portant symptom, but the absence of bulging does not in the least affect the diagnosis.

A BOUGIE is arrested at a distance of about nine inches from the teeth. It may, perchance, pass into the stomach, gliding over the orifice of the pouch. But the rule is, that it passes into the pouch; and, as the affection becomes more pronounced, it may be impossible to pass an instrument down the œsophagus. If the bougie be of metal and slightly curved, its end may be made to project, so that it can be felt and seen, in the side of the neck (always almost left side) behind the sterno-mastoid muscle.

WASTING AND LOSS OF WEIGHT are rarely, if ever, observed until the late stages of the disease. In fact, the patient may suffer from unmistakeable symptoms of a pouch for years without any sensible loss of weight. Of course, in those cases in which the condition is gradually producing death by starvation, wasting slowly occurs during the last months or years.

The course of the disease is, in every case which I have seen or read of, very slow. The symptoms had been noticed for several years in five of the six cases before I was consulted. In the remaining case, the trouble had existed only for a year. Naturally, I am now wondering whether I could readily make the diagnosis of pouch if I were consulted within a few weeks or months of the first appearance of the symptoms.

I do not know how many cases of œsophageal pouch have been treated by removal of the pouch, but I know that von Bergmann operated on one case, Billroth on one case, Kocher (Bern) on two cases, Bayer (Prague) on one case, Mixter (United States) on one case, while I have operated on two cases, and one more case has been operated on in London. Only one of the operations proved fatal, and from an unexpected cause—suppression of urine. The relief afforded in all cases has been, so far as I am aware, complete and permanent. The patients have been relieved of distressing symptoms, and of the fear of death from slow starvation, which has occurred in a considerable proportion of the recorded cases. Before the operation is performed, while the patient is under the influence of an anæsthetic, it is desirable to pass a curved metal instrument into the pouch from the mouth, and to make its end appear in the posterior triangle of the neck, which affords the clearest proof of the existence of a true pressure pouch. And, if possible, to pass a large bougie past the orifice of the pouch into the stomach, to prove that there is no stricture of the œsophagus.

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ROENTGEN RAYS AND LOCALISATION.

AN APPARATUS FOR EXACT MEASUREMENT AND LOCALISATION BY MEANS OF ROENTGEN RAYS.

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THE Roentgen rays in many of their applications are now great facts in surgical practice. However much they may find acceptance in other directions and in other fields their place there is secure, and must become more and more important. As their practical value was first realised in surgical practice, so because of their usefulness and their supplying what was long needed, it is not too much to say that it must grow. Any simple method by which their application may be rendered easier, and their scope wider and more certain is thus of the utmost practical value, and this must be my excuse in inviting attention to a simple method of localisation which will enable the surgeon to find a foreign body with precision.

It is not enough for the surgeon to have a fine photograph or skiagraph of the part of the human frame showing the presence of a foreign body. He wants more than that to enable him to operate with complete confidence. He wishes to know the size of the object and its position and depth from the skin at any point he may select. The extended use of the *x* rays has led to an increasing need for some simple method of localisation which can be at once readily carried out, and at the same time be reliable. The method I have devised I believe is of this character and I have had an apparatus constructed which fulfils these requirements. It was, of course, obvious from the first that taking a skiagraph from two or more points of view was the necessary starting point to any method of localisation. But the question was how the resulting photographs were to be dealt with to give the desired information as to the precise position of the foreign body. This remained a difficulty except to the comparatively few who were sufficiently familiar with geometrical drawing and mathematics.

