has a lien on 40 beds, some of which will be available for colony patients.

3. The colony now being inaugurated through the generosity of Mr. R. A. Pilkington in connexion with the Liverpool Sanatorium, in Delamere Forest. (30 colonists.)

4. The Royal Victoria Farm Colony, Polton, near Edinburgh, originally started by Sir Robert Philip. (Possibly 100 beds.)

Each of these colonies will probably develop on slightly different lines, as dictated by local conditions. At Kinson and at Edinburgh the colonies, as at present advised, will be purely agricultural. At Delamere Forest it is hoped that, through the good offices of H.M. Office of Woods and Forests, training in forestry will also be given, for which there will be full scope after the war, and it is possible too that training in a trade, such as clog-making, may be provided for certain of the colonists. At Papworth, under the energetic management of Dr. Varrier Jones, there will be training in agricultural and gardening work, but carpentering and engineering shops are also being erected. In the latter a course of instruction will be given, having as its basis the agricultural motor trade, such motors being now much in request in the agricultural counties adjoining Papworth, and the work of driving such ploughs having been found suitable for the patients. The colony at Papworth bids fair, therefore, to develop into a training colony rather than a farm colony pure and simple.

Such variation is all to the good, and will help to show on what lines the movement may best attain permanent success.

The patients sent to the colonies by the Ministry will be carefully selected, and will be those with early disease, in whose sputum tubercle bacilli have been found, or who have had a definite attack of haemoptysis or pleurisy with effusion, thus leaving no doubt as to the correctness of the diagnosis. The patients will be received direct from the sanatorium, and must be capable of working at least six hours a day without pyrexia, malaise or undue acceleration of pulse. They will engage to stay a year at the colony. During their stay payments for maintenance and training will be made by the Ministry on behalf of patients whose cases have been accepted by the Ministry at rates agreed upon between the body responsible for the management of the colony and the Ministry. The individual patient will also be entitled to the following benefits: During the year of treatment and training the man's

pension will be in abeyance, but he will receive instead an allowance at the rate of 27s. 6d. per week, from which a certain amount will be deducted weekly towards the payment of his board and lodging. Out of the balance it is proposed to pay over to him 5s. weekly, leaving the remainder to accumulate for his benefit until he leaves the colony, or, should he desire it, the balance may be paid weekly to such dependants as he may name. In addition to the above allowance, the colonist will be entitled during the last six months of his course to a weekly bonus of 5s. per week, provided that he completes satisfactorily the full year's course of treatment and training. This bonus will be paid to him at the termination of his year's course.

At the Kinson Farm Colony it has been decided (and possibly similar arrangements may follow elsewhere) that at the end of the twelve months' course the colonist will also receive a small sum, representing half the net profits (as apportioned among the colonists) which it is hoped may accrue from the successful farming operations of the colonists, the exact amount depending largely upon their individual efforts. The remaining 50 per cent. will go towards defraying the cost of the maintenance of the colonists.

Such are the lines on which farm or training colonies are being developed in this country, and it is hoped that these institutions may be the means of giving a fresh start in life to many a deserving patient, who might otherwise drift downhill by returning to unsuitable work amid unsatisfactory surroundings. In association with the other measures already taken for the proper care and treatment of soldiers whose tuberculosis has been caused or aggravated by military service, they are also an earnest of the firm resolve of the Minister of Pensions to spare no pains and to save no effort in his determination to do all possible to help these most deserving men, who have jeopardized their health in the service of their country.

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REMARKS ON ROENTGENOGRAPHIC PELVIMETRY.*

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IN considering the use of the Roentgen rays in the diagnosis of pregnancy, and in the prognosis of difficult labour, attention is to be paid to the size and shape of the mother's pelvis and of the fetal head, and also the relation of the one to the other. This paper deals chiefly with the former, as in the majority of cases the abnormal presentation is due to pelvic deformity rather than fetal abnormality.

Since the existence of contracted pelvis was first reported by Arantius various methods have been employed for diagnosing the existence and measuring the extent of pelvic deformity.

