mercury and supply the flame with a stream of the vapour. This increase in the current was taken as showing directly that the vapour in the flame was ionised. In some additional experiments photographs were taken of the flame and it was always found when the cup, CC, was empty and free from mercury that the Bunsen flame spectrum alone was obtained. When, however, mercury was introduced into the cup and the increased conductivity was exhibited, the single spectral line $\lambda = 2536{\cdot}72$ A.U. always came out on the plates in addition to the flame spectrum. In no case was any trace of any other spectral line within the region between $\lambda = 6000$ A.U. and $\lambda = 1800$ A.U. obtained. It was thought that possibly the line $\lambda = 1849{\cdot}6$ A.U. might have come out on the plates, even though feebly marked, but it was never observed. In so far then as these experiments go the results indicate that the emission by the vapour of the monochromatic radiation of wave-length $\lambda = 2536{\cdot}72$ A.U. connotes ionisation of the vapour. The experiments also support the view that when the vapour acquires the power to emit the radiation, it simultaneously acquires the power to conduct electricity. Further, it follows, since for the stimulation of the mercury vapour to the emission of the radiation $\lambda = 2536{\cdot}72$ A.U. by electrons, it is necessary for the latter to have kinetic energy corresponding to a fall of potential of 4·9 volts, that the experiments described go to confirm the conclusion drawn by Frank and Hertz from direct experiment that 4·9 volts is the ionising potential of mercury vapour.

3. *Further Experiments with Mercury.*

With the apparatus used in the preliminary experiments it was found difficult to maintain the current through the flame steady for long periods of time, but after several trials the modification of the burner shown in fig. 2 was found to give very satisfactory results. To the top of an ordinary Bunsen burner a brass cylinder, KL, 3·8 cm. in diameter and 8 cm. in height, was soldered. The top was closed by a lid provided with an aperture 1·8 cm. in diameter, into which there was inserted a short tube 0·5 cm. in length. Another brass cylinder, 2·8 cm. in diameter and 7 cm., in length was held in the centre of the tube, KL, by means of three asbestos supports. This inner cylinder contained a fused quartz tube, F, 1 cm. in diameter and about 8 cm. in length, drawn off to a neck about 0·5 cm. in diameter at the upper end. A coil of manganin wire, MN, was wound round this quartz tube, and the ends were led out as shown in the figure through two openings in the cylinder, KL, fitted with small porcelain insulating plugs. A layer of asbestos paper was wound round the coil of manganin wire, and then the whole space between the quartz tube and the brass tube next to it was filled