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THE

HYDERABAD CHLOROFORM COMMISSION.

THE REPORT OF THE SECOND COMMISSION.

APPENDIX B.

METHOD OF EXPERIMENTATION.

ADMINISTRATION OF ANÆSTHETICS.

FOR experiments on the general action of chloroform the animal was usually placed upon a table and held by several assistants. An inhaler, consisting of a conical bag of cloth containing a sponge or absorbent cotton-wool with the anæsthetic, was then placed over the animal's mouth and nostrils, and kept there as long as necessary. While one observer watched for the loss of reflex from the cornea, the cessation of respiration, stoppage of the pulse, and arrest of the heart, another seated at an adjoining table with a watch before him noted down the times at which each event occurred. The corneal reflex was ascertained by simply touching the cornea with the finger or a blunt instrument, such as the point of an aneurysm needle. The cessation of breathing was ascertained by simple ocular inspection of the thorax and diaphragm, the presence or absence of the pulse by feeling the femoral artery with the finger, and the entire stoppage of the heart's action by watching the movements of a needle pushed through the thoracic walls into the heart. The movements of this needle were rendered more evident by a straw bearing a small paper flag being fixed to the end which projected outside the thorax. Animals anæsthetised by this method struggled while they were held until the anæsthetic had had time to take effect. In order to avoid struggling another method was adopted. This consisted in simply lifting the animal into a wooden box 3 ft. 10 in. long by 1 ft. 5 in. broad, and 1 ft. 7 in. deep, and putting on the lid, in which was an opening. Through this opening was passed a large piece of blotting-paper on which half an ounce or more of chloroform had been poured. A piece of wood or glass was then placed over the opening in the lid, and in a short time the anæsthetic took effect. To prevent too large admixture of air a strip of spongio-piline was nailed round the edges of the box and covered with vaseline, so that the lid shut down air-tight. Even when a piece of wood was used to close the aperture in the lid at first it was usually replaced by glass, when the chloroform began to take effect, as the movements of the animal could thus be watched. When it fell down insensible it was usually taken out at once, and if prolonged anæsthesia was required, as for blood-pressure experiments, an additional quantity of the anæsthetic was administered on a cap.

ADMINISTRATION OF DEFINITE PROPORTIONS OF CHLOROFORM VAPOUR.

In order to make animals respire air charged with definite proportions of chloroform vapour, the following methods were used.

(*a*) A certain quantity—e.g., ½ oz., 1 oz., or 2 oz. of chloroform was poured on blotting-paper in the box already described, and when it was seen through the glass in the lid that evaporation was complete, the lid was lifted, the animal introduced, and the lid quickly replaced. The box contained almost exactly eight cubic feet of air, so that the proportion of chloroform vapour in it was easily reckoned. As the whole of the chloroform was evaporated before the animal was introduced, the alteration which its bulk produced in the air-content of the box did not affect the proportion of vapour.

(*b*) But in the process of opening the box and introducing the animal there was almost inevitably some disturbance of the air charged with chloroform which the box contained. In order to avoid this, a box of tin plate the same size as the last was taken, and a round opening 5 in. in diameter was made in one end near the bottom. Round this a collar of tin plate ½ in. in depth was soldered, and on the top of the box was another opening 8 in. long by 5½ in. broad covered by a tin lid. The chloroform was introduced by the opening on the top, and allowed to evaporate as before, and the animal's head was then introduced through the opening at the end, and made as nearly as possible air-tight by a piece of mackintosh fastened to the tin collar surrounding the opening, and tied round the animal's neck.

(*c*) When it was thought desirable to make the animal inspire a definite proportion of chloroform vapour through a tracheal cannula, the same apparatus as above described was used, but in one end of the box two tin tubes were fixed each ¾ in. in diameter. These were connected by indiarubber tubing of a similar bore to the arms of a tin Y tube. The leg of this tube was connected with indiarubber tubing to a glass cannula tightly tied into the trachea. By means of indiarubber valves the current of air was made to circulate always in one direction.

