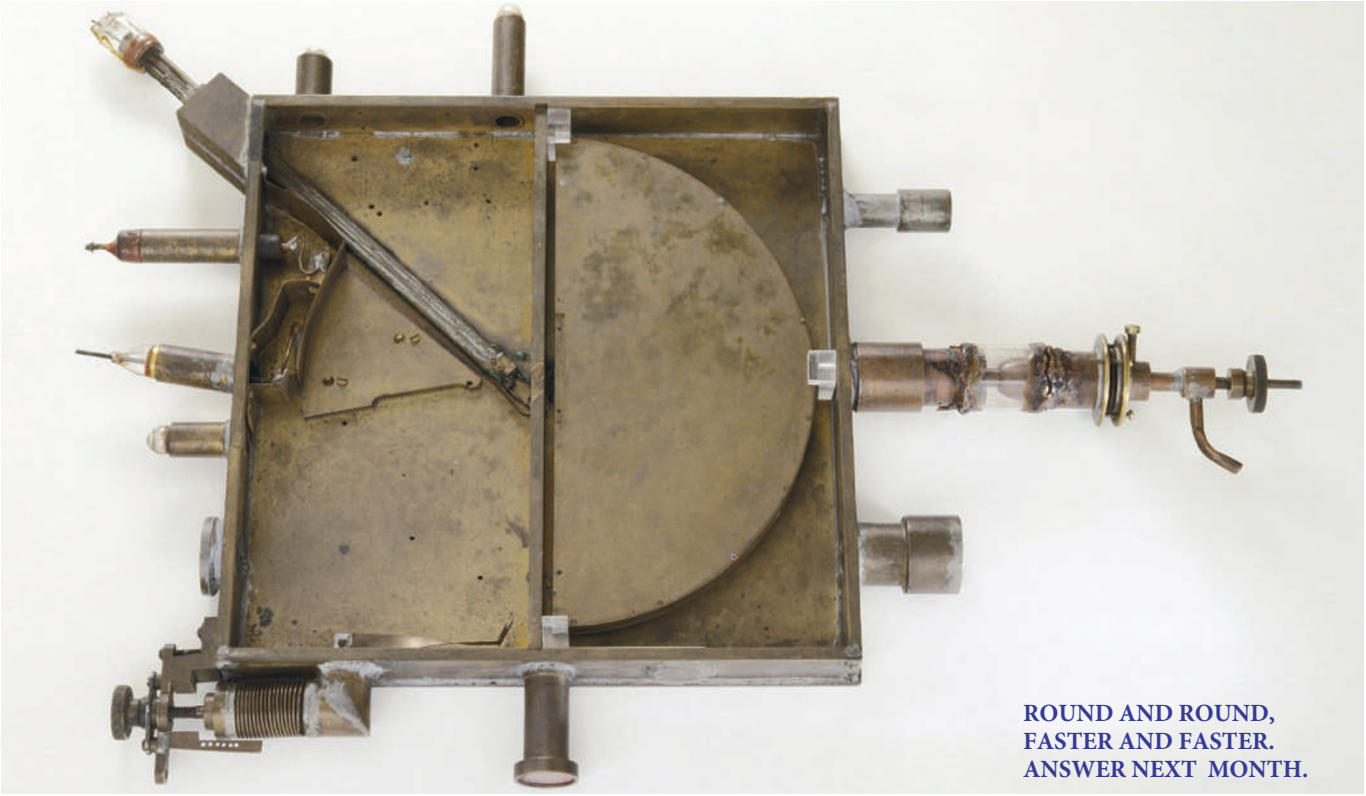
Round and around

This apparatus, held in London's Science Museum, has some significant purpose — or curiosity value — in the history of physics. Can you guess what it is?

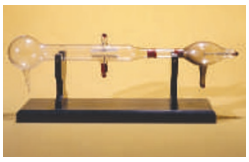


ROUND AND ROUND, FASTER AND FASTER. ANSWER NEXT MONTH.

This has been claimed to be the apparatus with which Joseph John Thomson discovered the electron in 1897. Although it was certainly one of his instruments, he used a series of cathode-ray tubes in that year, so we cannot be certain.

Although the moment of discovery of the first subatomic particle has been controversial, Thomson's measurement of the charge-to-mass ratio for cathode rays is now considered to have defined the electron. The road leading to the discovery had been an arduous one, trodden by many scientists. The discharge tubes and pumps invented by Heinrich Geissler in the 1850s, and the induction coil perfected by Heinrich Ruhmkorff at about the same time, had enabled many physicists, such as Julius Plücker and Johann Hittorf, to experiment with the new 'cathode rays'. This earlier generation had observed that these rays travelled in straight lines but could be deflected by a magnetic field, which became the basis of Thomson's work.

Others, such as geophysicist Emil Wiechert, realized that the charged carriers of electricity were very small, but Thomson seems to have been the first to suggest that electrons — or 'corpuscles', as he called them — existed inside the atom; he put forward a model for atomic structure that was based on the patterns of repulsion of floating magnets noted by Alfred Mayer in 1878. By 1897, Thomson had measured the charge-to-mass ratio, but finding the charge or mass of the electron independently took a further two years.



Last month: J. J. Thomson's cathode-ray tube

In the apparatus shown here, rays produced at the cathode were focused into a narrow beam by the slits in the cylinders in the narrow part of the tube, producing a fluorescent spot on the spherical end of the tube. The beam was deflected by passing it through an electric field between the parallel plates. An equal deflection was produced by applying a magnetic field, perpendicular to the electric field, using an electromagnet. The charge-to-mass ratio could then be calculated, and was found to be at least 1,000 times higher than that of the hydrogen atom.

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www.sciencemuseum.org.uk