

ANALYSIS OF MUSICAL SOUNDS BY MEANS OF A NEON TUBE

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The method of analysis of sounds by means of a manometric gas flame is well known, and it has served as an excellent qualitative demonstration experiment for many years. Other methods involving considerably more skill and demanding a greater outlay for equipment have been devised and successfully used. One of these is the well-known phonodeik method devised by Professor Dayton C. Miller of the Case School at Cleveland.

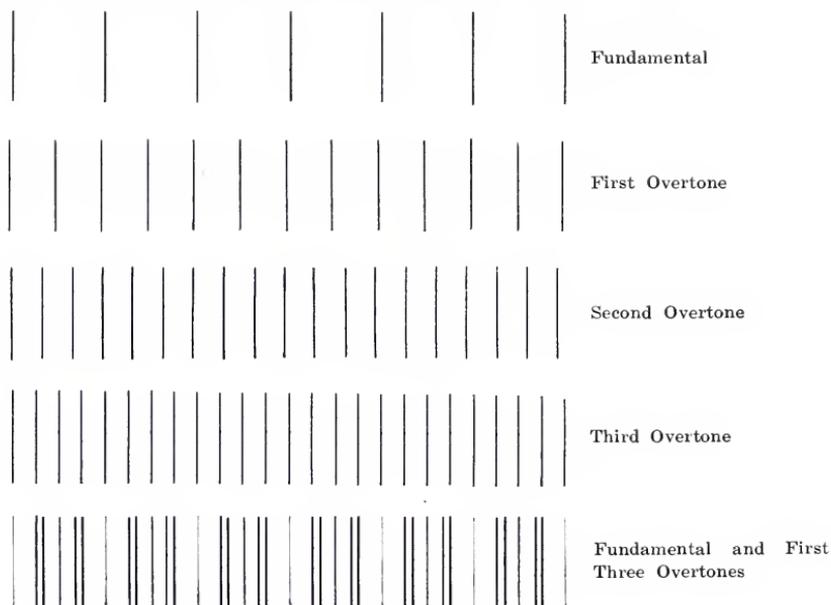
Without doubt, the most successful method of sound analysis is that employing an oscillograph. With this method, sound waves of any complexity may be most thoroughly analyzed. The apparatus employed in this method is both complex and expensive; thus a great many physics laboratories are denied the privilege of its use.

Various forms of neon tubes are now devised which may be used to take the place of the rather clumsy and generally eccentric gas flame, and to some extent they offer possibilities which may rival the expensive oscillograph equipment. These neon tubes are constructed in various shapes and operate on voltages from 100 to 10,000 or more. The power expenditure necessary to operate these tubes is very low, and they are very responsive to sudden changes in energy such as might be due to the vibrations picked up by a telephone transmitter or a microphone.

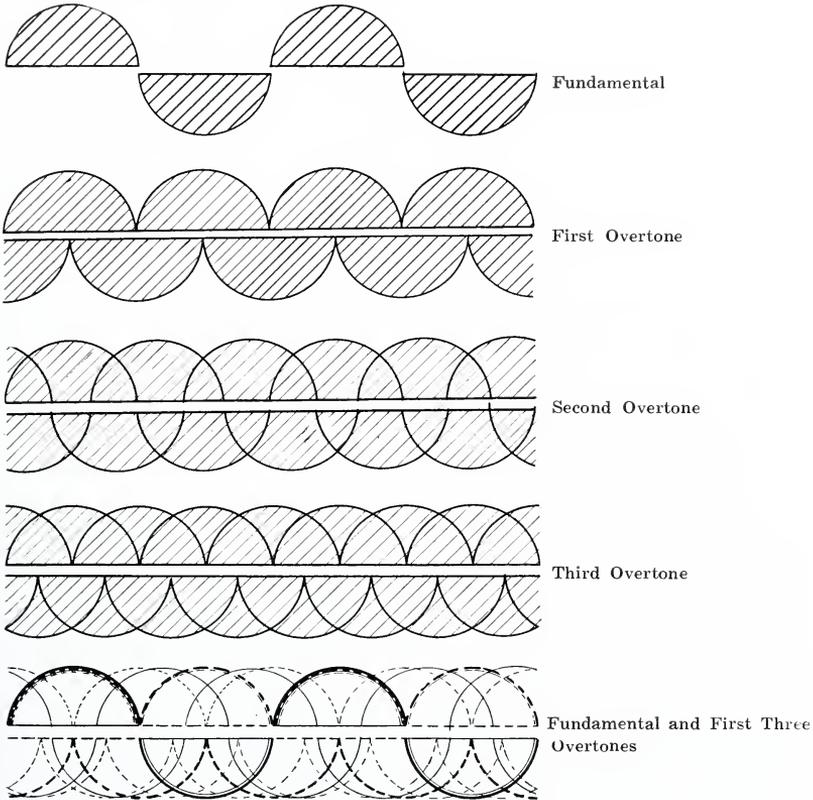
If one of these two-watt neon glow lamps is used to replace a loud speaker on the output circuit of a three or four stage amplifier, and if an impedance matched microphone or telephone transmitter is used in the input circuit, one may talk into the microphone and obtain a visual picture of the sound in a revolving mirror placed near the glow lamp. Of course, such sounds as come from tuning forks and from organ pipes which are gently blown will give essentially pure sounds without overtone, while most sounds from violins and horns, and syllables sung by the human voice will show complexities. When the mirror is rotated at a given speed, it is not difficult to pick out the overtones present; and, if a photographic record is made, it should be possible to determine the approximate prominence of each of the partials or overtones.

The picture which one will observe in the mirror will depend upon the construction of the particular lamp or tube used.

If an ordinary neon spectrum tube with a long capillary bore is used, we get pictures in the revolving mirror such as these:



In the case of the two-watt glow lamp mentioned above, the pictures will look something like the following:



With a little practice one should have no trouble in determining when certain overtones are present. It is obvious that a simple equipment of this kind would be of great value, not only for demonstration purposes in physical lectures, but indeed for persons interested in voice culture and vocal and instrumental music, and for all who are interested in acoustics. One of the best things about such an arrangement is its simplicity, and in most cases the equipment necessary will be found already in the laboratory. The only new thing is the tube or glow lamp, and it is quite inexpensive.