(*d*) When it was desired to insufflate the animal's lungs with air containing a definite proportion of chloroform vapour, the apparatus just described was employed with the addition of a bellows, which drew the air from the box. In the valve-hole of the bellows a ¾-in. tube was fixed by means of a large cork bung. This tube was connected by a ¾-in. indiarubber tubing with one of the tubes in the end of the box already described, and by the Y tube with the tracheal cannula. A valve over the nozzle of the bellows and another on one arm of the Y tube regulated the direction of the current of air. These valves consisted simply of a piece of dentists' sheet rubber tied loosely over the end of the nozzle or tube and then cut across. When the air passed in one direction—e.g., from the bellows—it blew open the edges of the cut rubber, but when it tried to pass in the opposite direction the edges of the rubber fell together and presented a considerable obstacle.

ADMINISTRATION OF DEFINITE QUANTITIES OF CHLOROFORM.

For the purpose of giving a definite quantity of chloroform with unlimited quantity of air another apparatus was used. It consisted of a wide-necked jar 7 in. deep by 5½ in. internal diameter. The top was closed by a tightly-fitting bung, in which there were three apertures. In two of these were fixed ¾-in. glass tubes, and the third was closed by a small stopper, which could be withdrawn at will for the purpose of introducing chloroform into the bottle. To one of these tubes a valve was attached which only allowed the air to enter the bottle, but prevented its exit. The other tube was connected by wide rubber tubing with a tin inhaler. This inhaler was in the form of a truncated cone, and had two ¾-in. tubes opening into it. One of these was at the apical end, and the other at the side of the inhaler. The apical tube was connected with the bottle just described. The side tube was closed by a simple valve consisting of a perforated cork, over which a strip of thin sheet rubber was loosely fastened. At each expiration the rubber allowed the air to escape freely, but at each inspiration it closed completely. The muzzle of the animal was inserted in the inhaler, and a piece of mackintosh was tied round the inhaler and the head of the animal by means of an elastic bandage, so that the inhaler was nearly air-tight. On inspiration the air passed through the glass cylinder, becoming partially charged with chloroform on its way, and during expiration it passed out through the side tube of the inhaler.

For the purpose of keeping up artificial respiration an ordinary bellows was employed, but to the nozzle of it was fixed a valve which closed when the bellows was pressed, and thus directed the air into the lungs, but opened as the bellows expanded, and thus allowed the air to escape from the lungs. This valve consisted of a T tin tube ¾ in. in diameter. One end of its transverse limb was connected with the nozzle of the bellows, the other with the tracheal cannula. The opening of the perpendicular limb was covered by a piece of tin plate mounted on a hinge in such a way that when the bellows was pressed a cord tied to the upper handle of the bellows pulled it down and closed the opening, but during the expansion of the bellows it was raised and the opening uncovered by the elastic force of a piece of indiarubber. The cord and indiarubber were both attached to a short rod fixed at right angles to that which carried the cover. When it was desired to give chloroform vapour along with the insufflated air, a piece of blotting-paper soaked with chloroform was held over the valve opening of the bellows, or the opening was closed by a bung and wide rubber tube, and the blotting-paper was placed inside the tube. In the first com-

parative experiments on the effects of chloroform and ether on the heart in monkeys, when given by insufflation, the bellows and valve just described was employed. Instead of one limb of the T tube being directly connected with the tracheal cannula, however, it was connected to a small glass T tube. Each of the other limbs of this tube passed to a long-necked glass flask furnished with a tubulature through which the anæsthetic could be introduced. The neck of the flask was closed by a stopper through which two glass tubes passed, one reaching only a little way below the stopper, but the other extending nearly to the bottom of the flask. One of these tubes was connected with the glass T tube just mentioned, and the other with a glass cannula tightly tied into the trachea. At each blast of the bellows the air passed onward through these glass flasks to the tracheas of the animals, and returned through the flasks and out through the valve during the expansion of the bellows. It is evident that by this arrangement a certain admixture of ether and chloroform vapour will occur in the tubes between the animals and the valve, so that after a few blasts both animals will receive mixed vapour, although that of chloroform will predominate in the one case and that of ether in the other. In order to avoid this admixture the bellows was used without the valve, and provision was made for allowing the air to escape from the lungs by using a different form of tracheal cannula. Instead of a plain glass tube a small glass T tube was used. The perpendicular limb was inserted into the trachea, and one end of the horizontal limb was connected with the bellows; the other was partially closed by a piece of glass tubing, one end of which was drawn out and cut off so as to leave only a small orifice. This was attached by a short piece of indiarubber tubing to the limb of the T tracheal cannula. The orifice was of such a size that while it presented sufficient resistance to the passage of air to allow the lungs to become completely inflated when the bellows was pressed, yet during the expansion of the bellows it allowed the air to escape from the lungs and thus prevented over-distension.

