

sidered the end to be gained did not justify the pain they would have inflicted.

(22) In experiment 178, the case of a dog that had had morphine, remarkable slowing and even temporary cessation of the heart's action occurred again and again at the same moment as the respiration stopped, but the heart invariably recovered itself, and began again to beat regularly before any steps were taken to restore the animal, and without any respiration occurring. We find in this case that it was possible to restore the animal even after unusually long intervals had been allowed to elapse between the cessation of the natural and the commencement of artificial respiration. The failure of the heart, if such it can be called, instead of being a danger to the animal, proved to be a positive safeguard, by preventing the absorption of the residual chloroform and its distribution through the system.

(23) The effect of artificial respiration after the natural respiration has ceased is to cause an alternate rise and fall of small amount in the blood pressure, the trace thus formed upon the drum being a coarse imitation, altered somewhat by the shaking of the table, of the natural respiratory cure. The difference consists chiefly in the fact that the artificial rise and fall are more abrupt than in natural breathing, and that the rise always coincides with expiration or compression of the chest. After artificial respiration has been continued for a certain time, the blood pressure begins to rise again, and a little later natural respiration returns.

(24) The effect of artificial respiration in restoring an animal after the respiration had stopped was always marked. In a few exceptional cases, such as experiment 159, a phosphorous dog, and Experiment 142, a horse which had an enormous over-dose, although the artificial respiration was commenced as soon as possible after the breathing was noticed to have stopped, it was not successful.

(25) Complete stoppage of the respiration always means that an over-dose has been administered, and the over-dose may have been so great as to produce a very prolonged after-fall of blood pressure, and may thus render restoration impossible. As it is impossible to say whether, after chloroform has been pushed and then discontinued, the respiration will be restored spontaneously or not, so it is never in any case certain that artificial respiration will restore the natural respiration and blood pressure, no matter how soon it is commenced after the respiration stops. A great deal depends upon the amount of the after-fall; in some cases, even after the respiration has been restored, the pressure continues to fall and respiration again ceases, and artificial respiration then fails. We thus find respiration restored by artificial respiration while chloroform is still being

absorbed, and this tends to show that artificial respiration does not merely pump the chloroform out of the blood, but exerts considerable influence in exciting the natural respiration.

(26) The time which elapses before artificial respiration succeeds in restoring natural respiration varies very greatly. In one case, Experiment 116, it was continued for eleven minutes before the first natural gasps commenced. This period is undoubtedly prolonged in some cases by a condition of physiological apnoea, which renders it unnecessary for the animal to breathe. Consequently, whenever the pressure rose considerably during artificial respiration it was stopped, and the animal then generally breathed after a few seconds.

(27) The time which may be allowed to pass with impunity before commencing artificial respiration also seems to vary considerably. This point was not particularly attended to in the manometer experiments except in Experiments 162 and 178, which were instituted to test the truth of the opinion formed by the sub-committee that morphine had some slight action in impairing the efficiency of artificial respiration. In these cases the commencement of artificial respiration was postponed for more than two minutes after respiration ceased, and was successful; but this is certainly far above the average interval that can be allowed with safety. The success of artificial respiration in restoring the blood pressure is in some cases very remarkable; *vide* especially Experiment 40, in which the heart had apparently ceased beating, and the dog was believed by everyone present to be dead, and yet recovered with artificial respiration. The success in this instance is due to the fact that chloroform had only been administered for a few seconds, and that the depression was the result, not of continuous chloroform administration until respiration ceased, but of a long and severe after-fall.

(28) It corresponds to those cases, which are so often reported, in which dangerous failure of the heart is said to have occurred some minutes after the administration of chloroform had been discontinued, and which are sometimes restored, and sometimes not, by artificial respiration. There is nothing at all sudden about the failure of the heart in these cases, but the attention of the chloroformist which has been wandering, is suddenly called to the fact that the patient is apparently dead. When the animal was really dead, it was found in some cases that artificial respiration still maintained a small amount of mean pressure in the manometer. In others the pressure seemed to fall to the zero line between each compression of the chest.

(29) The dangers of too vigorous artificial respiration were illustrated in some of the accidental deaths. In one case the liver was badly ruptured, and in another the pleural cavity was filled with