Fig. 2.—Physical signs on June 12th:—Anteriorly: Impaired resonance below the fifth rib; bulging and hyper-resonance above. Posteriorly: Dullness and splashing below the level of the seventh spine; "Grocco's triangle" at the right base. The heart was still displaced.

Intravenous Injections of Adrenalin.—On June 17th, as the level of the fluid continued to rise, Dr. Ewart introduced into the chest an intravenous injection of 10 minims of solution of adrenalin (1 in 1,000). On this date the heart had not returned to its normal position. The impairment of note and splashing were still present, and the convexity of Damoiseau's line and the apex of Grocco's triangle were on a level with the sixth dorsal spine. But the air entry was better, and the vesicular murmur was more distinct.

Fig. 3.—Physical signs on June 17th:—Anteriorly: Dullness at the left base. Posteriorly: Dullness, splashing, and "Grocco's triangle" extend upwards to the level of the sixth dorsal spine. The heart still displaced.

On June 20th a second injection was given. The heart had not returned to its normal position, and the fluid had continued to rise.

On June 22nd a third injection was given. The apex of Grocco's triangle and the convexity of Damoiseau's line were as high as the fourth dorsal spine. The heart had partially returned to the left side of the sternum.

Fig. 4.—Physical signs on June 22nd: The heart had begun to move leftwards. Some dullness at the left base rising posteriorly together with "Grocco's triangle," to the level of the fourth dorsal spine. Some splashing was still audible.

On June 26th a fourth injection was given. Meanwhile his general condition had improved greatly. The heart had returned to its normal position, and the area of dullness did not extend higher than the ninth dorsal spine. There was no splashing to be heard, the last remnant of air having apparently been absorbed. He was gaining flesh rapidly.

Fig. 5.—Physical signs on June 26th: The heart had returned to its normal position. No splashing could be heard; but dullness and a "Grocco's triangle" were made out below the level of the ninth dorsal spine.

A fifth and final injection was given on June 28th. The child was then convalescent. There was only a slight impair-

ment of the percussion note remaining at the left base, and Grocco's triangle of dullness had disappeared. He made an uninterrupted recovery, and went to a convalescent home on July 8th in a satisfactory state of health; and he has since done well.

REMARKS.

The interest of the case lies in the results of the two separate methods of treatment employed. As regards the first method, it should be mentioned that special care was taken to evacuate the fluid completely, by altering the patient's posture during the operation, a result probably not attainable by the airless methods. The chief facts which stand out are (1) that as previously well known, the introduction of filtered air is harmless when this is practised without any pressure; (2) that it is possible for the lung to re-expand perceptibly in these circumstances before the mediastinal displacement undergoes any correction; (3) that therefore, in spite of the persistent cardiac displacement, the substitution of pneumothorax for hydrothorax confers a respiratory advantage and an appreciable measure of comfort; (4) that at a relatively early stage of the effusion (fifth day in this instance) the artificial pneumothorax does not prevent a reaccumulation of fluid, although it is probable that it may delay the secondary effusion.

The results of the "preliminary intravenous method" are equally instructive. (1) It is a harmless way of administering suitable doses of adrenalin; but attention must be drawn to a precaution which is part of this method, namely, that the injection should only be practised when, after inserting the hypodermic syringe (or in the adult the exploring syringe) containing the adrenalin, some of the effusion can be drawn into it by further drawing out the piston. This gives us the assurance that the adrenalin will to a certainty be injected, not directly into the highly-absorbing tissues of the lung or pleura, but into a fluid collection, where it will be further diluted. (2) An injection of 10 minims only, and its repetition did not succeed in immediately stopping the progress of the secondary effusion. (3) It is noteworthy, however, that after the second injection the rise in the level of dullness in the back was a local sign and did not correspond to any proportionate increase in effusion, for the improved breath sounds indicated progressive pulmonary re-expansion in front, and the heart was beginning to return to its normal position. (4) The reabsorption of the fluid proceeded rapidly under a continuance of the same treatment, which was originally undertaken as merely "preparatory" to paracentesis. (5) Assuming—and in the absence of demonstrable evidence we can only assume—that the adrenalin, which was certainly absorbed with the fluid, had any share in promoting its absorption, it would appear that the preliminary injection of adrenalin advocated in this modification of Sir James Barr's method would favour the more complete success of an ordinary paracentesis to be performed a day or two later. (6) That most probably in the more favourable set of cases the same result might be achieved as in this case—namely, by one or two repetitions of a somewhat more liberal "preliminary intravenous injection" the performance of paracentesis might be entirely avoided.

