

BOOKS

Elementary-particle physics, by Gunnar Källén (Reading, Mass., Addison-Wesley Publishing Co. Inc., 1964; \$ 15.00), is a volume of the *Series in Advanced Physics*, which has Morton Hamermesh as Consulting Editor.

As pointed out by the author, most books of this kind are a somewhat expanded and modernized version of a course given by the writer at some university in a certain year. The present book is no exception, being based on a course on phenomenological elementary-particle physics given in the academic year 1961-1962 in the department of theoretical physics at the University of Lund, Sweden. The bibliography is updated to include part of 1963, extending in a few cases to work published in 1964. As a result, the book represents the most up-to-date text on the physics of elementary particles that can be found in a library at the present moment. This fact alone, although ephemeral, is by itself a good reason for the student to read the book or at least parts of it.

The book, as envisaged by the author, is directed towards the physics student who wants to specialize in the field of elementary particles. It should be pointed out, however, that the student in question should have a good theoretical background and a main interest in theoretical physics. In particular, he should have a thorough knowledge not only of ordinary non-relativistic quantum mechanics but also of the Dirac equation, and some knowledge of field quantization.

In conformity with this purpose, all experimental details have been left out and the emphasis directed towards theoretical methods and techniques applied to specific problems as illustrations. This, of course, is the correct theoretical approach, but it may leave the unbiased reader under the impression that the field of elementary-particle physics is, after all, only a collection of theoretical calculations, here and there approximated by some experimental result. As for the biased experimental reader, he may sometimes wonder: for example, when, concerning the experimental numbers quoted, he learns that 'some precautions have been taken that the values given are not entirely ridiculous'. Hopefully, this was not done on the basis of a comparison with the theoretical calculations!

The book is divided into three main parts: strong interactions of non-strange particles (191 pages), strong interactions of strange particles (59 pages) and weak interactions (199 pages). In addition, a large introduction (38 pages) deals extensively with subjects like notations, definitions, the list of elementary particles, relativistic kinematics and S-matrix properties. The methods by which the masses of the elementary particles have been measured are reviewed in detail.

The part on the non-strange strong interactions is mainly devoted to the properties of the pion. A good survey of its spin and parity determination is given; the concept of isotopic spin is developed up to its applications in connexion with the formalism of second quantization. The scattering of pions by nucleons is then discussed from a phenomenological point of view (a good collection of

the relevant experimental results is presented), although with a tendency to dedicate more space to such quibbles as the Yang ambiguity than to the more physical content of the scattering experiments. Directly connected with this attitude, the treatment closes with a pessimistic note on the practical use of scattering techniques for the determination of the quantum numbers of the nucleon resonances. A chapter is dedicated to the formal theory of pion-nucleon scattering, dealing in particular with the static model and the forward dispersion relations. Pion photoproduction and multiple pion production in pion-nucleon collisions and $\bar{p}p$ annihilations are given one chapter each. The old-fashioned approach to pion resonances by means of the extrapolation method is given perhaps too much emphasis in view of the scarcity of results it has produced. Some of the resonances are discussed in detail, like ρ , η and ω .

The second part, on the strong interactions of strange particles, gives a somewhat hurried view of the properties of these particles, of their quantum numbers and of the scattering of K-mesons on nucleons. A careful compilation of all the existing scattering data can be found in the section devoted to the phenomenology of the K-nucleon interaction. Unfortunately here again, as for the case of pion-nucleon scattering, a critical attitude pervades the treatment of the scattering experiments, all to the detriment of a reasonable understanding of these phenomena. It must be said, however, that ample space is dedicated to a very useful phenomenological approach like the Dalitz-Tuan analysis of the low energy $\bar{K}N$ problem. A number of strange resonances are discussed and some of the methods for the determination of their spin and parity are explained.

The part on the weak interactions is probably the most expanded and detailed section of the book. A general introduction on symmetry properties deals clearly and exhaustively with concepts like space and time reflections, charge conjugation, G-parity and CPT, all the time remaining very near their physical significance and without making explicit recourse to group-theoretical arguments. In a well-organized series of chapters, the behaviour under weak interactions of the nucleon, the μ , the π , the K and the hyperon is systematically examined.