External pelvimetry, introduced by Baudelocque, while enabling us to measure directly the external pelvic diameters, and thence to draw certain conclusions as to the degree of contraction, is insufficient for estimating the size of the pelvic cavity. This cannot be done directly in the living woman.

Internal Pelvimetry.—A method was devised by Skutsch which makes it possible to estimate the size of the pelvic cavity indirectly and with fair accuracy, but as the employment of his instrument is usually painful to the patient, an anaesthetic is required if an accurate diagnosis is to be made.

The Roentgen rays, it was thought possible, might afford a valuable method of investigating the size and shape of the pelvis, but it was found that, while an excellent idea as to shape was obtained, that as to size was erroneous,

owing to the fact that the sacrum and pubis lay at different levels from the sensitive plate, and consequently one portion of the pelvis was enlarged out of all proportion to the other. This defect made it impossible to utilize the radiograph for purposes of mensuration.

The employment of the following method will obviate this difficulty, and make it possible not only to see the existence and extent of the pelvic contraction both of the inlet and outlet, but also to compare it with the normal pelvis, and measure its degree without causing much inconvenience to the patient.

Method.

In a normal pelvic bone, which is designated the "standard pelvis," the various diameters, both external and internal, are accurately measured. When this bone is radiographed definite points can be marked on the plate; the distance between these points will bear a definite ratio to that between the corresponding points measured on the pelvis. This radiograph is taken as the "standard plate." By radiographing the patient in the same position as the "standard pelvis," having the points of focus the same, the x-ray tube at the same angle and the same distance from the sensitive plate, an accurate comparison of the patient's plate with the "standard plate" will be obtained, and therefore of the patient's pelvis with the "standard" or normal pelvis; from it the internal measurements can be mathematically worked out; when compared to the direct measurements they are fairly accurate, as is shown by Figs. 1 and 2, there being an error of 2 mm. only. To work out mathematically the transverse diameter, for example, of the pelvic inlet the length of the transverse diameter of the pelvic radiograph of the patient is multiplied by the transverse diameter of the standard pelvis, and divided by the transverse diameter of

FIG. 1.—Drawing from skiagram of a normal pelvic bone, "standard pelvis."

FIG. 2.—Drawing from skiagram of an abnormal pelvic bone.

*Read before the Ulster Medical Society, March, 1918.

the standard plate. In the same way the antero-posterior diameter of the inlet or the transverse diameter of the outlet can be worked out. I have not mentioned the oblique diameters, because if the true conjugate is diminished the oblique will also necessarily be reduced in proportion.

Fetus.

It is possible to obtain the x -ray shadow of the fetus *in utero*, and this is a great clinical advantage in cases in which there is doubt as to the presence of pregnancy or the existence of abnormality. I am unable to state the earliest month at which the fetus can be recognized. It is necessary to take the x -ray plate in the earlier stages, if pelvic measurements are required, for in the later stages, as will be readily understood, the outlines of the pelvis may be more or less obliterated by the presenting part. An accurate comparison between the fetal skull and the pelvic inlet can be obtained if the photograph be taken when the head is about to engage in the pelvis.

While it is possible to measure the diameter of the head which lies parallel to the transverse diameter of the pelvis, it is not so with the diameter which enters the true conjugate. Therefore dependence must be placed on comparison rather than measurement. Even on finding the

Fig. 3, drawn from a skiagram, represents the pelvis of a healthy woman, aged 25 years, who has had three normal labours, and whose external measurements are normal. The internal measurements have worked out very satisfactorily when compared with the standard plate.

	Standard.		Mrs. "A."	
	Pelvis.	Skiagram.	Pelvis.	Skiagram.
Inlet:				
Antero-posterior...	11.5 cm.	13.5 cm.	11.5 cm.	13.5 cm.
Transverse...	13.6 cm.	15.9 cm.	13.6 cm.	16.0 cm.
Outlet:				
Transverse...	Direct. 11 cm.	Worked Out. 12.0 cm.	Direct. 11 cm.	Worked Out. 12.2 cm.

