Medical Officer in charge of the Roentgen Ray Department, Charing Cross Hospital.

THE ADVANTAGES OF STEREOSCOPIC PICTURES.

THE advantages of stereoscopic photography for the purpose of recording and illustrating medical and scientific work is very great. For years past I have used it with the greatest benefit to myself and to students. Once its advantages over the ordinary single picture are realised, it appears certain that many illustrations in medical journals and in scientific or other periodicals—even in books—will be reproduced stereoscopically. The observer will be able to use some simple form of stereoscope (similar to a pair of pince-nez) for examining the illustration, and will at once see it in perfect relief. (See Fig. 1.)

STEREOSCOPIC PHOTOGRAPHY,

In order to take stereoscopic photographs, the first requisite is a camera with twin lenses of 3½ to 6-inch focus, which should be mounted with their centres 2½ inches apart. It would be out of place here to enter into details of the method of taking these photographs and mounting the prints. The result to be aimed at is to obtain a picture in relief which shall be as far as possible a correct representation of the original. This can be done provided that the lenses in the stereoscope be of the same focal length as the lenses in the camera with which the photograph was taken. The observer, of course, must possess binocular vision.

The most convenient instrument for viewing ordinary stereoscopic photographs is some form of lenticular stereoscope, and there are a great variety of these to be had. The ordinary cheap forms do quite well, but it is an advantage to have one in which the distance between the two eyepieces can be altered to suit different observers.

If colour be desirable, the writer has succeeded in the following way: Two albumen prints were mounted correctly on a thin sheet of glass (stereoscopic size), and then coloured by the "chrystoleum process." Excellent results can thus be obtained.

STEREOSCOPIC SKIAGRAPHY.

It is only necessary to look at two good stereoscopic skiagraphs in a Wheatstone's stereoscope to realise at once how thoroughly practical and important this method is in surgical work. A single skiagraph is often confusing, if not misleading, but with two properly taken and viewed in a stereoscope, the picture stands out in true relief, and shows clearly the relation of the parts.

I will now describe the method and apparatus[1] I employ. It is that which up to the present time I have found to be the best.

1. *The Crookes's Tube.*—A tube giving the best possible definition, and which will at the same time allow of the shortest exposures, is essential. The tube with an osmium anode (introduced by the writer) answers these requirements well. Mr. Cossar has made these tubes admirably, but unfortunately the supply of pure solid osmium seems to be exhausted. It can be obtained in fine powder, but in small lumps it cannot now be procured, and no one seems to care to make any more in the solid form.

2. *Horizontal Bar.*—Two skiagraphs must be taken from two different points of view. The Crookes's tube after one skiagraph has been taken must be displaced and then another skiagraph taken. I use the horizontal bar of my localising apparatus (described and illustrated in the BRITISH MEDICAL JOURNAL of January 1st, 1898). Any desired displacement, of course, may be given to the tube, but it seems best to displace it about 6 cm., which may roughly be taken as the distance between our eyes. The two skiagraphs thus taken from two different points of view, and the necessary marks made on the patient's skin to guide the surgeon, give data sufficient to localise the position of any foreign body or other part accurately; while the same skiagraphs give a stereoscopic picture enabling the surgeon to have a correct view of the parts in relief. This method, if correctly carried out, is so accurate and complete that the surgeon can have little cause for complaint.

3. *Changing Box.*—This consists of a stout frame of any desired size over which is tightly stretched some calf skin. This is stout enough to support a considerable weight and at the same time is thin and quite transparent to *x* rays. The photographic plate, wrapt in black paper in the usual way, is placed beneath the skin and brought up against it, and supported there by some suitable arrangement. Fig. 3 shows the apparatus, and if it be viewed with a stereoscope its construction will be readily seen and understood. The horizontal bar shows the tube holder displaced to one side, and the clip on the right side is the limit to which it must be displaced for the second photograph. A wire is seen stretched on the nearer end of the box, and the bar is arranged parallel to this wire. This leaves a white line at the edge of each negative, and this enables the photographs to be mounted correctly in register. A board is seen below, and upon it will be noted the photographic plate wrapt in the black paper. By means of a lever worked by a screw at the far end of the box, not visible in the illustration, this board is raised so that the plate is brought firmly up against the calf skin. The part of the patient to be skiagraphed is placed upon the top of the box. It will be easily seen how two photographs can be taken on different plates without disturbing the position of the patient; we are thus sure of obtaining correct stereoscopic pictures. This method can, of course, be carried out by having a table made with calf skin covering a space cut out of the top; or, again, an operating table can have a window, so to speak, covered by the calf skin upon which the patient can lie. This has the further advantage that it will allow a Crookes's tube to be placed below this part of the table, so that the patient could be examined by a fluorescent screen while lying on the couch.

