

## Reduction of Traffic Noise

ON September 10, in Section G (Engineering) of the British Association meeting at Aberdeen, Sir Henry Fowler presented, as chairman, the report of the Committee on Reduction of Noise, and thus introduced a series of papers on the subject. This Committee has analysed a large number of letters from members of the public concerning the noises which cause them most discomfort and inconvenience, and has reached the conclusion that the sources which cause most annoyance are, in turn, inadequately silenced motor-bicycles and 'sports'-type motor-cars, motor-horns, other road transport noises and aircraft. No other cause produces half the complaint levelled against the latter source. Realising that the Air Ministry is doing everything possible to reduce aircraft noise, the Committee has devoted its attention first to the exhaust noises of motor-bicycles and sports-cars and, with the help of a donation of £50 from Lord Wakefield, an investigation of silencers was carried out at University College, Southampton. In order to assist in the establishment of an authority to which types of motor-vehicle could be submitted for test of approved silence, the Committee arranged for a critical review of the methods available for measuring noise, particularly noises of a given type, such as exhaust noises. Arrangements were also made for a firm manufacturing motor-horns to give a paper examining characteristics which render a signal effective as well as those which cause it to be offensive.

Dr. E. O. Turner, of Messrs. Joseph Lucas, Ltd., described and demonstrated various horns at the meeting and at open-air tests. He considers that expedients suitable for further consideration are that horns should give a strictly periodic note without appreciable delay when operated; that the note should have a fundamental of low pitch with one or more strong overtones, the highest not exceeding 3,000 cycles per second, the loudness not exceeding a prescribed figure; that auxiliary horns of higher pitch and greater loudness might be fitted to motor-vehicles, but for country use only, and that single staccato signals should be employed wherever possible instead of sustained notes.

Wing Commander Cave-Brown-Cave outlined the experiments which have been carried out at Southampton, in attacking the problem of silencing the exhausts of motor-bicycles. He reviewed recent work on exhaust noise, and ascertained with the assistance of the Motor Cycle Manufacturers and Traders Union the maximum size acceptable for silencers intended for motor-cycles. After experiments in which the back pressure on the engine and the power developed were measured, he has evolved silencers for representative 2-stroke and 4-stroke machines which gave adequate silencing without obstructing the flow of exhaust gases, and thus without causing loss of power. These silencers consist essentially of two lengths of absorption silencer in series with two small expansion chambers, the whole being compactly contrived in an outer casing of convenient size. The absorption silencers consist of a perforated pipe surrounded with one of larger diameter. In some cases, the interspace is packed with absorbing material such as glass silk, and in others the packing is omitted and the perforations are in the form of lipped holes resembling those used in nutmeg graters.

Demonstrations of the effectiveness of the silencers were given at the meeting and on a hill near the Brig o' Dee, where 2-stroke and 4-stroke motor-cycles fitted with various standard and "B.A." silencers were demonstrated.

Dr. A. H. Davis, of the National Physical Laboratory, in discussing noise measurement from the point of view of tests of approved silence, dealt particularly with the accuracy and validity of various methods. Aural methods of loudness measurements necessitate the averaging of the results of several observers in order to get a typical result with the precision that is likely to be called for in testing machines to specification. Moreover, aural results will always be open to suspicion of personal bias. Objective instruments can be constructed, however, which, in suitable cases, will give a meter reading corresponding to the average aural judgment. Such instruments are not wholly rigorous in their theoretical foundations, but the more serious difficulties are known and appear to have been overcome. In fact, objective meters have been used successfully for measuring moderate and loud sounds of varied character, and have even proved more reliable than individual hearers in assessing average judgments as to relative loudness. The demands upon the objective meter are, however, minimised if the sounds concerned are of similar character and of the same order of loudness, so that properly designed meters may certainly be expected to indicate whether or not a device of a given type (say, exhaust or motor-horn) is louder than a standard device of the same kind. At present, however, preliminary test of any particular meter is desirable upon the type of noise concerned.

Dr. Davis later demonstrated, at the motor-cycle silencer trials, a noise-measuring instrument of his own design which is in use at the National Physical Laboratory; this gave indications in the trial which were believed to be in agreement with the general impressions of the order of loudness of the silencers concerned. The loudness at the roadside, under the conditions of the test, of the unsilenced 4-stroke motor-cycle, was about 106 phon, and this was reduced on an average to 93 and 87 phon respectively when standard and "B.A." silencers were fitted; a rather larger "B.A." silencer gave further reduction, to 84 phon. Conditions (speed, throttle-opening, etc.) were maintained as constant as possible during the tests, but closer control would be necessary to differentiate between exhaust systems differing in loudness by only one or two phon. In the case of the 2-stroke motor-cycle, the loudness unsilenced was about 100 phon, a level which was reduced to 82 phon and 75 phon respectively when standard and "B.A." silencers were fitted. An improved (1934) Standard silencer was in this case almost indistinguishable in loudness from the "B.A." silencer.

It may perhaps be now inferred that appreciable silencing of motor-cycles can be achieved. It also appears that if manufacturers or appropriate authorities desire to fix limits to the permitted noisiness of machines or of motor-horns, some standardisation would undoubtedly be necessary of the conditions and surroundings under which the machines or horns are to be tested, but that it is now within the scope of well-designed physical noise meters to make the necessary measurements.

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