Fig. 4 is a drawing from a skiagram of a woman with a flat pelvis. This patient's first child was eviscerated and her second was delivered by Caesarean section. The transverse diameter of the inlet is normal, but the antero-

Fig. 3.—Drawing from skiagram—normal pelvis of healthy woman.

Fig. 4.—Drawing from skiagram—flat pelvis.

Fig. 5.—Drawing from skiagram—generally contracted pelvis.

relations of the fetal head to the mother's pelvis satisfactory, we must take into account the inability to judge the exact amount of mobility existing between the bones of the fetal skull, which, if soft, would mould themselves to the pelvis, but if densely ossified would be incapable of reduction in size.

Fig. 1 is a drawing from a skiagram of a normal pelvic bone, which is taken as the "standard plate"; the dimensions are:

	Pelvis: Direct Measurements.	Skiagram.
Inlet:		
Antero-posterior ...	11.5 cm.	13.5 cm.
Transverse ...	13.6 cm.	15.9 cm.
Outlet:		
Transverse ...	11.0 cm.	12.0 cm.

Fig. 2 shows an abnormal pelvic bone, the internal measurements of which show a very slight diminution when worked out by the above method as compared with the direct measurements, there being only an error of 3 mm. in the antero-posterior diameter of the inlet, 2.1 mm. in the transverse diameter of the inlet. It also shows clearly the diminution in the outlet.

	Pelvis.		Skiagram.
	Direct Measurement.	Worked Out.	
Inlet:			
Antero-posterior ...	10.5 cm.	10.2 cm.	12.0 cm.
Transverse ...	12.0 cm.	11.79 cm.	13.7 cm.
Outlet:			
Transverse ...	7.5 cm.	7.5 cm.	8.2 cm.

posterior is diminished over an inch. The transverse diameter of the outlet is 1 cm. larger than normal.

	Standard.		Mrs. "B."	
	Pelvis.	Skiagram.	Pelvis.	Skiagram.
Inlet:				
Antero-posterior ...	11.5 cm.	13.5 cm.	8.5 cm.	10.0 cm.
Transverse ...	13.6 cm.	15.9 cm.	13.6 cm.	16.0 cm.
Outlet:				
Transverse ...	11.0 cm.	12.0 cm.	12.19 cm.	13.3 cm.

Fig. 5 is drawn from a skiagram of a woman with a generally contracted pelvis. This patient's first confinement was terminated by craniotomy and the second by Caesarean section.

	Standard.		Mrs. "C."	
	Pelvis.	Skiagram.	Pelvis.	Skiagram.
Inlet:				
Antero-posterior ...	11.5 cm.	13.5 cm.	9.6 cm.	11.3 cm.
Transverse ...	13.6 cm.	15.9 cm.	11.71 cm.	13.7 cm.
Outlet:				
Transverse ...	11.0 cm.	12.0 cm.	10.8 cm.	11.8 cm.

Fig. 6 represents the pelvis of a healthy primipara seven and a half months pregnant. She consulted her own doctor as to his prognosis of a normal labour. He found on external pelvimetry that the distance between the anterior superior spines was only 8 in. and that between the iliac crests $9\frac{1}{4}$ in. She was sent to me for x -ray pelvimetry.

External.—On comparing her x -ray plate with the "standard" there is considerable narrowing and apparent

flattening of the iliac bones, more marked on the right side. When worked out, the amount compares favourably with the doctor's direct measurements.

Between Iliac Crests.	Pelvis.	Skiagram.
Standard	28 cm.	32.5 cm.
Mrs. I.	23 cm.	26.8 cm.

At the level of the antero-inferior spines the bones are distinctly narrower than normal.

FIG. 6.—Drawing from skiagram—female pelvis showing deformity of iliac bones and normal cavity.

Internal.—On comparison with the "standard," the inlet appears normal, and when worked out it is as follows:

	Antero-posterior.		Transverse.	
	Pelvis.	Skiagram.	Pelvis.	Skiagram.
Standard	11.5 cm.	13.5 cm.	13.6 cm.	15.9 cm.
Mrs. I.	11.5 cm.	13.6 cm.	13.6 cm.	16.0 cm.

