

Note on a New Rotating Commutator

By

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(Plate VII)

ABSTRACT.

A ring of thin ebonite sheet is mounted on a Phonic wheel. Fixed to the ring are two sets A and B of uniformly spaced radial sectors of metal sheet. The elements of A are between those of B and nearer the centre of the ring, so that the outer thirds of the elements of A and the inner thirds of those of B lie on a common circle. Three insulated metal brushes are mounted in a radial line to touch these sectors as the ring rotates, so that brushes 1-2 and 2-3 are alternately shorted through the elements of A and B respectively. The arrangement can be used to charge condensers or applied to other similar purposes. Using additional sets of brushes at different positions, on the ring, a number of similar commutating effects can be obtained with any desired variation in phase.

A rotating commutator is frequently employed for the accurate determination of small capacities. The accuracy of the results of such experiments depends on the possibility of maintaining a steady speed and accurate measurement thereof. There is a limit to the constancy of speed of a commutator driven by a small motor at high speed, and the chance of variation is the greater, the longer the speed has to be maintained. An alternative method has been the employment of an electrically driven tuning fork to move a commutating metal strip between two metal contacts. This is satisfactory only in so far as we could get a steady speed employing little

power, and also different rates of commutation by the use of forks of suitable frequencies. But the efficiency of commutation depends on the efficiency and duration of the contact between the moving strip and the contacts on either side. Actual trial showed unsatisfactory results, the galvanometer deflection depending on the amplitude of motion of the fork.

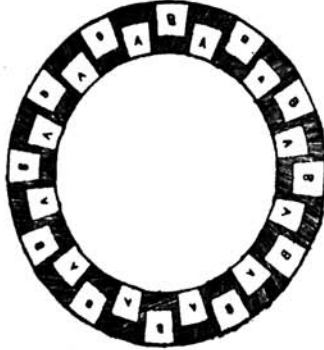
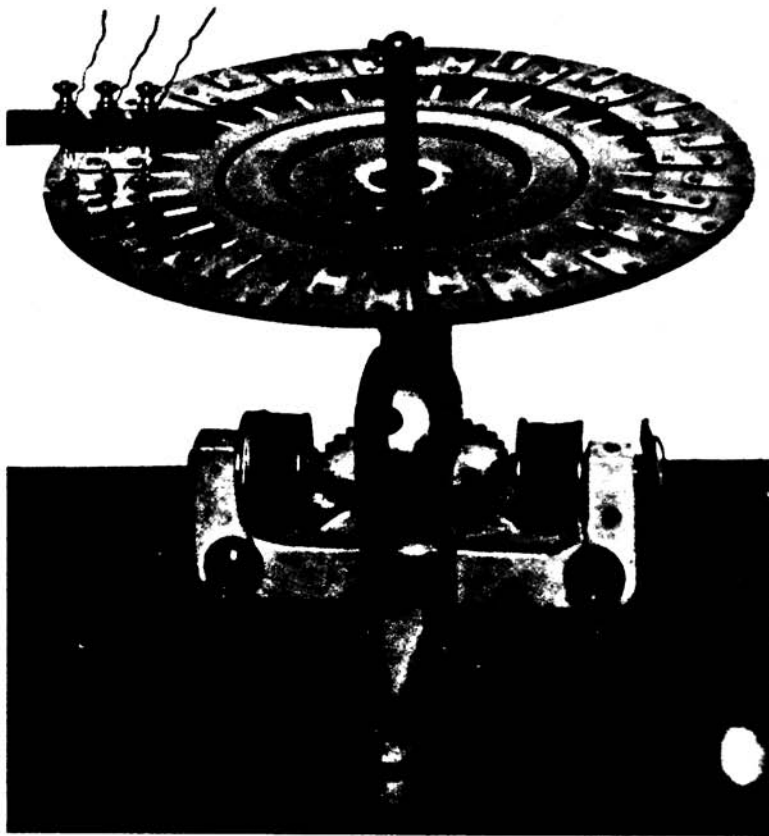


FIG. I.

VULCANTIC RING WITH METAL SECTORS.

The present device secures a combination of the advantages of both, while eliminating the defects. A phonic wheel actuated by the intermittent current of an electrically maintained tuning fork is set rotating at a constant speed. This speed can be very accurately determined with the gear, counter and bell provided on the phonic wheel, and could be determined once for all for any fork.

A ring of thin vulcanite sheet 20-30 cms. in diameter and 4 or 5 cms. wide is fixed to the top of the phonic wheel so that its axis coincides with the axis of the rotating spindle (Plate IV). A number of sectors of thin brass sheet or thick tin foil about 3 cms. long and of suitable width are fixed radially on the ring, at equal intervals (Fig. 1). These sectors form two sets, the elements of one alternating with the elements of the second, and being nearer to the centre of the ring by about



Phonic wheel with commutator and brushes.

1 cm. A set of three soft metal brushes¹ carried on an insulating rod are supported along a radial line to rub on these sectors as the ring rotates. The innermost brush touches only the sectors of the first set, the outer brush those of the second set only, while the middle brush touches all the sectors in succession. The sectors will thus alternately connect brushes 1-2 and 2-3....The brushes rubbing on metal give efficient contact and the duration of each contact is sufficiently long.

It is possible to use further sets of brushes simultaneously in other positions on the ring, and by their proper location, any desired phase difference can be introduced. By providing rings having different numbers of sectors, the frequency of the operation can be varied. Forks of different frequency can be employed. There is thus room for a wide range of frequencies, each of which could be exactly determined and maintained.

The special features of the apparatus may be listed as follows :—

- (i) The speed is constant, and can be maintained so, indefinitely.
- (ii) The speed can be very accurately determined.
- (iii) A variety of frequencies can be obtained by the use of different forks and rings provided with different numbers of sectors.
- (iv) The contacts are efficient and of sufficient duration.
- (v) The power consumption for working the apparatus is quite low.

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¹ Tinsel has been found suitable for making these brushes.