When it was desired to give vapour by insufflation to one small animal, such as a monkey or rabbit, only the indiarubber ball of Junker's apparatus was used instead of the bellows. Junker's apparatus consists of the india-rubber balls ordinarily used for spray producers, but these are attached to a bottle in which the anæsthetic is put in such a way that, instead of producing spray, the air simply passes through the anæsthetic and becomes charged with the vapour. It then passes to a mouthpiece and is inhaled. The mouthpiece which we employed for dogs was made of stout leather in the form of a truncated cone. A metal tube ¼ in. in diameter, opening into the inhaler at its apical end, conveyed the vapour into it. This tube fitted the opening in the inhaler, through which it passed closely, but the junction was not air-tight. The inhaler at its other end did not fit the dog's muzzle at all closely, so that there was a free circulation of air. When we wished to prevent this, and to give concentrated vapour, a piece of mackintosh was tied over the inhaler and muzzle so as to close up the space between them.

BLOOD-PRESSURE EXPERIMENTS.

In all these experiments the pressure within the arteries was registered by one of Ludwig's kymographs consisting of a mercurial manometer and a revolving cylinder on which the oscillations of the mercury were recorded. The paper on the cylinder was smoked by means of burning camphor. The float on the mercury of the manometer consisted of a cylindrical piece of ivory tapering below and bearing above a steel wire, near the top of which a writing point of glass was fixed by a bit of cork. This point was kept in contact with the smoked paper by a silk thread loaded with a shot. To the top of the manometer was fastened a second writing point made of glass or of copper foil. When the mercury was at zero this point was at the same level as the point on the float, and as the cylinder revolved it traced the zero line round it, and thus afforded a means of estimating the height of the blood pressure at any moment. The cylinder revolved once in nearly thirty minutes. Near the top of the cylinder was placed a magnetic time-marker worked by a Du Bois Reymond's key.

An observer sat constantly beside the cylinder with a watch in front of him, and recorded on the cylinder by means of the time-marker, as well as the instant when anything worthy of note occurred, the time, minute by minute When the revolution of the cylinder or drum was complete it was removed, and a second drum, which was kept ready smoked, was substituted. The tracing on the first drum was at once cut off and varnished, and another paper put on and smoked, so as to be in readiness when required.

The movement of the cylinder in these experiments is much slower than that usually employed, but it has the double advantage of allowing the whole record of the experiment to be reproduced, and of rendering distinct even small variations of pressure which are apt to escape observation in the long tracing taken on a rapidly revolving drum. But the tracing taken on such a slow drum as we employed has the disadvantage of being so compressed that the individual pulse beats are invisible.

To obviate this defect a method of double registration was adopted, which had been devised by one of us for a previous research. In the connexion between Ludwig's kymograph and the artery a Y tube was inserted, by means of which a second kymograph, the cylinder of which revolved once in 3/9 seconds minutes, or about ten times as rapidly as the first, could also be brought into communication with the artery. Both were provided with stopcocks, so that they might either be allowed to work simultaneously, or the communication of either or both with the artery cut off at will. If a mercurial manometer had been used in the second kymograph it would have given the number of pulse beats, but the oscillation of the mercury itself would have modified their size and form. One of Fick's spring manometers was therefore used, and, in order to prevent the oscillations of the mercury in the other manometer affecting Fick's, the stopcock connecting the former with the artery was almost always turned off when the latter was turned on. This plan had the further advantage that the straight line traced by the float of Ludwig's kymograph attracts the eye so that a glance at the tracing at once shows when a tracing has been taken by Fick's manometer, and, by attaching corresponding numbers to these blanks in the tracing from Ludwig's kymograph and the tracings by Fick's kymograph, the relation of the tracings to each other can be at once ascertained. The clockwork of Fick's kymograph was usually started at the moment when the stopcock connecting it with the artery was opened. A short time is required for the clockwork to attain its full speed, and therefore at the beginning of a tracing the oscillations may be closer together, and the pulse may appear to be quicker at the beginning than the end of a reading of Fick's kymograph, although the pulse rate might be really the same throughout. The cylinder was usually, though not always, allowed to revolve a little space after the connexion of the manometer with the artery had been cut off in order that the readings might be more distinctly separated from one another. The mercurial manometer was connected with the artery partly by metal and partly by indiarubber tubing. The Fick's manometer was connected entirely by indiarubber tubing in the experiments up to November 5th, but after that the connexion was made partly by indiarubber and partly by metal, exactly as in the Ludwig's. The whole of the connecting tubes, except those between the Y tube and the manometers where water was used, were filled with a solution of sodium bicarbonate in order to prevent coagulation occurring in them.