THE TREATMENT OF BRONCHIAL FISTULA.

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On March 16th, 1905, I was consulted by a young lady suffering from bronchial fistula. She was barely 22 years of age, and contemplating marriage. The fissure was always discharging, damaging her dress, and debarring her from wearing evening dress. I had to tell her that an operation would probably be necessary, might not be successful, and would in any event leave a scar to a greater or less extent. It however occurred to me to try the constant current, and I named it as a possible way out of the difficulty, but gave her and her parents clearly to understand that I had never heard of a case being cured by it.

The fistula extended from the origin of the sterno-mastoid into the clavicle, at which point it was discharging, and ended at or about the level of the upper border of the hyoid bone. There was no tumour in connexion with the fistula or anywhere in the neck.

During the treatment I discovered that there was at least one communication with the pharynx. There was no history to be obtained, except the fact that it had been discharging since she was a child, and that the amount of discharge had increased considerably for the past two or three years. An ordinary probe passed without pain through the opening immediately over the origin of the sterno-mastoid upwards for $3\frac{1}{2}$ in., stopping, as it seemed, just above the hyoid bone; on extraction there followed a slight discharge of sero-purulent or sebaceous fluid, but no trace of blood.

Next day I passed a very small gum-elastic urethral catheter, and injected a 1 in 40 phenol solution to wash the track out; some of the solution, the patient said, entered the pharynx and was spat out. She could tell me what the solution was by the taste. The day after I again syringed it out, and passed and left in a silkworm-gut drain; on the third day, after having syringed it out, I twisted together and passed four lengths of No. 2 silkworm gut, having first dipped them in croton oil. I passed them to what I believed to be the upper extremity of the fistula, my object being, of course, to try and destroy the lining mucous membrane; in this it seemed I succeeded to some extent, on account of the copious discharge of pus there was on the dressings the following day. After two more days of antiseptic syringing and draining I passed to the upper extremity of the fistula a silver wire electrode bent on itself, the blunt bent extremity being passed up the fistula, and the two sharp ends of the other extremity fitted into a handle which was connected with the cathode wire. I gradually increased the current from zero up to 5 milliamperes, and immediately reduced it gradually to zero again. I then made the anode the active electrode on the inside of the fistula, and gradually increased from zero up to 10 milliamperes, and reduced slowly to zero again. I then put on a superficial dressing without drainage. The next day, and every day for a week, I applied a flat, flexible tin electrode to the skin surface immediately over the track only, bending the electrode on itself longitudinally, and applying the bent convex narrow border to the skin immediately over the fistula. At each application I first made the cathode the active electrode, increasing the strength of the current from zero to from 15 to 20 milliamperes for a few minutes, and then reducing again to zero, after which I made the anode the active electrode in the same way, but reaching from 30 to 35 milliamperes. Before the application of the alternating currents to the external surface of the fistula, there was a discharge from the exit on applying pressure over the course of the fistula, but after four or five days of the external treatment this discharge could not be produced on any pressure, and at about the end of the week's application the watery external discharge always produced before, on the application of the cathode as the active electrode, ceased externally; but on such application, and at intervals during the day, the patient complained of a bitter fluid discharging into her throat. The applications were continued for another week, up to April 13th, with continued good effect. During the two days previous to April 13th the patient only felt the bitter discharge into the mouth once, and that very slightly. The applications were therefore discontinued on that date.