At the end, three appendices (40 pages) summarize the main concepts and formulae relative to angular momentum, the Dirac equation and the second quantization. Excellent author and subject indexes close the book.

A final remark about the topics which do not appear; the main absentee is the electromagnetic interaction, for which the author feels that exhaustive treatments already exist in several textbooks. Nucleon-nucleon scattering has been left out, considering that its pedagogical value is already exploited in the analogous problem of π and K scattering. Subjects like diffraction scattering in general and higher symmetry schemes among elementary particles have been considered too controversial at the present stage to be included.

M. Ferro-Luzzi

Also received:

Light scattering from dilute polymer solutions, edited by D. McIntyre and F. Gornick (New York, Gordon and Breach Science Publishers Inc., 1964; \$ 5.95) — vol. 3 of *International science review series*, presenting 33 papers (including five English translations) covering the basic literature on the use of light scattering as a probe for the measurement of the molecular properties of polymeric solutes.

Reviews of plasma physics, vol. 1, edited by M.A. Leontovich (New York, Consultants Bureau Enterprises Inc., 1965; \$ 12.50) — translation from the Russian edition of 1963 but incorporating new material; comprehensive introduction to 'classical' plasma physics containing papers on orbit theory, collisions in fully ionized plasmas, plasma transport phenomena, and plasma thermodynamics.

The propagation of gamma quanta in matter, by O.I. Leipunskii, B.V. Novozkilov and V.N. Sakharov (Oxford, Pergamon Press Ltd., 1965; £ 5) — edited translation of 1960 Russian edition; essentially describes the theory of the propagation and absorption of gamma quanta, including the effects of multiple scattering, primarily for applications in reactor technology.

Two-group reactor theory, by J.L. Meem (New York, Gordon and Breach Science Publishers Inc., 1964; \$ 20.50) — written for the graduate student working for a higher

degree in nuclear engineering; emphasizes the engineering analysis of nuclear reactors rather than the underlying reactor physics.

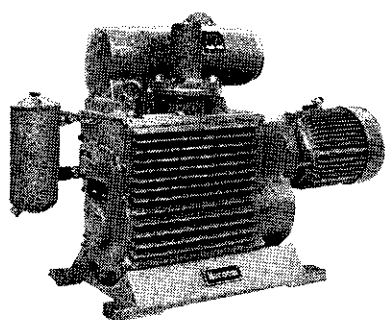
Energetics in metallurgical phenomena, vol. 1, edited by W.M. Mueller (New York, Gordon and Breach Science Publishers Inc., 1965; cloth \$ 19.50, paper \$ 9.50) — subject matter of eight one-week lecture series at the first Seminar on energetics in metallurgical phenomena, University of Denver, 1962.

L'oxydation des métaux, tome II, monographies, by J. Bénard (Paris, Gauthier-Villars, éditeur, 1964) — second volume, dealing more with practical applications of oxidation phenomena, of book reviewed in *CERN COURIER*, vol. 2, no. 11 (November 1962), p. 11.

Unit processes in hydrometallurgy, edited by M.E. Wadsworth and F.T. Davis (New York, Gordon and Breach Science Publishers Inc., 1964; paper \$ 9.50 for each of 3 volumes, cloth \$ 47.50 complete) — vol. 24 of series on *Metallurgical Society Conferences*; based on papers presented at the International symposium held at Dallas, Texas, in 1963.

Deformation twinning, edited by R.E. Reed-Hill, J.P. Hirth and H.C. Rogers (New York, Gordon and Breach Science Publishers Inc., 1964; cloth \$ 25.00, paper \$ 11.50) — vol. 25 of series on *Metallurgical Society Conferences*; proceedings of the Conference at Gainesville, Florida, in 1963.

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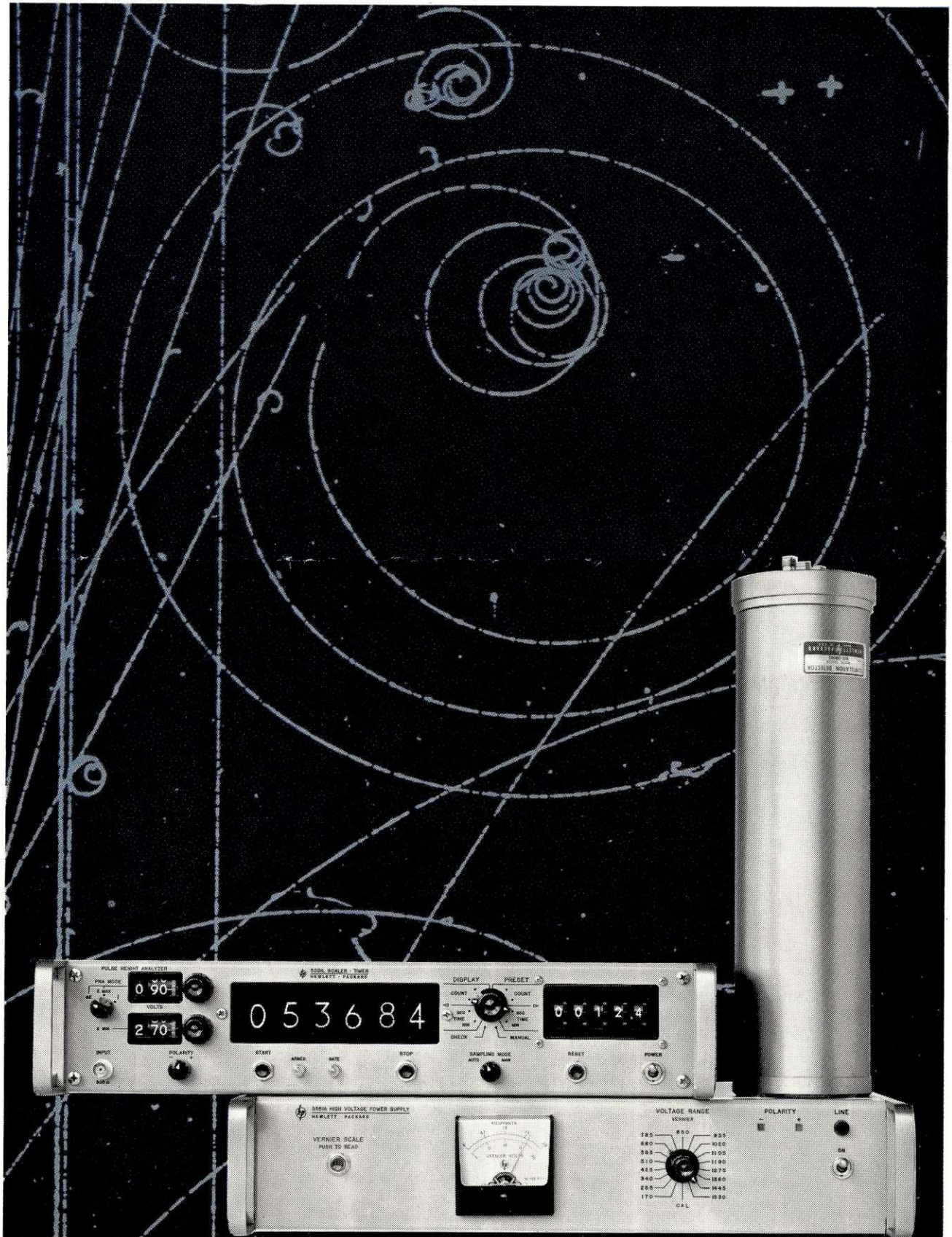
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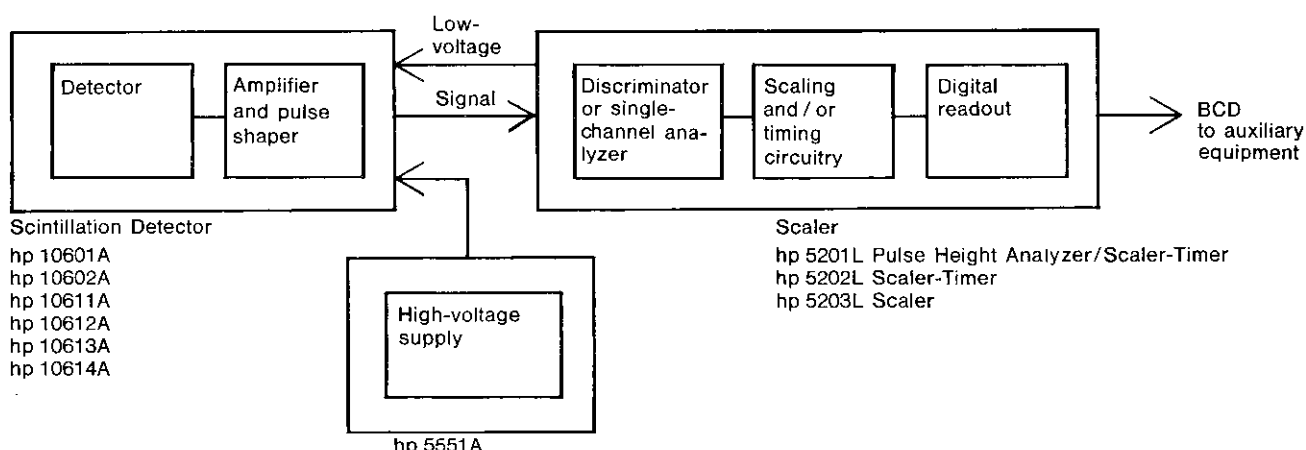
