

with urethane were asphyxiated by occlusion of the trachea: the respirations became slower, and later deeper as well, and finally ceased: about a minute later a series of gasps occurred, which were usually ineffective in restoring the circulation (the trachea having been opened) unless the heart was also beating. The blood pressure fell when respiration ceased, and the heart gradually stopped.

Manual pressure on the chest may now cause recovery, both by renewing the air in the lungs and by pumping blood through the heart; artificial ventilation of the lungs alone may fail. The blood pressure may rapidly rise to an abnormal height before settling to the normal level, probably due to passage of adrenaline in the stagnant venous blood through the heart and arteries. The injection of adrenaline into the heart, especially the myocardium, will restore the beat to normal if the organ is beating feebly, or will arouse it again if given fairly soon after stoppage, together with inflation of the lungs. At the same time, it constricts the arteries and raises the blood pressure to its normal level or even higher. With restoration of the circulation, the breathing also returns, and though at first slow and deep, gradually becomes normal in character and rate. The injection of adrenaline into the heart, together with artificial

respiration, will only be successful in the human being provided the breathing and circulation have not been too long in abeyance; ten minutes is probably the limit in ordinary circumstances.

The manual method of artificial respiration is inconvenient and difficult to apply successfully over a prolonged period of time; P. Drinker and L. A. Shaw have invented a mechanical respirator for use in the respiratory paralysis of anterior poliomyelitis in children and in cases of respiratory failure due to carbon monoxide poisoning, electrocution, drowning, etc. (*J. Franklin Inst.*, vol. 213, p. 355; 1932). The patient is placed, except for his head, in a closed chamber; the neck is encircled by an air-tight flexible rubber collar. Air is rhythmically pumped from the chamber, producing inhalation in the patient; exhalation occurs when the air pressure returns to normal. The patient's respiration is completely under the control of the machine when the negative pressure is 7 cm. of water. The apparatus has been found so successful that more than 150 are now in use in the United States and Canada. It is of interest to note that the optimum diameters of the rubber collar and head hole in the lid were obtained by plotting frequency curves from manufacturers' sales of different sizes of collars and hats.

### Cosmic Radiation

IN a paper presented at the recent International Electrical Congress held at Paris, Prof. R. A. Millikan summarised in a convincing manner his views concerning the nature and origin of the penetrating cosmic radiation. The idea that they are neutrons, although it would combine the advantages of particles with failure to be deflected in the magnetic field of the earth, he considers unnecessary and not superior to the photon hypothesis. Commenting on the experiments which have been made to find if there is any preferential direction in which they enter the air, Prof. Millikan takes the view that there is no evidence that they are other than isotropic; this is in accord with his interpretation of their absorption curve, according to which the cosmic rays arise from processes involving the agglomeration of hydrogen nuclei for, probably, a very long time until they condense catastrophically to form a new nuclear type, which could scarcely occur where the temperature and pressure were not extremely low, as in interstellar space.

This paper contains some details of the experiments which have been made by Anderson in the Norman Bridge Laboratory in California, with a Wilson ex-

pansion chamber. The main aim of these was to deflect the products of the interaction of the rays with matter in a magnetic field, but many interesting subsidiary observations have been made.

The cosmic rays appear to be absorbed largely by nuclei, in general accord with the supposition that they arise in nuclear processes, but destroying the validity of the immediate application of the Klein-Nishina absorption formula, which assumes interaction with the extra-nuclear electrons. About thirty good trails have been photographed. Eleven show a proton with an energy of the order of some  $10^8$  electron-volts, two an electron of similar energy, three protons of between sixteen and forty million volts, five electron trails of about ten million volts, and the remainder particles of greater energy than  $5 \times 10^8$  volts. The reality of the latter would not be in agreement with Prof. Millikan's atom-building postulates, the energy being excessive, but there is some doubt if they are authentic, as the trails show a number of sudden small deflections which are difficult to reconcile with the transit of such energetic particles. In seventeen per cent of the encounters with nuclei, the latter suffered disintegration.

### International Conference on Radio Communication

RADIO engineers are looking forward anxiously to the international conference in Madrid on radio communication, which begins in September. In the *Wireless World* for Aug. 19 and 26, Noel Ashbridge, chief engineer to the British Broadcasting Company, states some of the problems of which a solution will have to be found. He confines himself to the broadcasting problem, and discusses first the problem of separating the frequencies and consequently the wave-lengths of the stations in Europe.

The existing agreement, known as the Prague plan, was put into operation by a large majority of the signatories in June 1929. It was decided that, so far as wave-lengths between 200 metres and 545 metres are concerned, the minimum separation between

stations should be 9 kilocycles. This number was not selected on technical grounds but because it was the only hope of getting a general agreement. For the first year after the agreement the arrangement worked very well, only a few people who had signed the agreement failing to observe it in practice. During this year there were only a few stations which worked with a higher power than 15 kw.

Serious trouble started in November 1930, when Mühlacker, a high-power station, operated with a frequency adjoining that of London Regional. The result was immediate and severe jamming after dark on the London programme. The condition of affairs was very bad, because two years ago ordinary receivers were not nearly so selective as they are now.