This solution was made by saturating boiling water with sodium bicarbonate and then boiling it for some minutes, so as partly to convert it into carbonate. It was then allowed to cool, and was poured into a large glass vessel furnished with a tubulature near the bottom, and suspended on the wall of the room at a height of 7 ft. from the floor and 4½ ft. above the level of the table. From the tubulature of this vessel the solution was conveyed by indiarubber tubing to a glass T-piece inserted in the connexion between the manometers and the artery. By means of clamps the soda solution could be passed at will through the tubes leading to the artery. Before beginning an experiment the pressure within the manometer was raised by means of the soda solution to a height approximating to the estimated blood pressure in the animal, so as to prevent the blood from passing too far up the tubes and forming clots. This was also done whenever the artery and manometer had to be disconnected on account of clots having formed. In order further to lessen the tendency to form clots an elongated glass bulb was introduced into the tubing, and was connected by a short piece of indiarubber tube with the glass cannula in

the artery. The cannulas used for insertion into the artery were blown with a short neck to hold the ligature and prevent the cannula from slipping out of the artery. They were of various sizes so as to fit the artery of the animal experimented on. In all the experiments with one exception, the animal was first rendered insensible by being placed in a box with chloroform, as ether given in this way would have been useless. As soon as it became insensible it was taken down and the legs fastened with cords to a simple piece of board 4 ft. 6 in. long by 2 ft. 2 in. broad. To one end of this one of Bernard's dog holders was attached, and in this the animal's head was put so as to hold it still. Chloroform or ether was then administered on a nose-cap as required to keep the animal anæsthetised and one carotid exposed, the left being selected in every case as it was nearest to the manometer. Occasionally one or both vagi were also exposed and a loop of thread placed under them, but not tightened round them.

The artery was firmly ligatured on its distal side, and the proximal side was compressed by spring forceps covered with indiarubber tubing to prevent their injuring the coats of the artery. The artery was then opened, the cannula inserted, and firmly tied in. The cannula was then filled with soda solution by means of a pipette, and connected with the glass bulb already mentioned, care being taken that no air bubbles were present. The spring forceps were then removed from the artery, the stopcock of the manometer turned so as to open the connexion with the artery, and the tracing commenced. All this time the animal was kept unconscious by the administration of an anæsthetic from time to time as required.

REGISTRATION OF THE MOVEMENTS OF THE HEART.

These were sometimes registered by inserting a needle into the heart, and connecting a thread to the end which projected outside the thorax when this was unopened, or outside the cardiac walls when the thorax was opened and the heart exposed. This thread was in the first instance tied to the lever of a Marey's tambour A, and the movement transmitted by it to a second one (B), which recorded it. The resistance of the two tambours, however, was too great, and the tracings obtained were unsatisfactory. Better results were obtained by connecting the needle in the heart with a time-marker by means of two very light wooden pulleys. The lever of the time-markers being kept up by a very fine spring, a very slight pull sufficed to depress it, and thus it marked even when the cardiac action was weak, and had the further advantage of opposing very little resistance to the action of the heart.

REGISTRATION OF THE RESPIRATION.

For this purpose the two Marey's tambours A and B were used. A was usually connected to a needle pushed through the chest walls into the diaphragm. On one or two occasions an incision was made just under the margin of the ribs, and a piece of thick copper wire, flattened at one end, was introduced, so that the flat pieces lay between the diaphragm and liver. The other end projected outside, and the thread from Marey's tambour was fastened to it. In some of the later experiments a fish-hook was used instead of a needle.

Pharmacology and Therapeutics.

TRICHLORACETIC ACID IN THROAT AFFECTIONS.