Taking stereoscopic skiagraphs is a beautiful method, but it is somewhat difficult and tedious to carry out, and while giving a picture in relief, yet the relations of the parts are only relative and not precise enough for practical guidance in a surgical operation. Besides stereoscopic skiagraphs are only useful to those who possess binocular vision. My method is as follows: I take two skiagraphs from two different points of view. In order to carry out the adjustment and movement of the Crookes's tube I use a horizontal bar with a scale upon the front of it graduated in millimetres with o° at the middle point of the bar (Fig. 1). This bar slides up

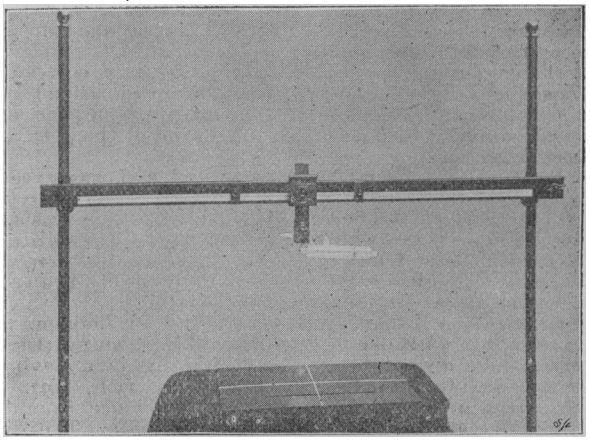

Fig. 1.—Showing the apparatus in position.

and down upon the two brass rods which rest upon the floor, each with a base similar to those in standard lamps. Further the bar can be readily detached at one end and opened like a gate so that a patient might conveniently lie under it to be photographed. There is a small holder for the Crookes's tube which slides horizontally along the bar, and there are two sliding checks, which can be fixed by means of a small screw at any desired points on the scale, thus enabling the tube to be quickly and accurately moved from position on one side of o° to a corresponding point on the other side.

In case it is desired to adjust the Crookes's tube to any particular height, there is a small bar which slides vertically up and down and carries the tube with it and acts as a fine adjustment; a small thumb screw clamps it. There is a small spirit level fixed on the top of the carrier of the Crookes's tube. As far as this part of the apparatus is concerned, it is simply a convenient method of enabling the tube to be displaced in taking the skiagrams, and somewhat similar arrangements have been in use by other workers.

I shall now describe the method of taking the skiagraphs. In the first place, it is important to note that the kathodal rays in a Crookes's tube (with a proper vacuum) give rise to the Roentgen rays at the point where they first strike solid matter. Fig. 2 illustrates in a diagrammatic way what takes place in the tube. The kathodal rays converge to a point, and then, strange to say, go on in a perfectly straight line and strike the anode at the point *x*. It is at this point that the Roentgen rays originate. The position of this point is ascertained by observing the spot which begins to get red hot on the platinum anode. This, then, is the point we have to deal with. It is the point from which all the *x* rays diverge in straight lines into space; just as with a candle, instead of a Crookes's tube, in studying the shadows produced we would have to know that the light rays come from the flame, and it alone.

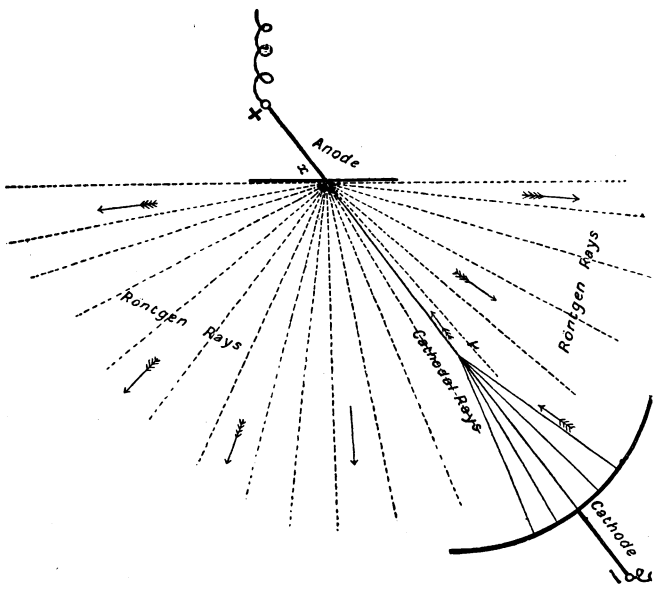

Fig 2.

