(R. A. S., *Mo. Not.*, v. 32, p. 258—misprinted 358), who gives the mantissa as .05211 65505-49998 14···. In the following year Glaisher quoted a letter from the then owner of MICHAEL TAYLOR's copy of VLACQ (*ibid.*, v. 33, p. 452) saying that some previous owner (GARDINER is suggested) had corrected log 11275 by hand.

Glaisher's remarks on end-figure errors are quoted in N **72**. They were prompted by this particular "error."

L. J. C.

UNPUBLISHED MATHEMATICAL TABLES

53[A, B].—NBSMTP, *Tables of Circumferences and Areas of Circles.* Tables prepared for the U. S. Bureau of Ordnance, Navy Department. Compare, *MTAC*, v. 2, p. 86–87.

These tables are for circles with diameters ranging [.001(.001)10; 6D]. The computations were made with IBM equipment, and a manuscript was prepared on the tabulator.

NBSMTP

54[L, M].—CARL HAMMER, *Table of selected values of* $Li(x) = \int_0^x dt/\ln t$, and $\int_2^x dt/\ln t$, mss. in possession of the author at 304 West 105th St., New York City; and in the Library at Brown University.

These tables are for x = [2(1)10(10)100(100)1000(1000)10 000(10 000)100 000; 8S]. The values for $Li(x)$ were previously given by J. VON SOLDNER, *Théorie et Tables d'une Nouvelle Fonction Transcendante*, Munich, 1809, p. 43–49, for x = [0(.01)1(.1)2(.5)3(1)20; 7D], [22(2)40(5)80(10)160(20)320(40)640(80)1280; 8S], Δ^3 to .8. This table was reprinted (without Δ^3, and with a misprint of 1220 for 1280) in A. DEMORGAN, *The Differential and Integral Calculus* . . ., London, 1842, p. 662–663. Thus of 90 values given in the ms., 22 were Soldner's values. Three other values of $Li(x)$, for $x = 10^3, 10^4, 10^5$ were taken from F. W. BESSEL, "Untersuchung der durch das Integral $\int dx/\ln x$ ausgedrückten transcendenten Function," *Königsberger Archiv f. Naturw. u. Math.*, v. 1, 1811, p. 31, and F. W. BESSEL, *Abhandlungen*, Leipzig, v. 2, 1876, p. 339. The other 65 values were computed by means of NBSMTP, (a) *Table of Natural Logarithms*, v. 2, 1941; (b) *Table of Sine and Cosine Integrals* . . ., 1942; (c) *Table of Sine, Cosine and Exponential Integrals*, 2 v., 1940; (d) *Tables of Lagrangian Interpolation Coefficients*, 1944, using five points for x = 500 to 9000, and seven points for x = 20 000 to 90 000.

C. HAMMER

55[P].—SIDNEY JOHNSTON, *Roller Chain Transmission Basic Exact Centre Distance Tables.* Ms., iii + 10 sheets typed on one side. 20.3 × 32 cm. Original in possession of the author at 81 Fountain St., Manchester 2, England; carbon copy in the Library of Brown University. Among the "References" in the ms. are the following: (a) K. B. JACOB, "Driving chains and theory application to power transmission," Engineering and Shipbuilding Draughtsmen's Assoc., *Trans.*, 1928–29 (also as a pamphlet, T. 5, centre distance tables, p. 47–54); (b) *Machinery's Handbook*, New York, Industrial Press, twelfth ed., 1943, p. 861–2.

These tables are intended to serve the mechanical engineer in solving the bothersome problem of the design of roller chain transmission. Suppose that a roller chain of N links and pitch P connects two chain gears, the number of whose teeth are T and t. The tables enable one to find the distance S between the centers of the gears. The formula on which the tables are based is:

$$S = \tfrac{1}{2}P(D - d)\csc x$$

where

$$D = \csc \pi T^{-1} \quad \text{and} \quad d = \csc \pi t^{-1},$$

and x is the least positive solution of

$$\cot x + cx = a, \quad \text{where}$$
$$c = \pi^{-1}(T - t)/(D - d) \quad \text{and} \quad a = [N - \tfrac{1}{2}(T + t)]/(D - d)$$

The table is one of double entry giving the factor $\csc x$ to 6, 5 and 4D in terms of c and a. The value of c in a typical case is slightly greater than unity. The present tables are for $c = 1$, 1.01 and 1.02 only. The second variable a has the following range

a = [1.75(.002)1.8(.0025)1.835(.005)1.93(.01)2.07, 2.075(.0125)2.325(.025)2.95(.05) 4.15, 4.125(.125)6.5(.25)10; 6D], [11.25(1.25)22.5(2.5)35(5)105; 5D], [100(50)300(100)1000; 4D].

The partial differences of $\csc x$ with respect to c and a are given together with the Bessel coefficient $\Delta(\Delta - 1)/4$. There is an auxiliary table of $\csc \pi T^{-1}$ for T = [10(1)160; 8D] for finding the pitch diameters d and D. Comparing this table with a similar smaller table to 4D in BRITISH STANDARDS INSTITUTION, *Specifications for Steel Roller Chains and Chain Wheels*, revised April 1934, no. 228–1934, p. 18–19, one finds in the latter table, 10 last-figure unit errors: in excess for T = 44, 46, 63, 76, and in defect for T = 11, 22, 91, 95, 107, 133; also at T = 127, *for* 49.4295, *read* 40.4295.

The present tables, if made available to machine design people, should do much to replace the crude approximations usually resorted to in dealing with this comparatively precise problem. A few handbooks give the exact formula

$$N = T + \pi^{-1}(T - t)(\tan A - A)$$

where

$$A = \arccos P(T - t)/2\pi S$$

or an equivalent formula but the reviewer has not found any other tables for obtaining S directly.

D. H. L.

MECHANICAL AIDS TO COMPUTATION

The reader is referred to the first two articles of this issue. dealing with MAC topics.

28[Z].—Akad. N., SSSR, Moscow, *Izvestiia, Otdelenie Tekhnicheskikh Nauk*, 1946, no. 8, September, p. 1065–1200. 16.7 × 25.8 cm. Entirely in Russian.

This issue is almost wholly devoted to material dealing with computation and computing mechanisms. The contents are as follows:

N. G. BRUEVICH, "The present state and problems of the theory of mechanism precision," p. 1065–1079.

I. ÎA. AKUSHSKIĬ, "An outline of punched cards machines," p. 1081–1120.

L. I. GUTENMAKHER, "Electrical models of physical phenomena and their applications in technology and physics," p. 1121–1146. In the literature list there are several references to American authors including two to BUSH.

L. LIŪSTERNIK, "Problems of computational mathematics," p. 1147–1156.