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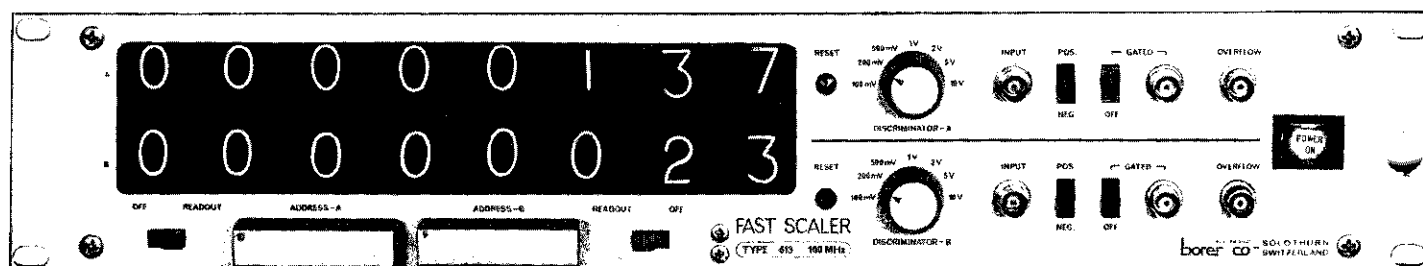
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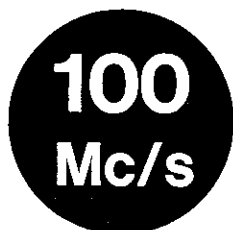
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