AN ELECTRO-THERMAL PARAFFIN BATH.

By R. H. STEEN, M.D.,

Senior Assistant Medical Officer, West Sussex Asylum.

SCIENTIFIC instruments which are required to work at a constant temperature are supplied, as a rule, by coal gas for this purpose. Many institutions and private houses are now being exclusively provided with electricity as an illuminant, and in these circumstances an electro-thermal apparatus becomes almost a necessity. The only alternative is to use the regulated heat from a paraffin lamp, but this arrangement is cumbersome, requires considerable attention, and is by no means delicate.

In the apparatus figured below the electric current from the mains is utilised to raise the temperature of a paraffin bath by means of the heat radiated from one or two ordinary lamps placed in an asbestos box beneath it. A mercurial thermostat placed in the bath maintains the temperature at a constant level by causing the lamps to be switched off and on when the temperature tends to rise above or fall below the degree required.

The diagram will assist in explaining how this is effected. It is lettered for purposes of demonstration, and shows the condition of things when the mercurial thermostat is so operating as to extinguish the lamps under the bath.

H I J G is the switch of the lamps K, which heat the bath. G is an electro-magnet, which attracts the armature H, thus causing the plungers at I to be drawn up (as in the diagram); when the magnet is not acting the armature is released, the plungers fall, and come into contact with the mercury cups which are in contact with the nuts J. These nuts are included in the circuit from the main which feeds the lamps, they are insulated, and the current can pass from the one to the other only by means of the mercury and the plungers, so that when the plungers are drawn up the circuit is broken, and the lamps extinguished; and when they fall the lamps re-light. The circuit in which the coil of the magnet G is placed must now be dealt with.

A wire is carried from the positive main at N to the base of the electro-magnet c; the current from the main then passes

up the pillar of the magnet through the armature D, which, when the magnet c is acting, makes contact with E; from thence the current passes through a lamp F, which is merely a resistance, then through the coil of the magnet G, the other end of the coil being connected up with the negative main. And so it happens that the activity of G depends on contact being made at E, which in its turn depends on the activity of the magnet c, for when c is not active the armature is released, and the contact at E is broken by means of the spring.

Therefore, when c is active G is active, and the lamps under the bath are extinguished; and when c is inactive G is inactive, and these lamps re-light, so that the temperature of the bath depends on the electric magnet c. This magnet (c) is controlled by the mercurial thermostat B, which is in the bath, and acts as the automatic regulator of the apparatus.

This instrument in shape resembles an ordinary mercurial thermometer. It is provided with two platinum wires—one passes through the glass and is in contact with the mercury near the bulb, the other passes into the bore hole from above. The lower wire is connected with the positive pole of a small battery A; the upper wire has a connection leading to one terminal of the coil round the magnet c, the other terminal having a connection with the negative pole of the battery.

When the mercury in the bore of the thermostat rises into contact with the upper wire the circuit in which the magnet c is placed is opened and the magnet acts. The series of events when the bath is in use is then as follows:—

The temperature of the water in the bath rises owing to the heat radiated from the lamps K beneath it; the mercury in the thermostat at the same time expands till it touches the upper wire, c becomes a magnet pulling down the armature D into contact with E, which brings the magnet G into play. This attracts the armature H, thereby elevating the plungers I, and the lamps under the bath are extinguished. The temperature of the bath then falls, the mercury in the thermostat contracts, contact with its upper wire ceases, c is no longer a magnet, upon which the magnet G ceases to act, the plungers fall and the lamps are relit, and the series is complete.

An incubator could be worked by the same apparatus, as the upper wire in the thermostat can be adjusted for any required temperature. As a matter of practice, the bath has worked

satisfactorily for weeks together without any attention, and its temperature does not alter to an extent that is appreciable to an ordinary thermometer.

The apparatus is simple, but difficult of explanation in a few words. My excuse for entering into minute detail is that I have desired to render myself clearly understood. There are probably not a few who have felt the want of such a contrivance, and who, like myself, have been informed by instrument makers that an electrical regulator was an impossibility.

Before closing, I desire to acknowledge my indebtedness to Mr. Weatherby, engineer, for constructing the apparatus and for valuable practical suggestions, and to Mr. A. C. Cossor, Farringdon Road, for making the thermostat.

PROLONGED ACTION OF THE HEART, MAINTAINED BY ARTIFICIAL RESPIRATION WITHOUT OTHER SIGNS IN A NEW- BORN INFANT.

BY
JOHN J. REDFERN, and GERVASE NEWBY,
M.D., M.Ch., F.R.C.S.,
Surgeon. Assistant-Surgeon.
Croydon General Hospital.

A WELL-DEVELOPED male child was delivered with forceps, under chloroform, at full term, at 3.30 P.M. on August 24th, 1901. The delivery showed no unusual symptoms for a primiparous one, the amount of pressure on the head being about that usual with instrumental delivery. The cord was wound twice round the child's neck, and respiration was entirely absent. The heart beat normally, and there was pulsation in the cord. Artificial respiration was attempted, and the chest and face flicked with towels wrung out of cold and hot water, and brandy was rubbed on the chest and along the spine. The trachea was free of mucus.

