

erved by the studio at Lugano. In order to meet the requirements for music transmission, circuits having a cut-off frequency of 10,000 are provided. This enables a sound spectrum of 35-7500 cycles per second to be obtained without distortion. In addition, there exist lightly loaded circuits having a cut-off frequency of 6800 cycles, giving a range of 150-5000 cycles for broadcast speech transmission. At present 87 per cent of all the toll circuits are in underground cable.

#### Broadcasting and Television in France

*La Nature* for Sept. 1 is devoted exclusively to an inquiry on television and broadcasting. The views of several eminent technicians both in France and other countries are given. Manfred von Ardenne takes an optimistic view of the progress of television in Germany and looks forward to a great increase in the art before next winter. Maps are given showing a national scheme for radio diffusion in France and comparing it with the present system. A description is given of the new short-wave transmitter in Berlin, the largest in the world. Power of 15 kilowatts is emitted by waves seven metres long. It will help in the solution of certain problems in television and in producing broadcasting free from disturbance. The legal aspects of the problems which arise when a 'listener' is disturbed by induction from apparatus working in the neighbourhood are considered at length. Several law cases are quoted which show that the rights of listeners are recognised in France, and that those who use apparatus which interferes with the working of a private user's set are liable to substantial fines. The disturbances may be due to an electric motor driving a gramophone, neon tube lighting, the working of a cinema, the electric bell system on the ground floor, and public electric supply systems. In certain cases the use of devices to prevent interference is enforced. In conclusion, the influence of American improvements on the design of French receiving sets is discussed.

#### An Early Diffraction Grating

THE June issue of the *Journal of the Franklin Institute* contains two interesting letters from the second volume of the *Transactions of the American Philosophical Society* (1786), from which it would appear that a transmission grating had been used to produce spectra prior to the work of Fraunhofer (1820). The first, which is addressed to David Rittenhouse from F. Hopkinson, of Philadelphia, has a description of the appearance presented when a street lamp is viewed through a silk handkerchief, and contains a request for an explanation of the pattern formed. The second, dated eleven months later, is Rittenhouse's reply. From its contents, and the lapse of time from the first letter, it appears that he had given considerable thought to the matter. Starting with the observation that the experiment is more curious than one would at first imagine, Rittenhouse then describes the grating he made to perform it with more accuracy. He constructed a square of parallel hairs, about half an inch each way, laid into the threads of two fine screws, with a pitch of 106 to the inch, which he had cut from brass wire. With this he

observed a small opening in the window shutter in a dark room, at first with the unaided eye, and later with a prismatic telescope and micrometer, to measure the angular separation in units of the pattern. Six orders of diffraction were observed on either side of the zero, and measured up, and he noted that the dispersion of colours was in the opposite sense to that obtained with a prism, which he considered parallel to Newton's observations on the colours of fringes at the edges of shadows. Rittenhouse was unable to carry out the calculation of wave-lengths from his observations, as Fresnel's theory of diffraction did not appear until 1815, but his data lead to quite good results: 6200 Å. for the red, and 4600 Å. for the blue. He does not appear to have followed the work up further, so far as this correspondence goes. Fraunhofer's work was of course the more complete, but this experiment is interesting as coming in the gap between the time of Newton and that of the great optical researches of the early nineteenth century.

#### Hydro-electric Power on the Dnieper

A REPORT from Washington states that "Dneprostroy" was dedicated on Aug. 25. This hydro-electric power project on the Dnieper River, with a capacity of 756,000 h.p., is the largest in the world. The power will be available for metallurgical and chemical industries and to irrigate the rich but droughty steppes. Ships from the Black Sea will now be able to penetrate hundreds of miles farther inland. The cost is approximately 110,000,000 dollars, and the dam, the largest ever constructed, was constructed ahead of the schedule. The dam is 3350 feet long and 140 feet high to the crest of the spillway, above which water may rise 30 feet during floods. The structure impounds a flow varying from 6300 to 835,000 cu. ft. a second at times of large freshets. Six of the nine power units are now being installed. The turbines have a rated capacity of 84,000 h.p., and 100,000 h.p. under a maximum head of water. The maximum or high-water capacity is 900,000 h.p., but owing to irregular flow, only three of the units can be operated during the entire year.

#### Agriculture in the East of England

THE report on an "Economic Survey of Agriculture in the Eastern Counties of England" issued by the Department of Agriculture, University of Cambridge, and published by Messrs. Heffer and Sons, Cambridge, price 2s. 9d. post paid, presents an analysis of the financial results for 1931 of nearly a thousand farms in the province. During the year farmers in this area experienced heavy losses. The general price level of agricultural produce averaged 18 per cent below that necessary to provide occupiers with a reasonable return for their own labour and capital investment. The majority of those farmers who were fortunate enough to secure a profit enjoyed special marketing facilities, retailed milk or concentrated on the production of livestock and livestock products, or both. As the eastern counties are generally described as a grain-growing area, it is rather surprising to find that while sales of cereals amounted to less than 14 per cent of the gross income, sales of livestock and their products