

inverters with the possibility of transmission at high D.C. voltages, together with the realization of a virtual static D.C. 'transformer'.

A lively discussion ensued which ranged over a number of topics, and in particular many questions were asked concerning the behaviour and application of the gas-filled triodes. It was clear, as Prof. Cockcroft said in closing the discussion, that there was sufficient interest for the Conference to go on indefinitely, and the Conference passed a resolution requesting the Board of the Institute of Physics to sanction the formation of an Electronics Group.

UTILIZATION OF INDIAN HOME-GROWN TIMBERS

A FOREST Bulletin, No. 92, Utilization (New Series), has been written by V. D. Limaya of the Forest Research Institute, Dehra Dun, on "The Testing of Packing Cases for Army Boots and suggested Improvements." (Govt. of India Press, New Delhi, 1941). Packing cases for army boots in India have usually been made of chir (*Pinus longifolia*) in the past. Owing to the large demand brought about by the War, other timbers for the purpose have come under review. The Ordnance Department suggested that semul (*Bombax malabaricum*) might answer equally well and would be more easily available as the species is not more or less confined to the outer hills of the Himalayan range. Since, however, it is a softish wood, doubts were expressed as to its suitability. Comparative tests of both timbers were therefore undertaken in the Timber Testing Section of the Institute. These tests showed that semul boxes were practically as strong as chir boxes and possessed in addition certain advantages. But the tests went further, and indicate how war-time emergencies sharpen the faculties. It was discovered that the original design could be greatly improved so as to produce a far stronger box by very small additions costing not more than two annas a box. Boxes so made were tested and found to be fifteen times stronger than those made according to the original design. The advantages to an army at war will be readily understandable. Two plates show the old box and its failure to stand certain stresses and the new one.

Bulletin No. 93, by the same author, is entitled "Indian Timbers for Tool Helves and Handles". When there has been a Forest Department in India for nearly eighty years and a Research Institute for well over thirty, it is difficult to account for the fact that up to quite recently very large quantities of hickory and ash handles were imported from America into India annually. In fact the big American manufacturers were doubtless correct in saying that "We 'handle' the World". Hickory only grows in the lower Mississippi valley and yet hickory tool handles and helves are to be found in use in practically every country in the world. Ash is also used to a very large extent for the lighter types of handles. These two species have very nearly monopolized the tool handle trade of the world. Until comparatively recently this remained true for India in spite of the large number of species growing in the great Indian forests.

The work carried out at the Forest Research Institute has, however, resulted in greater interest being taken in Indian timbers in this respect, with the result that more than three quarters of the railway

demand for tool handles (the largest demand in the country) is now met by handles made in India from Indian woods.

The author states that "wooden handles for tools are really becoming a world problem". Manufacturing processes require the use of various types of cutting tools and hammers and the demand for wooden handles for such tools has increased enormously. While admitting that hickory is rather a special type of timber and that it will probably remain in demand for special uses, it is now proved that certain Indian timbers fulfil the requirements for tool handles. The research work of the Timber Testing Department had resulted in the markets being supplied with tool handles made from Indian timbers, and the War has given a great impetus to the tool handle trade, large orders having been placed for pick-axe helves, hammer handles, axe-helves, wooden mallets, handles for entrenching tools, spades and so forth.

Some of the species of timbers used belong to about twenty genera. These, according to their qualities, are used for heavy hammer handles (hickory class), light hammer handles (ash class), axe helves (hickory class), handles for scooping tools (ash class) and handles for cutting tools (beech class). Other woods of small forest species are being tested. For example, *Anogeissus pendula*, which until recently was practically unknown as a tool handle wood, has been found to be the toughest timber ever tested.

DOWNWARD RADIATION OF THE EARTH'S ATMOSPHERE

IN Scientific Notes of the India Meteorological Department (8, No. 93) R. Narayanaswami gives a comparison between measurements of the downward radiation of the earth's atmosphere at night made by himself at Bombay between March 1937 and October 1938 and similar observations by Ramanathan and Desai at Poona in 1930-31. The interest of the comparison lies in the fact that the climates of the two places are in strong contrast, Bombay having a coastal climate of exceptional dampness, while at Poona the climate is continental apart from the rainy season (June-September), and at times very dry, the annual rainfalls being about 70 in. and 27 in. respectively.

The instrument used both at Bombay and at Poona for measuring the atmospheric radiation was Angstrom's pyrgeometer No. 48, made by G. Rose of Upsala. With this was measured the net radiation per horizontal square centimetre, that is, the difference between the full emitted black body radiation given by σT^4 and the radiation received from the atmosphere, interest attaching mainly to the comparison between the ratio sky radiation to full radiation, and the vapour pressure of the air around the instrument calculated from the readings of an Assmann psychrometer. Since the radiation from the sky is practically all due to the water vapour in the atmosphere, dry air being an exceedingly bad radiator, in so far as there is considerable positive correlation between the water vapour pressure near the ground and in the overlying atmosphere as a whole, so the ratio $S/\sigma T^4$, where S is the sky radiation, and the vapour pressure near the ground, show high positive correlation. Comparison between these quantities and the dry-bulb reading of the Assmann psychrometer is made by tables and graphs.