First, then, the process is to measure as accurately as possible the height of the point of origin of the x rays above the photographic plate or film, and generally for all practical purposes the middle of the anode plate may be taken as the radiant point. The sliding holder with the tube is placed with one of its edges on o° of the scale on the horizontal bar. The check clips are adjusted on either side of the o° to the desired degree of displacement and fixed there, so as to allow of equal displacements of the tube to either side of o°. The amount of displacement of the tube does not seem to affect the accuracy of the results. I have worked with a displacement of 3, 7, and 10 cm. to each side of zero.

On the table below the tube there is a large square of vulcanite, with two fine wires stretched across it at right angles, and dividing it into four equal parts (seen in Fig. 1). It should be considerably larger than the largest photographic plate or film which is to be used, so that the plate or film covered with black paper in the usual way can be slipped beneath the cross wires. Or, instead of the vulcanite, two wires can be tied directly across the covered photographic plate. The adjustments now necessary are as follows: Put the tube holder at o°, and then with a small plumb line drop a perpendicular from the point x of the anode plate (say the middle of the platinum anode). The vulcanite plate is then placed so that the point where the wires upon it cross is just under the plumb-line needle; in fact, vertically below x (see Fig. 2). Further note that it must be so placed that one of the wires is parallel to the plane in which the tube is to be displaced—that is, it must be made to lie parallel to the horizontal bar. This can be done by mere inspection by looking along the edge of the horizontal bar, and seeing that the wire is parallel to it. Once these adjustments are made, the vulcanite sheet can be fixed to the table with drawing pins, and the instrument is ready for use at any time without further adjustments being necessary.

The distance of the x point on the anode vertically from the plate is carefully measured and recorded. The tube holder is now displaced to the previously fixed check clip on one side. The cross wires are lightly brushed over with some suitable dye. (The ink used for rubber stamps is good.) The plate (I prefer a film), covered as usual, is then slipped beneath the cross wires. The patient now places the part to be photographed on the plate, and a small object, opaque to x rays (a small coin answers well), is placed on one of the corners of the plate so as to mark a quadrant. The current is turned on and one exposure made. It is then stopped for an instant till the tube is pushed over to the other side of o°, to where the other check clip had been previously fixed, and then another similar exposure is given on that same plate and without the patient moving. When the patient raises the part from the plate he should carry the mark of the cross wires in ink on his skin, and it is important to make a small mark on the quadrant of his skin which corresponds to the quadrant of the plate upon which the opaque object (coin, etc.) was placed. This is clearly necessary to keep the parts and the negative in register.

[I may here remark parenthetically that in some cases it will be an advantage after the patient is placed ready to be photographed to drop perpendiculars by means of the plumb-line from the anode of the tube on the patient's skin. This can be done from o° and from the two points of displacement of the tube, and the points where plummet needle touch, the skin marked, the points can then be joined by a straight line. Another can be drawn at right angles from the o° point. It is clear that the cross so marked on the upper part of the patient's skin will exactly correspond to the cross left by the inked wire below: and as our method depends upon measurements taken from the cross lines, it is obviously an advantage to have an upper as well as the lower plane from which to work.]

The negative is at at once developed and fixed in the usual way, and then we find two shadows of each foreign body opaque to the Roentgen rays, If, for example, it be a bullet, we get two bullet shadows in the negative.

Of course from the above data and with this negative, one can, by means of mathematical formulæ, or geometrical drawing to scale, arrive at a correct knowledge of the position of the bullet. But the requisite knowledge is not always at hand; and I think that the method I have devised of dealing with the negative and will now describe, is simple and accurate, and within the reach of everyone who can use a foot-rule and a pair of compasses.