4. *Wheatstone's Stereoscope.*—Two plane mirrors, about 4 inches square, are so fixed on a vertical support that their backs form an angle of 90° with each other. When the observer puts his face close to the edge where the mirrors meet, so that this edge lies vertically between his eyes, it follows that his right eye can only see what is reflected in the right mirror, while his left eye can only see what is reflected in the left mirror. Now, if the two skiagraphs,

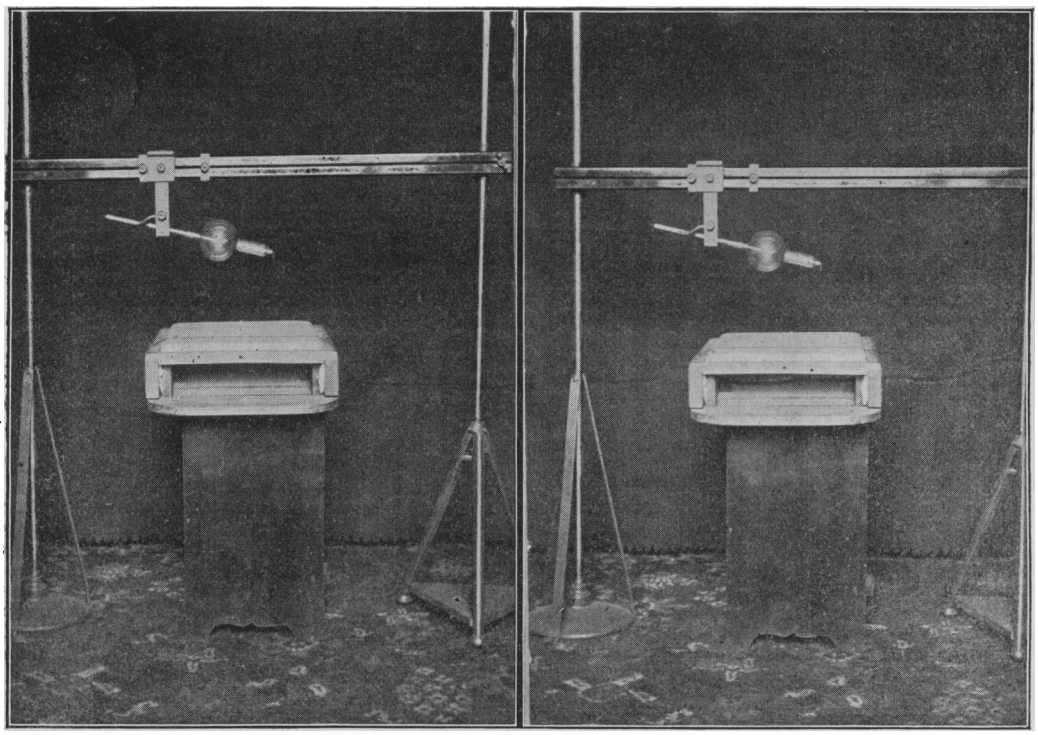

Fig. 3.—After a stereoscopic photograph showing horizontal bar with Crookes's tube and "changing box" arranged for taking stereoscopic skiagraphs