The cathode, which attracts hydrogen and alkalies, causes, through its irritative and stimulating effect, congestion, softens and liquefies the tissues, causing a watery discharge; on application of the anode, oxygen and acids are attracted, which have a tonic and astringent effect, harden and dry up the tissues, and cause contraction of the passage, so that if this electrode is left in too long it may be impossible to withdraw it without damaging the adjacent parts.

It has been shown¹ that the therapeutic results and chemical changes brought about by a single application of five minutes with a current strength of from 1 to 2 milliamperes so alters muscle structure that evidences of it can be seen for several days after, and so the inter-polar chemical changes set up have caused the cure of this case, possibly assisted by the use of a silver electrode. I do not think that very much therapeutic effect could be attained from the use of a silver electrode, which ionizes with difficulty as compared to metals such as lead, zinc, and copper, although it is, I believe, recognized that on applying the positive pole there is some movement of silver ions into the tissues, causing the liberation of

oxygen and chloride and the formation of insoluble silver chloride.

On April 15th I removed the pharyngeal tonsils, which had been chronically enlarged for some time, causing nasal breathing and night snoring. I ceased attendance on April 30th.

On July 29th I received a report from her father that there was not the slightest sign of the old trouble. I saw the patient on September 15th, and again in January, 1906, and with the exception of very slight redness, no bigger than a pin's head, there was absolutely no sign of the trouble.

The "working-in-the-dark" treatment, as applied in this case, carries with it a certain amount of risk, owing to the proximity of important structures, but by exercising a little care the slight risk is, I think, warranted by the result. The most interesting point about such cases is their rarity and the small number of British or any publications concerning the condition or its treatment.²

As the patient has now been a year without the slightest return of the old trouble, I think I am justified in claiming a cure.

This treatment in place of excision might also be applicable to a patent thyroglossal duct and cyst—a somewhat different state; being a cystic enlargement of a lymphatic in the neck brought about by a fistula or duct from the floor of the mouth or tongue muscles leading to it, and which fistula, I also suggest, is due to an embryological faultiness in the closure of one of the clefts, part of which cleft goes towards the formation of the thyroid gland and isthmus, perhaps the first cleft.

The application of an escharotic without the immediate after-application of galvanism I consider worse than useless, owing to the fact that the irregular destruction of lining membrane and irregular adhesions set up would be more than likely the cause of cystic formations.

REFERENCE AND NOTE.

¹ *Electro-Physiologie*, Weiss, p. 127. ² According to the *Index Medicus*, there were only three publications on this condition in 1903, two in 1904, and two in 1905, and all foreign.

THE INCUBATION PERIOD OF MALTA FEVER.

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THE following case is of interest, for it tells us, within certain limits, the incubation period of Malta fever. A knowledge of this period is of the utmost importance, for it enables us to determine the actual mode of infection from amongst the many possible modes which have been enunciated.

H.M.S. *Lancaster*, having been recently built and newly commissioned, left Portland on June 20th, 1904, for the Mediterranean. She sailed direct for Malta, where she arrived on July 1st. The day after her arrival one of the ship's stokers, who was on his first voyage abroad, was sent to the naval hospital at Valetta suffering from "chancreoid and bubo." He remained in hospital until July 19th, when he returned direct to his ship, cured. The ship left Malta the next day for the Dardanelles, and remained at sea for three weeks. Two days after leaving Malta this man was taken ill with fever.

On the fifth day of his illness he was tested for the serum reaction, which gave a positive result, and the *Micrococcus melitensis* was subsequently separated from his blood. He was invalided home in the following October.

H.M.S. *Lancaster* did not return to Malta until November, 1904, and no other cases of Malta fever occurred on board until January, 1905. It is obvious, therefore, that this man contracted the disease when in the wards of the naval hospital at Malta—that is, between July 2nd and 18th. Supposing that he became infected on the day that he went to hospital, the longest possible period of his incubation is nineteen days, and the shortest two days. The incubation period of Malta fever is somewhere between these two limits, certainly not longer.

Evidence has already been brought forward to show that the incubation period of the disease in human beings, when it has been contracted naturally, is from eight to eleven days.¹ Experimentally, according to the Malta Fever Commission,² the incubation periods of the possible modes of infection are as follows: