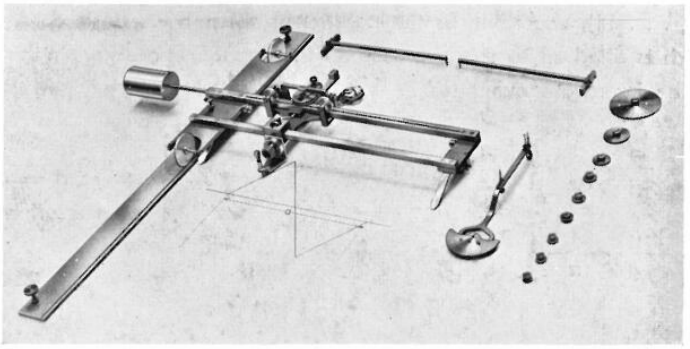
Amsler's Harvey Harmonic Analyser

(brass)



Harmonic Analysis is of chief importance in problems relating to vibrations in Mechanical, Electrical, Radio, Acoustical and other Sciences. To have possession of an instrument which will reliably give a high number of harmonics is an advantage which the industrial research worker can appreciate. Also, such an instrument is of special value in the hands of students of Colleges and Universities who are attempting to grasp and fix the fundamental mathematical principles involved in analysis.

The instrument here illustrated has been designed to determine the coefficient a_o and the pairs of coefficients a_n and b_n, $n = 1, 2, \ldots 14$, in the Fourier Series,

$$a_o + a_1 \cos x + a_2 \cos 2x + \ldots + a_{14} \cos 14x + \ldots$$
$$+ b_1 \sin x + b_2 \sin 2x + \ldots + b_{14} \sin 14x + \ldots$$

representing a function, F(x) over the range of angle, $0 < x < 2\pi$.

The curve representing the function must be reproduced on paper on a base length, a (= 24 cm), representing the range $0 - 2\pi$ of the angle x.

On the instrument, a tracing point fixed to a trolley having wheels on parallel bars of a frame is capable of covering the base length a in the direction of the bars. The frame can move in a perpendicular direction by means of guide wheels placed in the groove of a fixed bar laid on the paper. Thus the tracing point can be made to circumscribe a boundary including the curve, its end ordinates and the

base length. Motion of the tracing point through a distance representing an angle x parallel to the base line, turns by means of gears a spindle with an arm attached, so that the arm makes with the ordinate F (x) of the curve an angle nx, or $\frac{\pi}{2} - nx$, ($n = 1, 2, \ldots 14$), according as the coefficient a_n or b_n is desired. A recording wheel which is attached to the arm rolls on the paper and registers in the complete circuit of the figure the quantities

$$\frac{n}{d} \cdot \frac{1}{\pi} \int_0^{2\pi} F(x) \cos nx \, dx = \frac{n}{d} a_n$$

$$\text{or } \frac{n}{d} \cdot \frac{1}{\pi} \int_0^{2\pi} F(x) \sin nx \, dx = \frac{n}{d} b_n.$$

where d = diam. of measuring wheel = 2 cm

By a simple adjustment the instrument may be employed as an Amsler Planimeter for determining area. When the area, A, of the figure has been found, then, $a_o = \frac{A}{a.}$

By further adjustments, first moment (Static Moment) and second moment (Moment of Inertia) of an area with respect to an axis in its plane can be found as with Amsler's Integrator.

For a full explanation of the Theory and mechanism of the instrument see „Engineering", Dec. 21st. 1934.

The instrument and the guide rail are supplied each carefully packed in a carrying case provided with lock and key.

Weight of the instrument without case	5.5 kg =	12 lbs
„ „ „ case	5 kg =	11 lbs
„ „ „ rail withouf case	1.8 kg =	4 lbs
„ „ „ case for the rail	1.1 kg =	2½ lbs
Gross weight of the instrument and rail packed for despatch: one case 95 × 85 × 35 cm	35 kg =	77 lbs

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