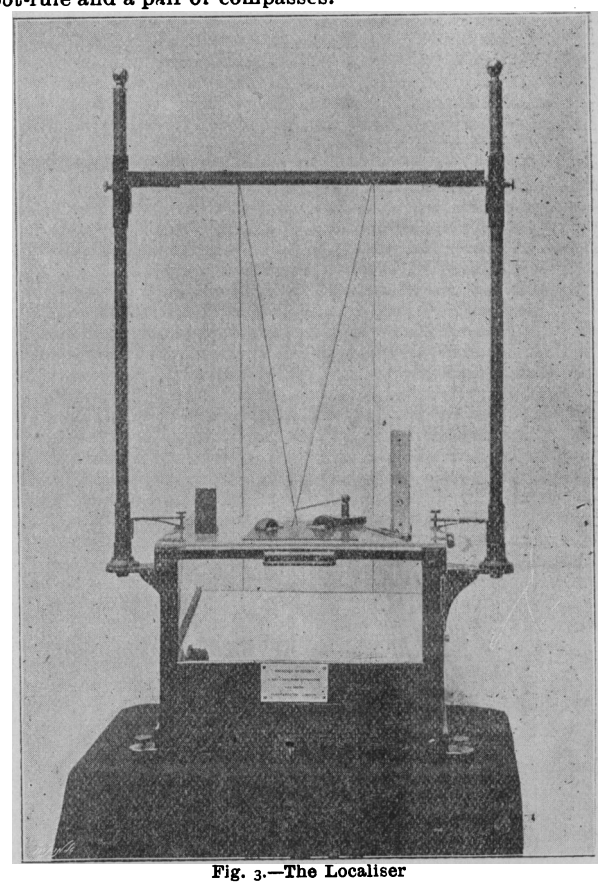

Fig. 3.—The Localiser

Fig. 3 shows the apparatus which may be called the "localiser." It resembles a photographer's retouching desk. Upon an iron stand a piece of plate glass is placed horizontally and level—a mirror which can be adjusted so as to reflect the light from a window or lamp up from below.

There is a horizontal bar which slides up and down upon two vertical brass rods. On this bar there is a millimetre scale with a small notch at each millimetre mark. The 0° is at the middle point of this bar. On the glass plate there are two lines cut with a diamond at right angles to each other (just like the cross wires on the vulcanite plate) and this glass plate, which is movable and can be clamped, is so placed that the point where the lines cross is vertically beneath the 0° on the scale above, and the line on the glass running right and left (when facing the scale) is placed parallel to the edge of the scale. In other words they are in the same vertical plane. The scale is now raised or lowered so as to make the 0° on it precisely at the same height vertically above the negative as the anode of the Crookes's tube was from the photographic plate or film when the negative was being produced. The whole apparatus stands on three screws so that it can be levelled easily.

The negative being slightly washed after fixing can be at once placed upon the horizontal stage and easily adjusted so that the white lines produced by the cross wires are made to coincide with the cross line on the glass plate, care being taken that the marked quadrant is in the same relative position as it occupied when the photograph was being taken. As a routine practice I always mark the right upper quadrant as I stand facing the scale on the bar. (See Fig. 1). To protect the wet gelatine surface of the negative I place a sheet of mica or celluloid over it. Or, if it be a film, I place it face downwards and squeegee it. It thus remains fixed, and, the celluloid being so thin, its thickness may be ignored in the subsequent measurements.

It is important to remember that if the negative is placed on the stage with the gelatine surface downwards, the relations of the parts are reversed. And it should be so placed that the marked quadrant, which would be on the right and upper corner, if the gelatine surface was upwards, should lie on the left upper corner. However, as the patient's skin has the corresponding quadrant marked upon it, there should be no confusion.

Matters being thus arranged, it will be seen that I have really placed the negative under exactly the same conditions as it occupied when it was being taken. Under these circumstances all that is now required is to trace the path of the *x* rays which produced the negative. I do this in a very simple way. The distance on each side of the middle point (0° on the scale) to which the anode was displaced is known. Suppose it was 7 cm., I place a fine white silk thread in the notch 7 cm. to one side of 0° and I place another silk thread (red) in the notch 7 cm. to the other side of the 0°. Small weights are attached to one of the ends of each thread to keep them taut, while the other is threaded into a fine needle which is weighted by being fixed into small lead weights, in shape resembling a mouse. (See Figs. 3 and 4).