This case demonstrates clearly the advantages of this method of pelvimetry.

Fig. 7 is a case of normal full term pregnancy with a normal delivery, x-rayed at eight and a half months, and showing the fetal head engaging the pelvis.

FIG. 7.—Drawing from skiagram—fetal head engaging pelvis.

Conclusion.

In conclusion I would like to emphasize the following:

1. The necessity of a "standard" plate for pelvic measurements.
2. The patient must be radiographed in the same position as the "standard" pelvis, having the same point of focus, the x-ray tube at the same angle and at the same distance from the sensitive plate.
3. The accuracy of diagnosis in showing to advantage the variety of pelvic contraction, and the ease with which the various pelvic diameters can be worked out.
4. The minimum amount of discomfort to the patient compared to other methods of pelvimetry.
5. The absence of any ill effect to the fetus.

FROM October next the University of Maryland will admit women students to the medical department. Women have been admitted to the dental and pharmacy departments for some time.

THE PART PLAYED BY CONCOMITANT INFECTION WITH ANAEROBIC ORGANISMS (OTHER THAN *B. TETANI*) IN THE CAUSATION OF TETANUS.

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I. INTRODUCTION.

THE problem of tetanus is bacteriological, and susceptible of solution only by bacteriological inquiry. While it is a platitude thus to state that the important factor in the causation of tetanus is reproduction of *B. tetani* in the living tissues or in immediate proximity thereto, it is almost necessary at the present time to emphasize this factor of infection as opposed to the factor of intoxication. The tendency on the part of investigators to focus all attention upon the process of intoxication and upon its mechanism has led to the disease being regarded from too limited a view point—that of the pharmacologist and physiologist.

The result has been that the prophylaxis of the disease has been so far limited to the employment of tetanus antitoxin, and to those general surgical measures designed for the limitation of sepsis. Admittedly tetanus antitoxin has reduced to a very remarkable extent the incidence of tetanus, but one feels that, as the immunity conferred by the prophylactic use of this agent is transient, lasting apparently only seven to ten days, and as even its repeated employment at seven-day intervals for a period of four weeks has not absolutely eliminated the disease, other influences in its causation, notably those relating to infection, are worthy of special attention.

The general surgical methods directed to the limitation of wound infection have also done much to assist this reduction in the numbers of cases of tetanus. It must be clearly appreciated, however, that even the most efficient antiseptic is unable to sterilize an infected wound, for the conditions obtaining in a wound, notably the presence of living tissue, are such that the value of any reagent which can be incorporated in a dressing is much reduced in respect of its bactericidal and antiseptic properties. So far, no substance has been obtained which does not exert a deleterious influence upon the tissues at the same time as it exerts a restraining influence upon the growth of bacteria in the wound exudate.

The ideal method of dealing with war wounds, which are all infected to a greater or less degree, is excision of the wound area. This, however, is not always practicable, and even when practicable a certain number of cases are bound to remain considerably infected—though the mass infection is greatly reduced—owing to the conditions under which military surgery must be practised in the field.

In what Direction can the Prophylaxis of Tetanus be Improved?

The experiments to be described indicate one direction in which improvement can confidently be hoped for and the measures which they suggest, while they in all probability will result in the limitation of the incidence of gas gangrene, will also form a valuable adjuvant to the prophylactic measures at present in use for the prevention of tetanus.

The reason for conducting the experiments under consideration is indicated in the results obtained by Vaillard and Vincent and by other investigators, who demonstrated that tetanus spores deprived of toxin by washing and heating, when injected into animals, do not frequently determine the development of the disease. If, however, an irritant foreign body were introduced, or a solution of an irritant chemical were injected along with such spores, tetanus almost invariably supervened. Similar experiments, in which growths of staphylococci or other aerobic micro-organisms were used as the irritant, gave variable results.

It may be stated broadly, then, that anything which causes devitalization of tissue will enhance the infectivity of *B. tetani*. The devitalizing factors that play a notable part in war wounds are (1) trauma and the presence of