As all efforts to start respiration, including rhythmical traction on the tongue with the head dependent, were unavailing, and as the heart still continued to beat normally, and the cord to pulsate, intubation was attempted; but a tube small enough to pass into the trachea not being at hand, the cord was tied, tracheotomy was performed, and a catheter introduced into the trachea. Through this tube air was blown into the lungs, and expressed by compression of the ribs. This was continued for over one hour, the heart continuing to beat regularly as long as the inflation was kept up, but if this was stopped the heart began to fail almost immediately, and at times the rate fell to about 50.

The use of the mouth to inflate the lungs proving very fatiguing, a bicycle pump was used, but a small pair of hand bellows acted more efficiently, and raised the heart-beat to over 100.

At the end of two hours and a half, during a short intermission of the bellows action, the first inspiratory effort was made; and again a few minutes afterwards, on stopping the bellows for a moment, it was repeated.

From this time breathing efforts were regularly repeated, three successive breaths being followed by an interval of 15 seconds. The bellows was still occasionally employed, as it seemed to quicken the heart's action, which was, however, remarkably strong and regular. By about 6.45 P.M. the respirations had increased in frequency, being two in every five or seven seconds, and this continued without artificial help until 10 P.M. The temporary tracheotomy tube was now removed, and as respiration through the mouth was only partially possible, another, softer and larger tube was inserted, with a lateral opening to allow respiration through the mouth, as well as through the tube. This tube tended to get blocked with mucus, and was kept free by passing a feather down in the usual way.

During the early hours of the night the respiratory rate was once in two and a half seconds and of this type . . . —. About midnight the respiration became gradually shallower and at longer intervals, say five to seven seconds. The lips turned colour about 2 A.M., the colour then returned and kept good until 4 A.M. when it became darker. The body was warmed with hot water bottles, and wrapped in cotton wool.

Between midnight and 1 A.M. clonic spasms of the right hand occurred.

About 4 A.M. the respiration was of the type . . . — instead of . . . — as it had been during the preceding six hours. Then it faded gradually. Death occurred about 4.20 A.M. After death the lips, ears and tongue were deeply cyanosed.

The points of unusual interest in this case are (1.) That the heart beat continued good for two and a half hours, without any voluntary respiratory effort, during which time artificial respiration was carried out; (2) increased use of the bellows produced marked quickening of the heart beat; (3) the child never gave any other sign of life than action of the heart and lungs, and clonic spasms of the right hand.

The causes of respiratory failure in this case involve the consideration of the following possibilities: (1) That it may have been caused by strangulation on the neck by the cord possibly producing pressure on the vagus, or phrenic nerve fibres, or (2) by the action of the chloroform inhaled by the mother and carried through the cord to the child, or (3) by injury to the respiratory centre through pressure of the forceps on the child's head.

If the second of these considerations may be entertained, the case would afford a striking example of respiratory failure preceding cardiac failure, and due to chloroform anaesthesia. As bearing on this case, it is interesting to read the opinion of Dr. Robert Kirk of Glasgow, published in the *BRITISH MEDICAL JOURNAL* of July 10th, 1897, in which he states that inversion without artificial respiration, is the way to treat cyanosis of chloroform. In the above case it was during the cessation of attempts at artificial respiration that the child first gasped, and it breathed better when artificial respiration was discontinued.

HERNIA OF A DIVERTICULUM, A TRUE LITTRE'S HERNIA.

BY T. RUDOLPH SMITH, M.B., B.C.CANTAB., F.R.C.S.,
Surgeon to the Stockton and Thornaby Hospital.

C. B., female, aged 34, married, was admitted into the Stockton and Thornaby Hospital, September 26th, 1901, complaining of pain across the lower part of the abdomen, and of a swelling in the left groin. Dr. Densham being absent, I took charge of the case at his request.

For the last two years the patient had had a swelling in the left groin when standing or straining; this always disappeared on lying down. For a few days before admission she had had a bilious attack; on the morning of September 26th, while retching, the swelling in the left groin became much more prominent and could not be pushed back. She vomited several times during the day and her bowels acted naturally three times. In the evening Dr. Taylor saw her and sent her into the hospital.

She was examined under an anaesthetic shortly after admission. There was a sausage-shaped swelling on the left side parallel to and half an inch below Poupart's ligament, extending from the situation of the femoral ring to half an inch internal to the anterior superior iliac spine. The swelling was very tense and moderate; taxis failed to reduce it. A vertical incision was made over the position of the femoral ring, and a tightly-distended hernial sac exposed. On incising the sac, blood-stained fluid escaped and some deeply congested gut was seen. This proved to be part of an intestinal diverticulum, the blind end forming the remainder of the swelling extending out towards the anterior superior iliac spine. The sac contained nothing else. The diverticulum was six inches long and of the calibre of the ileum slightly distended. Owing to the congestion of the gut and to the tightness of the femoral ring, there was great difficulty in dividing the constriction which was at the upper and inner margin of the ring.

On drawing down the gut, it was found to be nipped about three quarters of an inch from its point of origin from the small intestine. As the intestine could not be brought into view sufficiently to remove the diverticulum, and the condition of the patient did not warrant any further delay, the herniated diverticulum was returned and the ring sewn up.

The wound healed by first intention, though the temperature