not in a position to say, but one cannot help feeling that there is some connexion between the lesion in the bowel and the condition of the kidneys. With a powerful heart and diseased arteries we expect cerebral and retinal haemorrhages and epistaxis as a matter of course. Why, then, should the vessels of the stomach and intestine remain intact?

I beg to thank Dr. Douglas Stanley and Dr. Foxwell, of Queen's Hospital, for permission to publish this note concerning their cases.

ROENTGEN CINEMATOGRAPHY AND ITS IMPORTANCE IN MEDICINE.

By DR. FRANZ M. GROEDEL,
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SCIENTIFIC cinematography has two chief aims—first, to represent a series of movements on the screen; and, secondly, to analyse movements.

Roentgen cinematography has the same two aims in view. As yet, however, no positive result has been achieved. A few investigators (I may mention Macintyre, Levy-Dorn, Eykman, and Alban Köhler) have indeed succeeded, by a skilful combination of views taken at different times, in projecting certain movements of the body on the screen. Apart from the great didactic value of this combination of views no real scientific importance can be claimed for them.

The analysis of a movement is of far more importance than its pictorial reproduction. We can watch the process of the movement on the screen with tolerable distinctness, though not demonstrate it so well as by a cinematographic projection, by which everything is reproduced on an enlarged scale. In many cases, however, it is almost impossible to distinguish the various phases of the movement, owing to the well-known slowness of the human eye, or, rather, of the retina. It will not be until we come to study heart, stomach, and breathing movements by means of cinematographic views that this question will be finally cleared up.

For the production of real Roentgen cinematograms the shortest possible exposure is requisite. The way pointed out by me¹ to attain this has since been followed by several investigators, and experience has confirmed my statements. With every good inductor it is possible, by employing a primary current of sufficient strength, to produce views of the thorax with film intensifiers in $\frac{1}{10}$ to $\frac{1}{20}$ second.

Having thus, a year ago, succeeded in fulfilling this first necessary condition, I immediately proceeded to construct an apparatus for taking a series of Roentgenograms. It soon appeared that there were very considerable difficulties to be overcome, a detailed account of which in this place would lead me too far.* It will suffice here to describe in brief the main principles of my Roentgen cinematograph. A number—for example, 24—of strong drying boxes, each containing a film between two intensifiers, are gradually moved forwards by means of a slide. Immediately in front of a leaden screen supplied with a corresponding opening, against which the patient leans, the drying boxes fall through a slit into a case, which is proof against Roentgen rays. The tube is attached behind the patient. In front of the tube moves a large leaden disc, 1 cm. thick, which contains two openings diametrically opposite each other. When one of the openings is in front of the tube, the foremost plate is exposed, and when the opening is just covered the drying boxes are pushed forward and the foremost plate is then thrown off. The whole apparatus, which weighs more than $1\frac{1}{2}$ centner, is moved by means of an electric motor. It can take at least four views in a second.

If the apparatus is fixed for an exposure of $\frac{1}{10}$ to $\frac{1}{20}$ second, views of the heart in pulsation, or the diaphragm in motion, can be obtained with extremely sharp outlines. If it is fixed to $\frac{1}{10}$ second, the movements of the stomach can be distinctly reproduced. For joint movements the time of exposure varies according to whether the Roentgenogram is taken with plates or film-

intensifiers. The primary conditions will be found in the work above mentioned.

Thus we are now in a position to reproduce all the movements in the human body by means of Roentgen cinematography, to study the different phases and to analyse the movements, which the human eye itself is mostly unable to do. Much preparatory technical work has still to be done, it is true, but the way has now been cleared.

The question as to what practical use Roentgen cinematography will be to scientific research must at present remain unanswered. Certain motions, such as pulsation of the heart and the involuntary movements of the stomach, can now be examined with scientific exactitude for the first time. As regards other movements, such as breathing, we have yet to ascertain whether the views we have hitherto held were right or not. As has been repeatedly stated, the eye is not properly adapted for analysing a movement. Therefore we are perfectly justified in expecting revelations in quarters which have hitherto seemed perfectly cleared up. It is only necessary to call to mind what a revolution instantaneous photography and cinematography have produced in regard to the pictorial and plastic representation of moving objects.

We shall only be able duly to appreciate Roentgen cinematography from a practical point of view when we have studied cinematographically the changes of the movements in the interior of the body in a pathological condition. In this respect, to quote but a few examples, the study of the pathological state of breathing, the various abnormal forms of heart pulsation, the pathological changes in the movements of the stomach, etc., all afford an ample field for scientific research.

From the tests I have as yet made with this apparatus, I will here only mention that I have already succeeded in reproducing not only the movements of the joints, the stomach, and the breathing, which are comparatively easy, but also the pulsation of the heart, as I fully demonstrated before the Verein für innere Medizin in Berlin on March 1st, 1909.

REFERENCE.

¹ Groedel and Horn: Ueber Röntgenmomentaufnahmen mit den bisher gebräuchlichen Apparaten. *Muench. med. Woch.*, 1908. No. 11.

NOTES ON A CASE OF TETANIC SPASM

WITH REFERENCE TO THE DIFFERENTIAL DIAGNOSIS BETWEEN TETANUS AND STRYCHNINE POISONING.

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THE following case illustrates very well the difficulty which is occasionally met with in the differential diagnosis of tetanus and poisoning by strychnine:

L. H., a young woman of 24, unmarried, was admitted to the Royal Berkshire Hospital on a Wednesday suffering from intermittent spasm of the face and trunk. It appeared that she was a domestic servant, though she had left her last place a fortnight before, and had since been living at home. She said that she had twice recently fallen downstairs. There was no history of any other accident. Three days previously she noticed that the muscles of her face and lower jaw began to contract spasmodically. By the following day the muscles of the face were less affected, but the jaws were firmly closed, and could not be separated. On Tuesday her back became affected, and she assumed a position of mild opisthotonos.

Condition on Admission.

When seen on Wednesday evening she was in a very weak state. The pulse was rapid and compressible. Temperature 102°. Respirations 30. The muscles of the lower jaw, neck, and back were in a state of tonic contraction, the lower jaws about $\frac{1}{2}$ in. apart, and it was impossible to separate them any wider without using undue force. The muscles of the face were unaffected, but the head was retracted in a moderate degree, and the trunk was arched backwards and was quite rigid. The abdomen remained soft and could be palpated without difficulty during the severest spasms. Her arms were affected to some extent, the elbows being firmly pressed in to the sides and the forearms flexed and supinated; the hands were flexed on the forearms. Her lower limbs were stiff and the toes inclined to point downwards; but the legs, though kept flexed as a rule, could easily be straightened. The rigidity of the legs was sufficiently marked to prevent the successful testing of the reflexes. Respiration was shallow and rapid, but regular. The spasms, as a whole, showed periods of exacerbation, but even during these the respiration, though more rapid, remained

* I gave a full description of the apparatus constructed for me by Messrs. Reiniger, Gebbert, and Schall, in Erlangen, in the *Deutsche med. Wochenschrift*, 1909, No. 10.