

This rhythm apparatus is built on the principle of the piano player; *i.e.*, the pattern is cut in a stencil drawn under electric contacts which energize the time-marking instrument. The stencil is cut on a one-inch ticker tape in a continuous roll of any length by using an ordinary ticket punch and stenciling by the aid of a scale of units especially devised for the purpose, indicating halves, quarters and thirty seconds of this unit. Thus, the stencil is inexpensive, may be made of any length, and can be cut into any desirable pat-

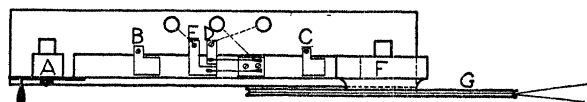


FIG. 1.

tern. This stencil is wound on a spool, A, Fig. 1, threaded under the guides B and C, and the contact brushes, D, E, and the end is fastened in a slit on the spool, F. This spool, F, is turned by the pulley, G, which is driven by a pulley on a phonograph. In place of the phonograph disk, an iron wheel with a pulley of suitable diameter is placed on the phonograph plate. For the study of musical rhythms this pulley should be 2 inches in diameter when G is 12 inches in diameter, in order that the phonograph may run at 78 revolutions per minute to produce the speed of 2 inches per second in the tape. In order to reduce the load and insure accuracy of the phonograph movement, it is necessary that the pulley on the phonograph shall be relatively small as compared with the pulley, G, and that the latter, together with the tape, shall operate with a minimum of friction. The spool, F, is made relatively large in order to reduce the amount of increase in speed due to accumulation of the tape in successive layers. If necessary, this error may be compensated for by the speed regulator in the phonograph. One could, of course, employ a synchronous motor for a drive, but, if kept in good condition, a phonograph motor is accurate enough for nearly all practical purposes; and, in addition to this, it is the most convenient universal timing motor that we have in the laboratory. The phonograph may stand in any part of the room, as there is no objection to a long belt.

In the case of an ordinary rhythm experiment, it is necessary to have a weak and a strong sound accurately timed and alternated in patterns. This is done by having two rows of holes in the stencil, one for the accented and one for the unaccented sounds, with an electric contact brush running over each line of holes, so that when a hole passes a brush, the latter impinges upon a silver plate exposed through the hole and completes an electric circuit. For most rhythm experiments, the telegraph sounder produces a satisfactory sound. This may be energized by a storage

battery or dry cells, and any desired relation of the intensity of the sound may be produced by varying the current through one of the brushes. Thus, six dry cells through one brush, and two of these through the other, makes a very satisfactory differentiation between accented and unaccented sounds.

If the apparatus is to be used for any other stimuli, the electric circuits can be used to energize these on the same principle. If more than two stimuli are needed, as many as five rows of holes may be cut on the one-inch tape; and if more than that is needed, a wider tape may be used. Thus, this apparatus can be made to operate any kind of acoustic, visual, or tactual stimuli for timed rhythmic or tachystoscopic stimulation.

At the present time we are using this apparatus in the measurement of the sense of rhythm (Kwalwasser, "The measurement of the sense of rhythm," ready for publication) and for training in the appreciation of rhythms. Kwalwasser has standardized a block of rhythms by the method of right and wrong cases and established norms for various conditions, so that the instrument is available at the present time in the musical laboratory for a ready measure of the sense of musical rhythm. This particular stencil has been put on a phonograph record and added to Seashore's "Measures of musical talent" (Columbia Graphophone Company, New York City).

C. E. SEASHORE

UNIVERSITY OF IOWA

AMERICAN MATHEMATICAL SOCIETY

THE thirteenth annual meeting of the American Mathematical Society was held at Columbia University, Thursday and Friday, December 27 and 28, 1923. Dormitory accommodations were furnished by Columbia University and Barnard College, and attending members were introduced at the University Faculty Club. At the dinner on Thursday, at which about 75 members were present, Professor J. L. Coolidge spoke on the progress of the Endowment Fund.

The attendance at this meeting included 95 members of the society. The secretary announced the election of 65 persons to membership. At the annual election, which closed on Thursday afternoon, the following trustees and officers and other members of the council were elected: *Trustees*, G. A. Bliss, W. B. Fite, Robert Henderson, R. G. D. Richardson, Oswald Veblen; *vice-presidents*, E. V. Huntington, T. H. Hildebrandt, J. H. M. Wedderburn; *secretary*, R. G. D. Richardson; *assistant secretary*, Arnold Dresden; *treasurer*, W. B. Fite; *librarian*, R. C. Archibald; *member of the editorial committee of the Bulletin*, Arnold Dresden; *member of the editorial committee of the Transactions*, Edward Kasner; *members of the council*, H. W.

