

BOOKS

An introduction to waves, rays and radiations in plasma media, by Julius J. Brandstatter (London, McGraw-Hill Publishing Co. Ltd., 1963 ; £5 16s. 6d.).

The publishers tell us that the author has worked as a mathematician and physicist in industry and has also been a lecturer. His varied experience probably explains why this basic handbook gives such a coherent account of the subject : waves, rays and radiation in plasma media. The approach is clearly mathematical, but the author has always kept in mind the physical aspects of the problems considered, and as a whole the book is extremely clear.

The titles of the chapters give an idea of the wide range of subjects treated :

- The homogeneous electron plasma in a uniform magnetic field.
- A résumé of the hydrodynamical equations and shock conditions for gases.
- The homogeneous ionic plasma in a magnetic field.
- Energy considerations and electrodynamics.
- The structure of waves in non-homogeneous media.
- Theory of propagation of waves in an inhomogeneous isotropic, dispersive and absorbing medium.
- Propagation phenomena based on the Boltzmann equation.
- Radiation in a plasma.

The book is rather unusual, because it deals completely with all aspects of the subject starting from the elementary mathematical and physical data, and particularly because it follows a single guide line throughout and never loses sight of the overall aspect of the phenomena studied, even though it gives comprehensive calculations. Accordingly, each chapter opens with an abstract. The author gathers together in his text ideas and techniques from many fields of mathematics and physics ; the mathematical forms used (vectors, matrixes, tensors) also make the description of the problems clear.

To sum up, this is a basic handbook for anyone working on ionized media. It forms a coherent whole, the quoting of references always being subordinated to the clarity of the text, and an ample bibliography is given at the end of each chapter.

This handsome 690-page book finishes with a set of problems on each subject.

M.P.

L'électronique dans les appareils de contrôle nucléaire (Electronics in nuclear control equipment), Vol. 1, by G. Nicolo (Paris, Éditions Eyrolles, 1963 ; 110 Fr.).

That first impressions do count is true even of a book, and in this case one's apprehension after the first glance is amply justified. The book is ostensibly destined to enlarge the gallery of practical handbooks on electronic equipment ;

SOLUTIONS TO 'PUZZLE PHOTOS

1. This is a highly polished metal torus intended to cap a condensor, charged to 300 000 volts, so as to reduce the discharge of electricity into the surrounding air. It was manufactured in the main workshop and is used by the linac group of the proton synchrotron.
2. This is not used for physics ; it is a 'Remy' rake known as the 'sun'. Photographed here in its raised position, it is one of the more modest pieces of equipment at CERN, and although its aerial appearance reminds one of a group of spiders it is on the ground that it comes into its own. Attached to a tractor, its task is to rake up the cuttings from those areas of the site given over to grassland. Robust and easy to handle, it enables the work to be carried out in difficult, even acrobatic positions (such as on 'Mount Citron' and the mounds of the PS ring), and it holds a leading position among the garden staff's tools.
3. Although some people might think this is a scientific musical instrument, it is in fact the 'rapid beam deflector' destined for use in the synchrotron early in the new year. A pulse of electric current in these two coils will cause the accelerated proton beam to be deflected, in a horizontal plane, so as to impinge on a target further round the ring for a controlled period of time, normally 200 microseconds. At the end of this time the rest of the beam will resume its normal circulation and can be used for the bombardment of other targets. The deflector was made under the direction of the linac group in the workshop of the mechanical section of the MPS Division (formerly the workshop of the apparatus layout group). Tightening up the nuts in this photograph is André Gailloud.
4. This doesn't help to drive the synchro-cyclotron, but was used to transport radioactive atoms from the target position near the accelerator to the detecting position outside the shielding wall. The belt was made of polyethylene, a compound containing only hydrogen and carbon. Bombardment of this by the external proton beam of the synchro-cyclotron produced radioactive boron-8, which decays by emitting a positron, half of the atoms present at a given time disintegrating in 0.7 second. The boron atoms were carried by the belt at about 100 km/hour through the shielding wall into the proton room, where the positrons were guided magnetically into a 'polarimeter' which measured their state of polarization. Discussing the arrangement with a visitor (left) in this picture is L. Dick.
5. Earlier this year an experiment performed at the synchrotron gave new information on the unstable excited states of the proton. Polyethylene targets inside the accelerator were bombarded by the proton beam, and scattered protons and deuterons produced in the

interactions were investigated with a high-resolution 'spectrometer'. The five objects to the left of this picture are scintillation counters forming part of this spectrometer. They detected particles coming from the target situated 80 metres away, at the other end of an evacuated pipe which can also be seen here. The apparatus was set up in the East hall, in a long 'corridor' formed of concrete shielding blocks.

6. No connexion with photo no. 2, this many-legged octopus, tended by Mario Grossi, is actually a pile of three 'pancakes' destined for a d.c. electromagnet under construction in NPA Division. Two more pancakes can be seen in the background. The magnet will produce a field of 100 000 gauss and will be used for testing the properties of superconducting samples. Each pancake is made of rectangular-section hollow conductor, 8.5 mm x 5.5 mm, spirally wound and cast in epoxy resin ; it is so arranged that there are 12 parallel water circuits for cooling, but one continuous electrical circuit as in a simple coil. The complete magnet contains eleven pancakes mounted in an iron yoke.
7. Neither genuine frost nor the decoration of the tools by artificial snow for Christmas, but the machining in the main workshop of a plexiglas light guide for a scintillation counter. Such a light guide is used to connect a flat sheet of plastic scintillator to the circular face of a photomultiplier. Its special shape is carefully calculated and manufactured to ensure that a maximum amount of light is transferred from the rectangular top face to the circular bottom one, thus enabling the light produced in the scintillator by energetic particles to be detected and transformed into electrical signals by the photomultiplier.
8. This is not quite as mysterious as it looks ; simply G. Fidecaro with part of the equipment for an experiment on the polarization of the neutral sigma particle, viewed through the plexiglas lens 1.4 metres in diameter. Five spark chambers detected particles arising from the production of the sigma particles in a hydrogen target. Plane mirrors and the lens enabled a camera, placed 10-metres away at the focus of the lens, to 'look' horizontally and vertically along every gap of each spark chamber, and photograph the sparks. A 1-ton cast-iron base, accurately flat to 0.05 mm, enabled the apparatus to be set up accurately, and a grid of fine lines (barely visible in this illustration) allowed the positions of the tracks to be measured accurately from the photographs. The grid was drawn on a sheet of glass, rather bigger than the lens, with the aid of a dentists' high-speed turbine drill. Both this and the lens are further examples of the precision work regularly done in CERN's main workshop.