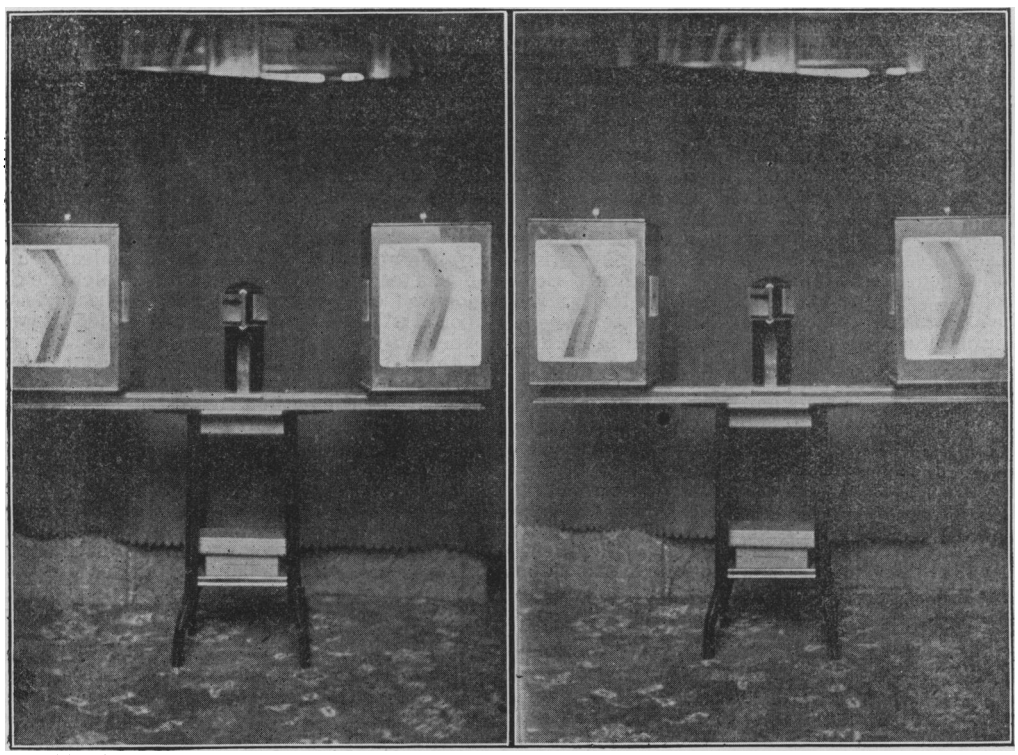

Fig. 4.—After a stereoscopic photogragh of a Wheatstone's stereoscope.

taken as already described, are placed so that the right eye image is opposite the right mirror and the left image opposite the left mirror, each eye will recognise its own picture, and they will combine (as usual) and give rise to a single image in perfect relief.

There are several devices for supporting the skiagraphs, and also for simultaneously making them approach or recede from the mirrors. The simplest of all arrangements is to have two mirrors mounted on an upright block of wood, which can be placed upon a table, while the skiagraphs can be supported by any simple means in the proper positions. The writer has devised a form of revolving Wheatstone stereoscope shown in Fig. 4.[2] A four-sided box, which can be revolved on a vertical rod, is placed opposite each mirror. Upon each of its four sides one of a pair of stereoscopic skiagraphs is placed. The corresponding pictures are similarly placed on the other box. In this way the boxes can be rotated and two corresponding skiagraphs brought simultaneously in correct position opposite the mirrors. This prevents the necessity of adjusting each pair separately, and saves time in demonstrations. The block supporting the mirrors is attached to a small base with bevelled edges, which slides in a broad groove, and enables the observer to slide the mirrors towards or away from his eyes. In this way he can adjust the mirrors to the position which enables him to combine the pictures most comfortably. Each revolving box is fixed by its vertical support to its sliding board. This allows the distance of the skiagraph from the mirrors to be altered at will.