Tyler, J. L. Coolidge, Harry Bateman, G. A. Bliss, Solomon Lefschetz, C. L. E. Moore, Anna J. Pell.

The total membership in the society is now 1,301, including 83 life members. The report of the treasurer shows a balance of \$9,638.78, exclusive of special funds; of this, \$5,726.91 is reserved to secure the life memberships. Sales of the society's publications during the year amounted to \$3,570.03.

The society's library now contains 6,546 volumes.

At the session on Friday morning, a paper was read, at the request of the program committee, by Professor Virgil Snyder, on "Problems connected with involutorial transformations in space."

At the same session was made the first award of the Bôcher Memorial Prize, founded in honor of the late Professor Maxime Bôcher. The prize was awarded to Professor G. D. Birkhoff, for his memoir, "Dynamical systems with two degrees of freedom," published in Volume 18 of the *Transactions of the American Mathematical Society*. The regulations governing the second award in 1924 and the third in 1928 were announced.

Professor H. F. Blichfeldt was selected as a representative of the society on the National Research Council. On account of the approach of the International Mathematical Congress to be held in Toronto during the summer of 1924, four additional representatives of the society were added to the American Section of the International Mathematical Union, namely, Professors A. B. Coble, Arnold Dresden, L. E. Dickson and Virgil Snyder.

Dean H. L. Hodgkins and Professor R. G. D. Richardson were appointed to represent the society on the council of the American Association for the Advancement of Science for the year 1924.

The following papers were read at this meeting:

The analytic functions defined by a certain functional differential equation: W. B. FITE.

The field equations of relativity as integrability conditions: K. W. LAMSON.

Characterization of spaces of constant curvature by the arrangement of their geodesics: JESSE DOUGLAS.

The non-linearity of Maxwell's equations in general relativity theory: G. Y. RAINICH.

A simple proof of Lüroth's theorem: J. L. COOLIDGE.

Representation of three-element algebras: B. A. BERNSTEIN.

On the expansion of analytic functions in series of polynomials: J. L. WALSH.

A new set of postulates for betweenness, with proof of complete independence: E. V. HUNTINGTON.

A new set of completely independent postulates for cyclic order: E. V. HUNTINGTON.

Representations of integers in certain quadratic forms in 2, 3, 4, 5 indeterminates and allied class number relations: E. T. BELL.

On Pellet's theorem concerning the roots of an algebraic equation: J. L. WALSH.

The m th derivative of a function of a function; calculus of m th derivatives: E. L. POST.

Invariant directions in the theory of surfaces: W. C. GRAUSTEIN.

A property of the curvature of the line of intersection of two surfaces: D. K. KAZARINOFF.

Simultaneous algebraic equations: LOUIS WEISNER.

On the types of monoidal involutions: VIRGIL SNYDER.

On the zeros of the functions of the parabolic cylinder: EINAR HILLE.

Geodesic families and their generalizations: EDWARD KASNER.

A statistical theory of depreciation: J. S. TAYLOR.

A classification of integral invariants in the calculus of variations: S. D. ZELDIN.

Problems connected with involutorial transformations in space: VIRGIL SNYDER.

Some theorems on trajectories in V_n : JOSEPH LIPKA.

On irreversible dynamical systems under a zero force: JOSEPH LIPKA.

Relations between different types of critical points of a real analytic function of n real variables: MARSTON MORSE.

The general theory of the linear q -difference equation: C. R. ADAMS.

The invariants of forms under the total group G_6 , modulo 2: O. E. GLENN.

On associated forms in the theory of formal modular covariants: OLIVE C. HAZLETT.

Intermediate curvatures in a Riemann space: EDWARD KASNER.

A proof of Cauchy's integral theorem for any rectifiable boundary: G. A. PFEIFFER.

A generalization of the calculus of finite differences to include the differential calculus: J. P. BALLANTINE.

A postulational introduction to the positive integers: J. P. BALLANTINE.

A note on the theory of testimony: J. S. TAYLOR.

The determination of how much one would be justified in expending to extend the life and multiply the value of an article: C. H. FORSYTH.

A contribution to the theory of interpolation: NORBERT WIENER.

The numerical integration of differential equations: L. R. FORD.

Invariant functionals of closed plane curves under one-parameter groups of transformations of the plane: A. D. MICHAL.

Note on Dirichlet series with complex exponents: J. F. RITT.

Integration in certain n -dimensional fields with the aid of a general discontinuity factor: E. L. DODD.

The next meeting of the American Mathematical Society will be held in New York City on March 1, preceded (on the evening of February 29) by the first Josiah Willard Gibbs Lecture, which will be delivered by Professor M. I. Pupin in the Engineering Societies' Building. Meetings will also be held in Chicago on April 18-19, and at New York on May 3.

R. G. D. RICHARDSON,

Secretary