Now these threads can be used to show the path of the *x* rays which produced the negative. Suppose we are dealing with a needle in some part of the body. On looking down on the negative we find two needles, and it is not difficult to see that as the Crookes's tube was displaced horizontally in a line running right and left, that the shadow of the needle to the left was produced by the tube when displaced to the right, and *vice versâ*. Thus, if we place one of the threads on the point of the needle in one shadow correctly, it will indicate the path of the *x* ray that produced the shadow of the needle point (P, Fig. 4). Now if the other thread is placed on the corresponding point of the other needle shadow (P′, Fig. 4). Then it must follow that the position actually occupied by the point of the needle in question is precisely where the two threads cross at *c* in Fig. 4.

If we can measure the perpendicular distance of a point from three planes which are at right angles to each other—in short, if we can get the *x*, *y*, and *z*, we then know all about the position of the point in question.

This we can do at once with the point *c* in Fig. 4. First, the vertical distance from the negative to where the threads cross each other is measured. This is the distance of the point of the needle beneath the skin (of the patient), which rested on the photographic plate. We can measure this with an ordinary pair of compasses, or with a surface gauge, which is seen in Fig. 3, pointing to where the threads cross. This little instrument has its point placed against a vertical millimetre scale (which is also shown in Fig. 3), and the distance from any plane vertically to where the point of the pointer rests is read off at once. The small arrow (Fig. 4) indicates the marked quadrant, and the Figs. 1, 2, 3, 4 mark the corners of the negative.

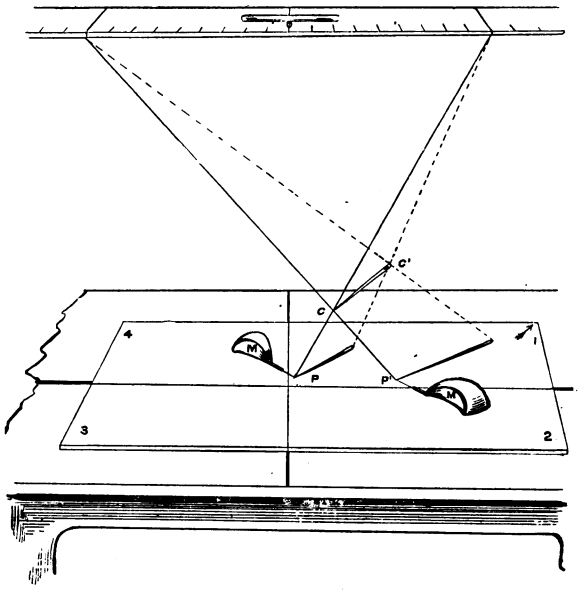

Fig. 4.

We next measure the vertical distances from the two vertical planes represented by the shadows of the cross wires to the point where the threads cross. An upright square is placed with its edge coincident with the shadow of one of the wires, and the perpendicular distance is measured with compasses from it to the point where the threads intersect. We now have obtained our *x*, *y*, and *z* of the point of the needle, and we note the result down as shown in Fig. 5. The arrows in Fig. 5 indicate the direction of the displacements of the Crookes's tube. We then proceed in a similar manner

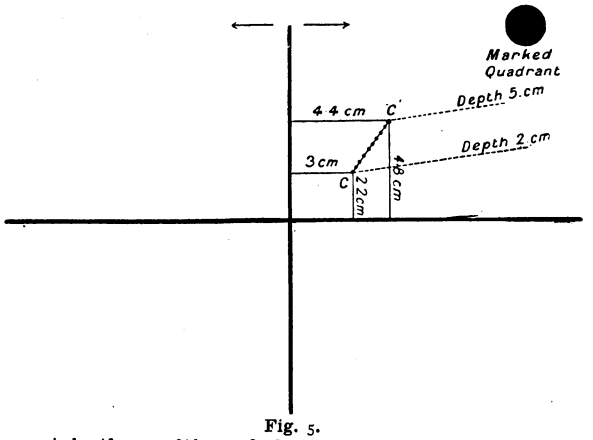

Fig. 5.

to ascertain the position of the eye of the needle c′ in Fig. 4. And the distance between c and c′ in Fig. 4 gives the direction and actual length of the needle.

