

is made by pouring a 10 per cent solution of gelatine in water into a chamber formed between a flat glass plate and a mould that has been optically worked to the required contour. On cooling, the gelatine solidifies and sticks to the glass plate, and the mould can be removed. The gelatine gel is then left to dry out, when it shrinks to one-tenth of its thickness, but retains exactly the contour given to it by the mould; any unavoidable defects in the mould, such as minute surface scratches, being reduced in proportion.

The whole projection television unit is made possible by the efficiency and cheapness of the corrector plate, combined with the use of a small cathode ray tube. The receiver is likely to prove suitable for providing entertainment and instruction in, for example, schools and clubs. In addition, it may be used like other television receivers on a closed circuit for relaying purposes inside a building, such as for displaying a surgical operation to students outside and away from the operating theatre.

10/6

ORGAN PIPE TONES

ALTHOUGH organ flue pipes are in common use and the practical organ builder can from long experience produce, purely empirically, a variety of musical tones, the tone-producing mechanism is at present obscure. So far, investigations have been made on the tones of pipes only in their finished condition, without examining effects of the adjustments made in 'voicing' the pipe; thus two articles which have recently become available, describing measurements of the steady-state acoustic spectra of pipes undergoing voicing operations, represent a more thorough attack on the problem and are very valuable.

The first is by K. T. Kuhn* and is entitled "Klangfarbe und Wirbelform einer Lippenpfeife in Abhängigkeit von der Bauweise". Three square wooden pipes were used, each speaking the same note, but with different cross-sectional areas; each pipe was of special construction, with lips and languid movable. By altering the position of one of these parts at a time, different voicing adjustments could be simulated, and in each case a set of graphs is given showing the effect on the first six harmonics of the particular adjustment for each of the three cross-sections. The effects are complex, since continued adjustment does not cause the harmonics to vary in a regular manner. It is surprising that no matter what is done to the pipe, the intensity of the fundamental varies comparatively little. The airflow at the mouth was also examined, stroboscopically, by the Schlieren method; qualitative agreement is shown between the mode of vibration of the airstream and the harmonic content of the tone.

In the second article, by F. Ingerslev and W. Frobenius†, which is in English and is entitled "Some Measurements of the End-corrections and Acoustic Spectra of Cylindrical Open Flue Organ Pipes", the dependence of the physical length of the pipe on the mouth dimensions is derived theoretically; good agreement is shown with several observed values. For the voicing tests seventeen pipes were used, all speaking the same note but differing in diameter and mouth dimensions, and the acoustic spectra are com-

pared and discussed. (It should be realized that the typical Danish pipe is of lighter and less forceful tone than its English counterpart.) Certain inharmonic fluctuating components were found, but were considerably reduced by 'nicking'. The semi-empirical formulæ given by J. G. Töpfer about a century ago, relating the dimensions of a pipe to its tone, were found to give fair agreement when tested. Measurements showed that, contrary to widespread belief, the edge-tone at the mouth is usually considerably higher in frequency than the fundamental of the pipe.

It is doubtless due to the practical experience of one of the authors of this second article as an organ-builder, that it is emphasized that a pipe must be correctly voiced and speaking its note properly for measurements on it to be of value; in practice it is seldom possible to adjust one variable alone over a wide range, so that it is doubtful if these conditions applied in the first article. The general conclusions of both papers confirm the estimates which have been made qualitatively on normal organ pipes. It is, however, clear, as the Danish authors stress, that much further investigation is required before organ tone can be thoroughly understood; the subtleties of tone which characterize an artistic voicer's work still await scientific analysis. D. M. A. MERCER

POPULATION OF BRITISH UNIVERSITIES DURING 1947-48

THE "Returns from Universities and University Colleges in receipt of Treasury Grants. Academic Year 1947-1948", recently issued by the University Grants Committee, would, in any event, have been examined with particular interest as the first annual return issued since that for the year 1938-39. Quite apart from the light the returns throw on the course of university expansion, observations by the Committee of Public Accounts in its third report for the session 1948-49 should increase the keenness with which the return is scrutinized. That Committee observes that the Universities Vote raises difficult issues, since rapidly increasing sums are involved, both for recurrent grants and for capital expenditure. The estimate for 1949-50 amounts to £17,564,500, as compared with £12,480,000 for 1948-49, apart from grants for the maintenance of students at the universities, also involving several millions of pounds but borne on other votes. Expenditure by universities, colleges, etc., in Great Britain out of the grants-in-aid is not accounted for in detail to the Comptroller and Auditor General, and the Committee of Public Accounts would like to see introduced more effective means of securing adequate Parliamentary control over this large expenditure of public money. The Committee was, however, impressed by the arguments advanced by the Treasury in favour of continuing the present system of administration without any enabling legislation. While the Committee does not wish to press for such legislation in the circumstances now prevailing, it suggests that the Treasury should consider whether, without impairing the independence of the universities, any further means could be adopted to inform Parliament more precisely how the grant-in aid proposed in the

* Doctorate dissertation, Berlin (1940); FIAT microfilm PBL 73620, reel P 121, frames 6315-6334.

† *Trans. Danish Acad. Tech. Sci.*, No. 1, 7 (1947).

* Returns from Universities and University Colleges in receipt of Treasury Grants. Academic Year 1947-1948. (University Grants Committee.) Pp. 28. (London: H.M. Stationery Office, 1949.) 1s. 6d. net.

estimate is to be spent and to assure Parliament that grants made to the universities are wisely used.