The Wheatstone stereoscope is peculiarly adapted for *x*-ray photographs; first, because, as everyone knows, a print from an *x*-ray negative is reversed—for example, if a skiagraph of a right hand be taken, when printed it appears to be a left hand. Now, if such a print be viewed in a Wheatstone stereoscope, it is reflected in one of the mirrors, and is thus reversed to its original position by the reflection. Therefore, if opposite the right mirror is placed the print from the negative produced when the Crookes's tube was displaced to the right side; and opposite the left mirror the print from the negative taken when the tube was displaced to the left, the observer will then see the parts in correct stereoscopic relief, as if he had been looking at them with his eyes placed so that the right eye was at the point occupied by the anode when displaced to the right, and the left eye at the point occupied by the anode when the tube was displaced to the left. If the skiagraphs be viewed under the same angle as they were taken, the stereoscopic picture would show the parts of the true or actual size, and the exaggerated distortion of the single *x*-ray photograph is overcome. The importance of such a result to a surgeon is great.

There is no limit to the size of the pictures which can be seen in a Wheatstone stereoscope. The largest size the writer has as yet taken stereoscopically is 12 by 15 inches.

If the right picture be placed opposite the left mirror, and left picture opposite the right mirror a stereoscopic picture will be seen as before, only reversed. For example, in one case a hand will appear as seen from the dorsal aspect; if the prints are transposed it will appear as a hand seen from the palmar aspect. The same transposition can be effected by turning each print upside down.

The negatives, while wet, can be seen in a stereoscope if they be held in proper position by upright frames, and each illuminated by a strong light diffused through ground glass or white paper, but the effect is not so good as viewing prints.

If it be desired to reproduce the skiagraphs as illustrations in a book or periodical they can be reduced and mounted alongside of each other, as has been done with the stereoscopic skiagraphs (see Fig. 2 on special paper) reproduced from the original full-sized plates taken by me of a case of "gunshot wound of the leg," under the care of Mr. Howard Marsh.

INSPECTION OF STEREOSCOPIC SLIDES WITHOUT THE STEREOSCOPE.

By practice it is not difficult to acquire the power of combining stereoscopic pictures without an instrument of any kind. There are two ways of doing this:

1. By looking beyond the photograph, so that each eye sees the picture opposite it.

2. The most easily acquired and most important for *x*-ray work, as it enables skiagraphs of any size to be seen at once, consists in crossing the visual axes. This may be accomplished as follows: The photographs or skiagraphs are placed correctly in front of the observer; he then holds up his finger in the middle line between his eyes and the skiagraphs, and while looking at the top of his finger he will observe double images of each skiagraph; by a little perseverance he will learn to make two of the images in the centre combine, and he then will have a beautifully clear stereoscopic image apparently in the air. Behind to right and left will be two images, but these he soon learns to ignore, or he can cut them off by bringing his hands cautiously from the outer side of each eye towards the middle line, stopping the moment the two side images are cut off. It is, of course, very convenient in this way to see negatives in stereoscopic relief immediately after development.[3]

NOTES.

[1] The apparatus is made by Messrs. Muirhead and Co., Elmer's End. [2] The Wheatstone stereoscope is made by Messrs. Curry and Paxton, Great Portland Street, W. [3] See Wheatstone's papers already referred to and Leconte's *Sight*, the International Scientific Series, Kegan, Paul, and Co.

A CASE OF BULLET WOUND OF THE LEG, IN WHICH THE BULLET WAS LOCATED BY SKIAGRAPHY.

[WITH SPECIAL STEREOSCOPIC SKIAGRAPH.]

By HOWARD MARSH, F.R.C.S.,
Surgeon to St. Bartholomew's Hospital.

F. E., aged 14, was admitted into St. Bartholomew's Hospital on June 8th, with a bullet wound in the left leg. He said that as he was wheeling a barrow in the street he felt something sting his leg. On pulling up his left trouser he found blood trickling down from the wound. On examination this was found to be a quarter of an inch in diameter, and placed at the junction of the uppermost and middle thirds of the leg. A probe passed into it travelled in a direction downwards and outwards for a distance of 6 inches.

A day or two afterwards a skiagraph was taken by Mr. Mackenzie Davidson, and the bullet was very clearly seen to be situated at the back of the limb (see Fig. 2, special plate) about half-way between the tibia and fibula, but on a posterior plane.

OPERATION.