From the measurements jotted down, as shown in Fig. 5, we can mark a line on the patient's skin in the same plane as the needle, and give the surgeon the exact depth at which each of its extremities can be reached by a vertical puncture.

Several pairs of threads might be used, and in this way the shape of the foreign body might be so far outlined; but it seems to me more convenient to use one pair. The point where they intersect can be fixed by the point of the surface gauge, and when the threads are moved to another position, the distance between their new point of intersection and

their former, where the point of the surface gauge stands, can be measured at once. In Fig. 4 the dark lines indicate the position of the threads—the dotted lines show the position they occupy when they are each directed to the eye of the needle, and the distance from c to c' is the actual length of the needle; it also indicates the direction in which the needle lies.

The final result of the process is that we can draw an outline of the foreign body on the patient's skin, and give the depth below the skin of any of its parts, and this enables us to give the direction and depth at which it can be reached from any other point the surgeon may select. In applying the measurements made from the negative it is most important to remember that the quadrants are reversed if measurements are made from the negative with gelatine surface upwards. Hence it is preferable to use a film, and to place it with the gelatine surface downwards. I have described the method somewhat in detail, but it is really very simple, rapid, and reliable, and can be done very quickly after a few practical trials.

Triangulation by means of threads in the manner I have described is likely to be capable of wider application. I should hope it will prove useful in the measurement of bones, displacements, and especially in pelvic measurements. Provided fairly well defined double skiagraphs can be obtained (preferably on the same plate) then the measurements by my method cannot fail to be accurate. Mr. Paxton (of Messrs. Curry and Paxton, 195, Great Portland Street, W.) has given me valuable assistance in constructing the apparatus to carry out this method conveniently and quickly.

I shall conclude by referring to two cases in which successful localisation has been made by this method. Mr. Openshaw had a case at the London Hospital in which a needle was supposed to be embedded in a man's foot. An attempt had been made to find it without success. Dr. W. S. Hedley, who has given me most willing assistance throughout, brought the case to me for localisation. The first photograph of this case is shown in Fig. 6. (A small wire cross was put upon the sole of the foot to mark the former incision). It shows that there are two pieces of a needle in the foot. I applied my method to this case, and Fig. 7 shows the negative with the double shadows. The centre of the anode was 56 cm. above the plate, and the total displacement of the Crookes's tube was 14 cm., that is, 7 cm. to each side of the o°. The left upper quadrant is the marked one in the print.

