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Nonastigmatic

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sharpened metal stylus can now make lines that are no wider than 5 to 10 microns. Stylus loads from 1 to 10 milligrams, depending upon soot conditions, are ample. The completed records, lacquered for permanency, are used to make photographic prints by direct projection. For the present purpose, lines finer than those quoted above have been unnecessary, but it is believed that lines no wider than one micron can be easily produced.

Large quantities of data can be stored in a small space with this method. In the present work 5 to 20 complicated friction records are put on a one-by-three inch glass slide. The high resolution also makes possible the direct and accurate recording of motions of only a few thousandths of an inch while the combination of high resolution and small force open up possibilities for high frequency mechanical recording. K.R.E.

High Resolution Recording with Soot. By Kenneth R. Eldredge. *Rev. Sci. Inst., 21: 199, March, 1950.*

Nonastigmatic

Cylinders and paraboloids, which, like the sphere, are surfaces of the second degree, were the only aspherical surfaces used for lenses and mirrors until the Schmidt corrector plate, a surface of higher degree, was successfully introduced into optics. Optical design of the future may find it most profitable to apply other high-degree surfaces for various purposes, if grinding difficulties can be overcome. As an example of the advantages of applying aspherical surfaces of higher degree, the properties of the torus grating have been studied theoretically.

The torus is a surface of the fourth degree and is generated by revolving a circle about a straight line lying in the plane of the circle. The torus grating (defined as an equatorial calotte of a right circular torus bearing a grating ruling on its concave side) is meant to eliminate astigmatism, which is the chief image deficiency of the spherical grating. The latter is outstanding in that it can produce and image a spectrum by a single katoptric process; yet, its astigmatism is disturbingly large, occasionally amounting to a few thousandths of the grating's radius. In contrast to this, the torus grating eliminates astigmatism entirely for two points in the spectrum, whereas astigmatism at both sides of these points is very small, giving rise to "quasi-stigmatic" ranges in the torus grating spectrum.

At the same time, other image deficiencies of the torus grating compare favorably to the spherical grating. The chief advantage of the torus grating lies in a considerable gain in spectral intensity and in the over-all usefulness of stigmatic spectral images. H.H.

The Torus Grating. By Heinz Haber. *J. Opt. Soc. Am., 40: 150, March, 1950.*

City Noise

A survey of noise in the city of Chicago has been in progress over the past two years under the sponsorship of the Armour Research Foundation of Illinois Institute of Technology, in cooperation with the Greater Chicago Noise Reduction Council. Foundation personnel have realized for a long time that the problem of noise is becoming more and more acute. Not only has there been a general feeling of futility among the public with respect to noise reduction, but engineers have been at a loss for means to measure the objectionable degree of noise reliably, simply, and rapidly. With this as the problem, physicists at the Foundation, having a wide background in acoustical measurements, felt that as a public service and to create interest in the problem a program should be undertaken to study the most common noises encountered by the public in this city.

In making such a study it was felt that measurement compromises would be required in order to arrive at a technique for evaluating noise. It was believed, however, that a workable method could be developed that would be of interest to all who were concerned with such noise conditions and would constitute a basis for tolerable levels to be used in writing or revising anti-noise legislation.

Earlier studies of city noise have been made by a number of workers. Far-reaching and beneficial results were obtained by a study of noise in New York City in 1930. The program covered by the present work, however, is believed to be the most extensive in which a wide survey of octave-band data is being made. The program includes investigation of noise from transportation vehicles and noise in traffic lanes, residential areas, and industrial zones.

The important phase of the work having to do with the technique of evaluating such noises concerns the levels which are indicated by standard sound measuring equipment. It is known, of course, that levels in the various octave bands are of more value in describing the noise than the single over-all level. Many acoustical measurements of mechanical noises have indicated the unreliability of this single level to represent the objectionable degree of the noise. In this program such octave-band levels have been studied and compared with the over-all levels.

The phase concerning noise of vehicles has been completed. Measurements were made both inside and outside of vehicles. Inside over-all measurements (flat network) ranged from 85 decibels in a new "L" car to 95 in subway cars. In the 400–800 cycles per second band, measurements ranged from 68 decibels in an automobile to 91 in subway cars. Outside of and close to vehicles, the over-all levels ranged from 78 decibels for automobiles to 94 for subway trains. Observations in the 400–800 cycles per second band ranged from 66 decibels for automobiles to 87 for subway trains.

The results of vehicle noise measurements are interesting in a number of ways. For instance, the reduction of noise in changing from outmoded to modern equipment is readily observable. This is especially true in the case of old and new street and "L" cars.

The survey is continuing with measurements in the remaining phases mentioned above. When analysis of these data is completed, the results will be made available as in the present phase. G.L.B.

Levels of Spectra of Transportation Vehicle Noise. By G. L. Bonvallet. *J. Acous. Soc. Am., 22: 201, March, 1950.*