The limb was rendered bloodless by an Esmarch's bandage, and an incision about 3 inches long was made through the skin and superficial fascia at the inner border of the tibia. The deep layer of muscles was then separated from the bone, but the bullet was not found. Then the superficial and deep layers were separated from each other, and the bullet was immediately found embedded in the substance of the tibialis posticus muscle, and was easily removed. The wound was closed by a continuous suture, and dressings were applied. The wound healed by primary union, and the boy was discharged a few days afterwards.

REMARKS.

The skiagraph, as produced by Mr. Mackenzie Davidson's stereoscopic process, defined the position of the bullet, which was not bigger than a pea, with great exactness. The stereoscopic skiagraph by which this report is illustrated, though reduced, well illustrates this point.

Without a skiagraph there was no means of knowing how far the bullet had travelled from its original point of entrance down the leg. The skiagraph disclosed this, and also the fact that it was placed on the posterior aspect of the limb and on a plane posterior to the bones. Thus the stereoscopic effect defined the situation of the bullet in a manner that had not as it appeared to me been previously possible.

MEDICAL EDUCATION OF WOMEN IN RUSSIA.—A proposal was brought before the recent Congress of Russian Medical Men that an institute for the medical instruction of women should be established at Kieff. Dr. Piasseski proposed that the Faculties of Medicine of all Russian universities should be open to women. Both these proposals were received with sympathetic acclamations.

Fig. 1.—Stereoscopic Photograph of a case of Small-pox by Dr. W. W. Stainthorpe (Saltburn.)

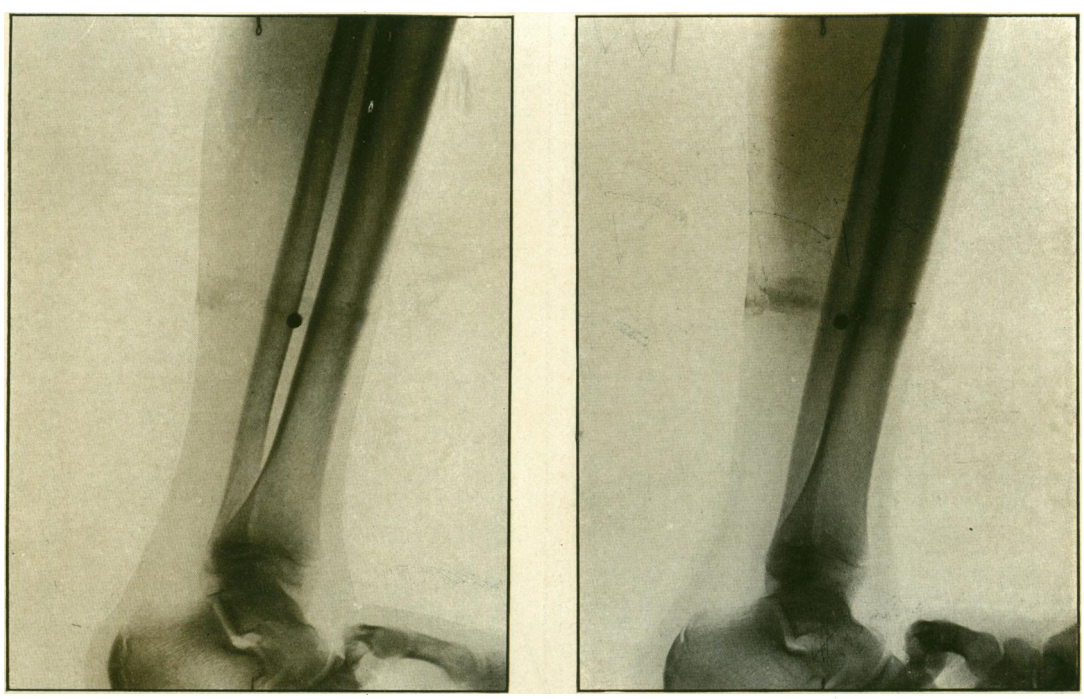

Fig. 2.—Stereoscopic Skiagraph, by Mr. Mackenzie Davidson, of a case of bullet in the leg (Mr. Howard Marsh's case). The shade encircling the limb is a ring of bismuth on the skin.