That suggestion should not be lost on the University Grants Committee or on the universities themselves. Whether the present returns can or cannot be expanded to supply the desired information, it is obvious that the maintenance of university autonomy under the new conditions will involve the supply through some channel or other of sufficient information for reasonable public discussions and criticism, inside and out of Parliament. While these returns include for the first time statistics for Hull University College and Leicester University College as well as for four constituent institutions of the University of London (Institute of Advanced Legal Studies, Warburg Institute, Wye College and the British Post-graduate Medical Federation), much desirable information is still lacking. In particular, the figures for income and expenditure at Oxford and Cambridge do not afford an accurate comparison with other universities, since they exclude all income and expenditure of the colleges, except the contributions of the colleges to the University, while a substantial part of the expenditure on teaching and administration is defrayed by the colleges.

Dealing first with finance, the income for the year amounted to £16,276,286, of which 7.6 per cent was represented by endowments, 2 per cent by donations and subscriptions, 4.8 per cent by grants from local authorities, 57.8 per cent by Parliamentary grants, and 21.4 per cent by fees. The total income for England was £13,056,875, of which £4,811,557 was for the University of London, £1,508,286 for Cambridge, £1,258,683 for Oxford and £5,478,349 for provincial universities and colleges. The figures for Oxford and Cambridge exclude college incomes, but subject to that qualification, it will be noted that Parliamentary grants represent 45 per cent and 48 per cent of the total income at Cambridge and Oxford, respectively, as against 23.4 per cent and 17.3 per cent from fees. The total income for Wales was £870,912 and for Scotland £2,348,499.

Of the total expenditure of £15,955,189, the sum of £526,115 represented allocations to reserves, and the remainder was distributed as follows: administration, 9.4 per cent; departmental maintenance, 66 per cent; maintenance of premises, 11.7 per cent; capital expenditure met from income, 2.6 per cent; other maintenance expenditure, 10.3 per cent, the largest item under the last head being the cost of the ordinary university examinations. Departmental maintenance includes the salaries of teaching and research staffs, superannuation and establishment costs of laboratories, lecture rooms, libraries, etc. The tables included in the return are sufficiently detailed to permit some interesting comparative calculations between universities. Library expenditure totals £458,516 for England, £19,234 for Wales and £73,126 for Scotland; this is further analysed in a separate table which shows that it averages 3.7 per cent of the total expenditure in England, 2.4 per cent in Wales and 3.4 per cent in Scotland.

Compared with the previous year, total income has risen by more than £3,232,000, chiefly through increases of some £2,531,000 in Parliamentary grants and more than £457,000 in fees, while expenditure has risen by some £3,004,000, of which £1,853,000 is represented by departmental maintenance (including £1,163,000 for salaries and superannuation of teaching staff, £572,000 for departmental and laboratory maintenance, and £107,000 for libraries), more than

£309,000 by maintenance of premises and some £252,000 by administration. Compared with the academic year 1938-39, income has increased by £9,564,219, mainly through an increase of £7,011,640 in Parliamentary grants, which now represents 57.8 per cent of the total instead of 35.8 per cent. In the same period the endowment income, while increasing by £205,569, has shrunk from 15.4 per cent to 7.6 per cent, and fees from 7.4 per cent to 6.4 per cent, in spite of an actual increase of £1,481,507. On the other hand, while total expenditure has increased by £8,766,594, the distribution of expenditure is relatively unchanged. The full-time teaching staff in the same period increased from 3,994 to 6,536, mainly in the categories of lecturers and of assistant lecturers, which increased from 1,543 and 856 to 2,812 and 1,488, respectively. The number of professors rose from 889 to 1,079, and that of readers, assistant professors and independent lecturers from 369 to 537.

This increased staff has to cope with an increase of 28,505 students, the total of 78,507 full-time students being distributed as follows: arts, 44.9 per cent; pure science, 18.5 per cent; medicine and dentistry, 20.3 per cent; technology, 12.9 per cent; agriculture and forestry, 3.4 per cent, the corresponding figures for 1938-39 being 44.7, 15.3, 27.3, 10.6 and 2.1, respectively. Of these 78,507 full-time students, 5,805 were engaged in research or other advanced work, 64,015 were reading for a first degree and 8,687 for a diploma. Of these students, 58,301 were in English, 4,762 in Welsh and 15,444 in Scottish university institutions, the English total comprising 14,803 at Oxford and Cambridge, 16,611 at London and 26,887 at provincial universities and colleges. The proportion residing in colleges and hostels was 23.4 per cent (19.7 per cent for men, 34.4 per cent for women), while 37.1 per cent resided in lodgings and 39.5 per cent at home. Of overseas students from within the British Commonwealth, 3,188 were full-time and 1,403 part-time; a further 2,700 full-time and 1,089 part-time students came from foreign countries. Cambridge took 669 and Oxford 625 of these overseas students, but the only other institutions with more than 300 were University College, London (399), University of Edinburgh (396) and the London School of Economics (374), although the University of Manchester and the Imperial College of Science and Technology were only just short of that figure. A total of 23,507 students were admitted for the first time during the year, and of the grand total of 78,507, 75.2 per cent were men and 24.8 per cent women. Compared with the previous year, this total was an increase of 10,055, of which 1,313 were advanced students, the increase in England being 7,068 and in Scotland 2,330. The total entry for the year increased by 962, but the general outline of the distribution over subject groups of studies showed little change.

Of the 78,507 full-time students, 55,539 or 70.7 per cent were receiving assistance from Government departments, local authorities, universities or other bodies during the year, the percentage of assisted students for England as a whole being 72.1; for Wales and Scotland, the figures are 78.2 and 63.2, respectively. It is interesting to note that while the percentage of assisted students in the provincial universities is near to the average at 74.5, in the University of Oxford it is 80.4, in the University of Cambridge 77.7, and in the University of London 62.1.