magnet with centimetre, gram, second and permeability of vacuum fundamental, the electrostatic with permittivity replacing permeability, and rationalized and subrationalized forms of each, the Gaussian mixed system with some quantities expressed in electromagnetic others in electrostatic units, the rationalized form of this, introduced by Heaviside and Lorentz, the Maxwell quadrant (10^9 cm.), 10^{-11} gram, second and permeability of vacuum, the Bennett and others, centimetre, 10^7 gram, and a unit of permittivity of vacuum $= 1/(8 \cdot 989 \times 10^{11})$, the Giorgi, metre, kilogram, second and 10^7 times the permeability of vacuum. The last three systems all have the ampere, volt and watt as units of current, potential and power respectively.

Trend of Design of Electric Locomotives

THE paper on the trend of the design of electric locomotives during the last ten years, read to the Institution of Electrical Engineers by C. E. Fairburn, the electrical engineer to the L.M.S. railway, is a valuable contribution to electric traction. He shows clearly that there is a growing demand for locomotives of greater power and speed. This is due partly to the necessity of improving running schedules with heavier trains and of avoiding the higher cost of multiple operation. Fairly complete data are given of ten electric railways in eight different countries and from twelve manufacturing companies. To analyse them is difficult because the outlook and methods vary not only from country to country but also from railway to railway in the same country. In Austria, Germany, Switzerland and Sweden low-frequency alternating current is employed; in Belgium, Italy and Poland, 3,000 volts direct current; France, Holland, Japan and much of the British Empire, use 1,500 volts direct current. Three-phase systems seem to be making little progress. In Germany, the express locomotive of the German State Railways is of 4,150 horse-power. Recent Swiss locomotives have 8,630 horse-power and the articulated express locomotives of the Pennsylvania Railroad can supply 9,500 horse-power for a short period. General experience with high-power locomotives, in particular on the Pennsylvania Railroad, shows that even larger horse-powers are desirable, especially on lines carrying heavy traffic. It is definitely stated that the advantages of electric braking on long gradients lie more in the reduction of wear in the mechanical parts than in the value of the energy returned to the supply system. With high speeds it is advisable to retain mechanical brakes for emergency operation as this makes higher speeds possible with safety.

Water Heating by Electricity

AT a meeting of the Association of Supervising Electrical Engineers held in London on April 12, P. Honey discussed the technical aspects of water heating by electricity. Since two trades were involved, namely, plumbing and wiring, the question of responsibility for satisfactory working has to be considered. The retailer of the appliance has to take upon himself the responsibility of planning the installation and, with the co-operation of a hot-water fitter, make certain that the workmanship is good. The problems of the water authorities are similar, in some respects, to those of supply undertakings. Unlike electric supply they have not the stimulus of competition. As water for domestic purposes is rarely charged for by quantity, the most urgent need is to prevent waste. They have therefore insisted that the fittings and appliances should be in accordance with certain specifications. To eliminate 'peak' demands which would cause serious drop in water pressure, the use of feed cisterns is insisted on by many authorities to ensure a more even demand. The amount of storage water held in this way in the houses of consumers is a considerable fraction of the total stored by the authorities. Regulations, therefore, were issued which restricted the connexion of electric water heaters of the thermal storage type direct to the cold water main. For example, in London, no heater larger than three gallons must be connected in such a manner. Those of larger size must be fed from an adequate storage system. No water authority in Great Britain would permit the connexion of a pressure water heater direct to the cold mains in the way frequently done abroad. The cost of servicing electric water heaters of all kinds is not a serious item. The majority of the few electrical defects which occur are probably due to the thermostat and are not serious.

Education in 1932-1934 in the United States

THE United States Office of Education has recently published its "Biennial Survey of Education 1932–1934" (Washington: Government Printing Office. Pp. 1222. Price 1.10 dollars). The effects of the economic depression, which touched its lowest point in 1932, are reflected in many of the statistical tables. The total aggregate income for education from kindergarten upwards in 1933–34 was about 2,604 million dollars, of which huge sum more than five sixths represent income of publicly controlled institutions. Compared with the corresponding figures for 1931–32, there was a decrease of 15·5 per cent, and compared with those for 1929–30 a decrease of 22·6 per cent. It is noteworthy that the decrease was twice as heavy in privately controlled as in publicly controlled institutions from 1932 to 1934, although it had been much lighter in the preceding biennium. Statistics of university enrolments which had risen continuously for many years showed a sharp drop after 1932. It is estimated that the percentage of boys and girls who on completion of their secondary school education entered a university or other institution for further education was in 1933 about 26. This is a high figure compared with the corresponding percentage in Great Britain, but it is low compared with the average percentage (44) of the years 1921–1929 in the United States.

University College, London

ITS recently issued annual report shows that this most cosmopolitan of all colleges in Great Britain numbered last year among its 3,284 students no fewer than 910 visitors from 52 countries outside the British Isles. By far the biggest contingent, 228,