as BARK (Binar Automatish Rela-Kalkylator) is being constructed at the Tekniska Högskolan, Stockholm. This is a parallel binary machine with a word length of 32 digits and a floating binary point. It uses about 5500 relays and is programmed by means of a plug board on which a program of up to 840 orders may be plugged. Provision is made for the use of conditional orders and subroutines.

OTHER AIDS TO COMPUTATION

Addition and Subtraction on a Logarithmic Slide Rule

It does not seem to be generally known that the principle of addition logarithms can be applied to the use of an ordinary slide rule for adding. The process is, of course, not worthwhile if additions occur in isolation, but much time can be saved if additions occur in combination with multiplications or divisions, and if slide rule accuracy is sufficient.

Using the C and D scales, the sum $(a + b)$ can be found thus:

Set the index of C to the value of a on D (preferably choose $a > b$). Set the cursor to the value of b on D. Read the value of b/a on C, under the cursor. Form mentally $(1 + b/a)$ and set the cursor to this value on C. Read $(a + b)$ on D, under the cursor.

When additions are combined with another process, one of the terms can usually be arranged to appear on the D scale ready for addition, or the sum appearing on the D scale can be used there for the next process. For example $(ab + c)$ can be formed thus:

Set the cursor to a on D and move the slide so that b on CR lies below the cursor line; the index of C is now opposite ab on D. Move the cursor to the value of c on D, read c/ab on C under the cursor, add 1 mentally and set the cursor to $(1 + c/ab)$ on C. Read $(ab + c)$ on D, under the cursor.

Analogous methods apply to other combinations of operations involving addition, and subtractions can also be handled in a similar manner.

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Bibliography Z–X

14. *Polnoe Sobranie Sochineniĭ P. L. Chebysheva* [Complete Collection of Works by P. L. Chebyshev]. Volume 4: *Teoria Mechanismov* [Theory of Mechanisms]. Moscow and Leningrad, Academy of Sciences, 1948, 254 p. + portrait frontispiece, 16.5 × 25.5 cm.

This volume which is the fourth in a series of collected works of Chebyshev, contains fourteen articles on theory of mechanisms prepared by the author during the period of 1861–1888, a brief discussion of these articles, and a brief description of model mechanisms built by the author. The author's articles included in this volume were previously published in v. 1 and 2 of the first edition, 1899–1907, of his collected works [*MTAC*, v. 1, p. 440–441]. Five of the articles were published previously in various French publications. The author's article "Theory of Mechanisms Called Parallelograms," because of its mathematical nature was included in v. 2 which is devoted to the work in mathematical analysis.

Most of the articles are devoted to the mathematical derivation of parameters for design of four-bar linkages and harmonic transformer mechanisms which will best approximate the desired motion. Also included is a description of a computing machine (p. 158–160) with a continuous movement of the components rather than movement with discrete intervals such as used by common mechanical digital computers. The continuous motion is obtained by means of planetary gears.

The volume concludes with an article by I. I. ARTOBOLEVSKIĬ & N. I. LEVITSKIĬ on models of Chebyshev's mechanisms, which are preserved in the Leningrad Academy of Sciences. There are 25 of these mechanisms which are described and illustrated. The illustration of Chebyshev's "arithmometer" is disappointingly inadequate.

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15. J. G. L. MICHAEL, "A nomogram for calculating extended terms," Institute of Actuaries Students' Soc., *Jn.* v., 8, 1948, p. 147–159.

Two nomograms are given for the calculation of endowment insurance.

16. F. J. MURRAY, "Linear Equation Solvers," *Quart. Applied Math.*, v. 7, 1949, p. 263–274.

17. G. H. ORCUTT, "A New Regression Analyzer," R. Stat. Soc., *Jn.*, Sec. A, v. 111, 1948, p. 54–70.

The analyzer described in this paper is based on units, each of which consists of a card reader and commutator. By means of this combination a time sequence of voltages $X_1, X_2, X_3, \cdots, X_n$ corresponding to the two-digit quantities punched on the cards is obtained. When a number of units are combined with suitable output circuits it is possible to obtain a variety of second degree expressions, for instance $\sum (X_i - \bar{X})\cdot(Y_i - \bar{Y})$ or $\sum X_i \cdot Y_{i+k}$, where k is a shift subject to the operator's control. The author discusses in detail the application of these expressions to statistical problems including those in which varying time lags between sequences are to be considered. The advantages of the use of the commutator over parallel operation consists in the simplicity of the associated circuits and the fact that the various sequences of voltages can be shown immediately on an oscillograph.

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NOTES

110. NEW FACTORIZATIONS OF $2^n \pm 1$.—In *MTAC*, v. 3, p. 496–7 we gave a proof of the primality of $(2^{92} + 1)/17$. Using the same methods we have now established the primality of

$$N_1 = (2^{79} + 1)/3 = 2014\ 87636\ 60243\ 81957\ 84363$$

and

$$N_2 = (2^{85} + 1)/(3\cdot 11\cdot 43691) = 26831\ 42303\ 60653\ 52611$$
$$N_3 = (2^{83} - 1)/167 = 579\ 12614\ 11327\ 56490\ 87721.$$