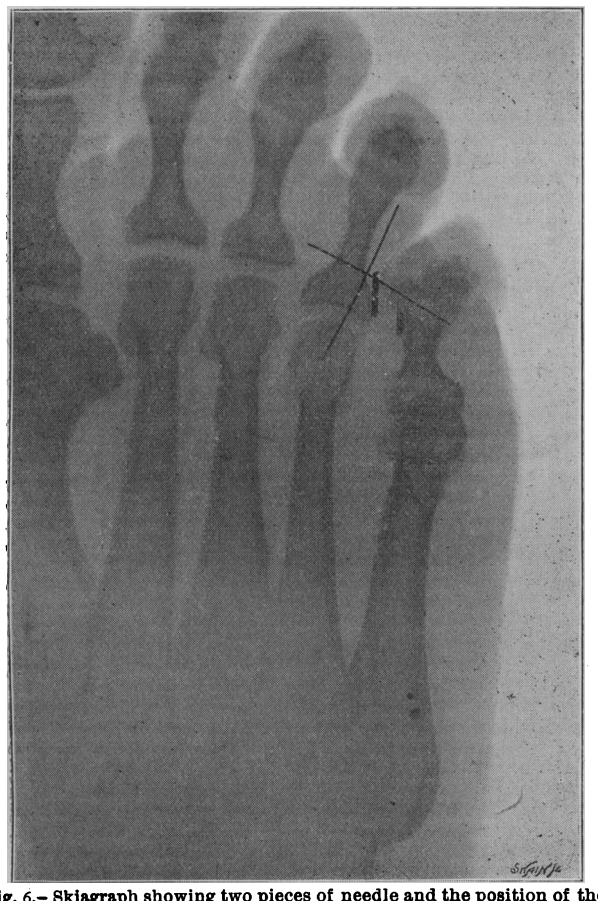

Fig. 6.—Skiagraph showing two pieces of needle and the position of the early incision is shown by the cross.

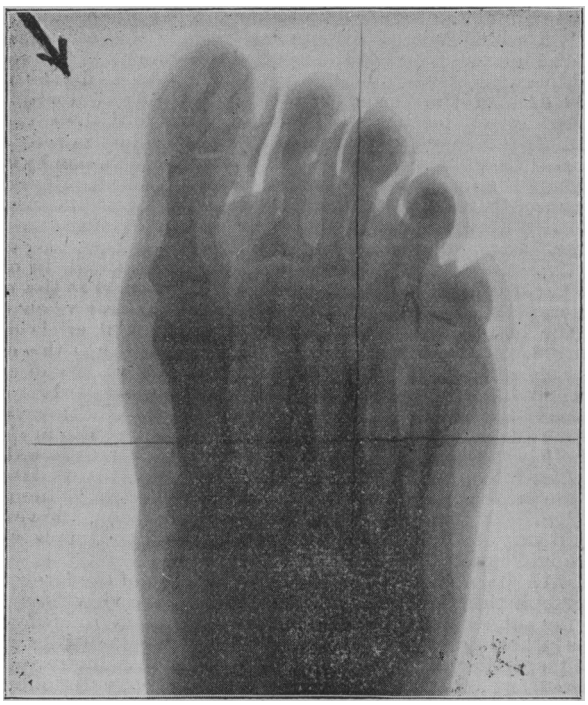

Fig. 7.—Skiagraph showing two exposures on same plate. Anode 56 cm. vertically from plate. Each exposure was equal and taken 7 cm. from the middle point.

The length of each fragment was correctly estimated, their positions outlined on the skin, and the depth of each extremity given. Mr. Openshaw, from the measurements and indications afforded, extracted the two pieces of the needle readily, and making only a very small incision.

I am informed that the first independent application of this method has been carried out by Professor Ogston, of Aberdeen, and his assistant, Dr. Irvine Fortescue. From my written description an apparatus was constructed which enabled them to locate a needle precisely in a woman's foot, and even to estimate its length correctly to a millimetre. It was successfully removed. It is of interest to note that the patient previously had had a skiagraph taken showing the presence of the needle, and had undergone two unsuccessful operations for its extraction. This case pretty clearly establishes the advantages of exact localisation preceding operative interference.

THE COLONIAL NURSING ASSOCIATION.—The first annual meeting of this Association was held recently, under the presidency of Lord Loch. The object of the Association is to meet the difficulty in obtaining skilled nursing in many of the Crown Colonies and among British communities in foreign countries. It has already sent out two nurses to Mauritius and two to Cyprus, with encouraging results even from a financial point of view. Two nurses were about to be sent to Selangor, and applications had been received from Dominica, St. Vincent, St. Lucia, and Bermuda. British communities in foreign countries also have availed themselves of the scheme. Mr. Haddon-Smith, Colonial Secretary for the Gold Coast, said that the services of the nurses had been greatly appreciated on the West Coast of Africa.