DR. EHRMANN has employed trichloraectic acid in 140 cases of chronic inflammations and in hypertrophied conditions of various parts in the neighbourhood of the nose and pharynx with very marked success, 122 of the cases being permanently cured. The tonsils or other parts affected were rubbed with a crystal of the acid, which produced a white, dry, smooth, adhering eschar, which is thrown off much more quickly than that produced by chromic acid. No secondary inflammation and no unpleasant effects of any kind were observed. If a mere astringent action be desired trichloracetic acid may be dissolved in an equal weight (or in double its weight) of glycerine, with the addition of a little iodine and iodide of potassium, and the mixture used to paint the throat. This treatment proved very successful in follicular tonsillitis and in chronic pharyngitis.

OREXIN.

Dr. Hugo Gluckziegel has just published some observations upon orexin. The preparation employed was a pill containing a grain and a half of orexin with the extracts of gentian and marsh mallow. First of all, Dr. Gluckziegel and a healthy young medical student took three of the pills daily for four days. No increase of appetite or any other effect, bad or good, was produced in either of them. The treatment was then tried on seventeen patients, who were all suffering more or less from anorexia. In two cases the appetite improved the very first day. In four cases an improvement was noticed on the second day. In three cases no improvement was effected even after some time, but vomiting was produced. After the treatment was stopped, seven patients had a normal appetite, and in four there was a decided improvement. In addition to the vomiting above mentioned the only other case in which any disagreeable effect was induced was that of a man with cardiac disease who complained of pain in the stomach, which, however, disappeared as soon as the orexin was discontinued. It would seem therefore that this drug may, if prescribed with care, be of value in a considerable number of cases of dyspepsia.

BISULPHIDE OF CARBON IN DYSENTERY.

Dr. Jakobleff reports in the Proceedings of a Russian provincial medical society that he has found great benefit in dysentery from the employment of bisulphide of carbon—of course largely diluted. The quantity given per diem was from three to five grains in half a tumbler of water or milk, with a little peppermint. First of all, however, one or two grains of calomel were administered hourly until calomel stools had been induced; and during this time enemata containing a grain and a half of sulphide of carbon in an ounce and a half of water were administered twice daily. Great improvement was produced, and frequently this was as rapid as it was marked, so that there could not be any doubt that it had been brought about by the bisulphide of carbon treatment.

IODOFORM EMULSION IN COLD ABSCESS.

Dr. Jasinski of Cracow has treated eighty-six cases of cold abscess by means of injections through a trocar of iodoform emulsion with encouraging results. A certain number were cured by a single injection, others after two or three injections. In eleven cases after the injection the abscess broke, a large quantity of pus mixed with iodoform being discharged. These were all cured without any further surgical interference. In nineteen cases an incision had to be made, the cavity was then washed out with carbolised water, iodoform emulsion injected, and the wound sewn up after a drainage-tube had been inserted. In some of these cases the injection had to be repeated several times. Though 180 grammes of a 10 per cent. emulsion were injected at once no toxic symptoms were ever observed.

ICHTHYOL IN GYNÆCOLOGY.

Dr. Freund, first assistant in the gynæcological clinic at Strassburg, has found ichthyol of considerable use in parametritis, perimetritis with effusion, cicatrisation of the vagina and os, chronic metritis, inflammations of the ovaries and Fallopian tubes, ulceration of the os and pruritus vulvæ. He uses the drug internally in the form of pills and externally as a 5 per cent. solution in glycerine applied on cotton wool; also with lanolin as an application to the abdominal walls, and made up into suppositories with cacao butter. In many cases he has obtained excellent results, notably in one where there was an extensive effusion into the pouch of Douglas, which was entirely absorbed in sixteen days, ichthyol being used both internally and externally. In no case was any untoward result noted. The disagreeable smell of the ichthyol was covered by the addition of cumarin.

PROPOSED HOSPITAL FOR BACUP.—At the monthly meeting of the Town Council, held on the 7th inst., Councillor Simcock expressed the opinion that the present joint hospital at Sourhall was at an inconvenient distance (six miles), and that there should be a hospital within the borough. He thought, in view of the recent generous gifts to the town, that the necessary funds by voluntary contributions might be raised to erect a hospital, and, as a common working man, he would give £20 towards that object—an example which the Mayor hoped would be generally followed.