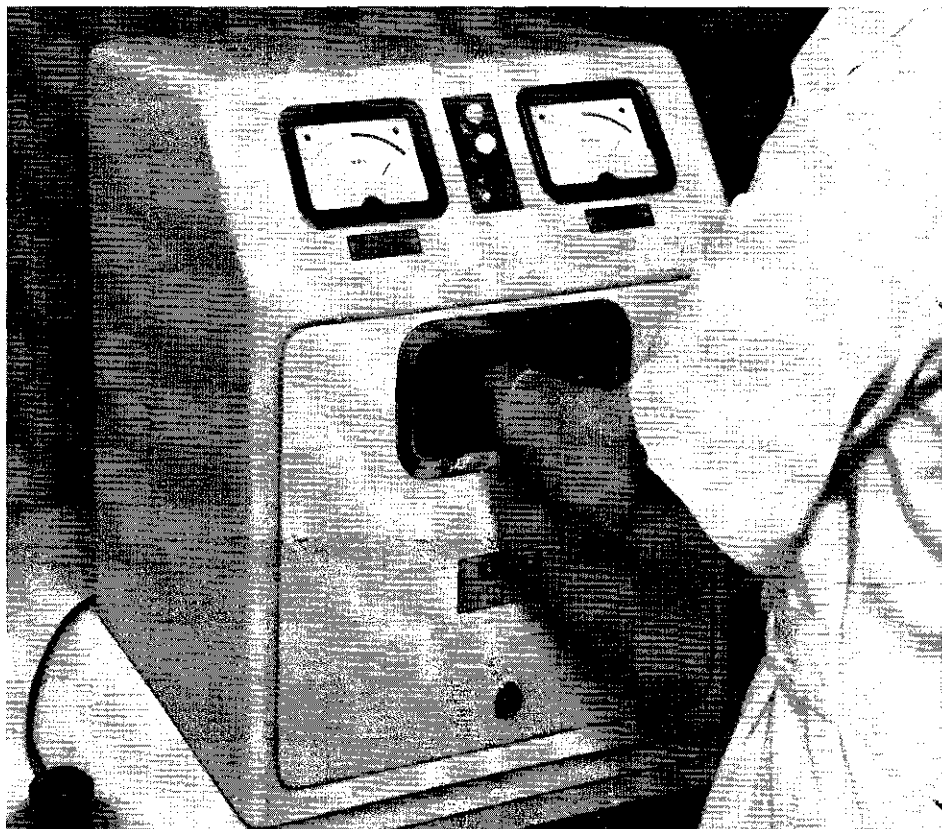
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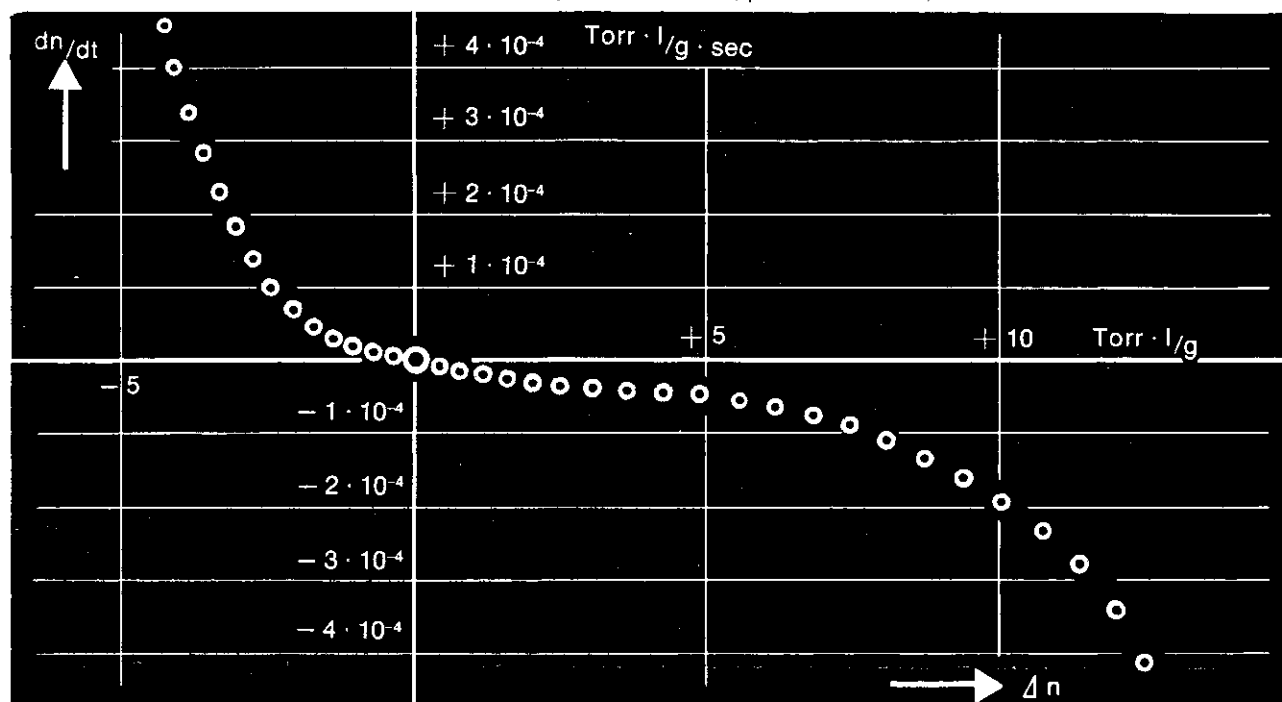
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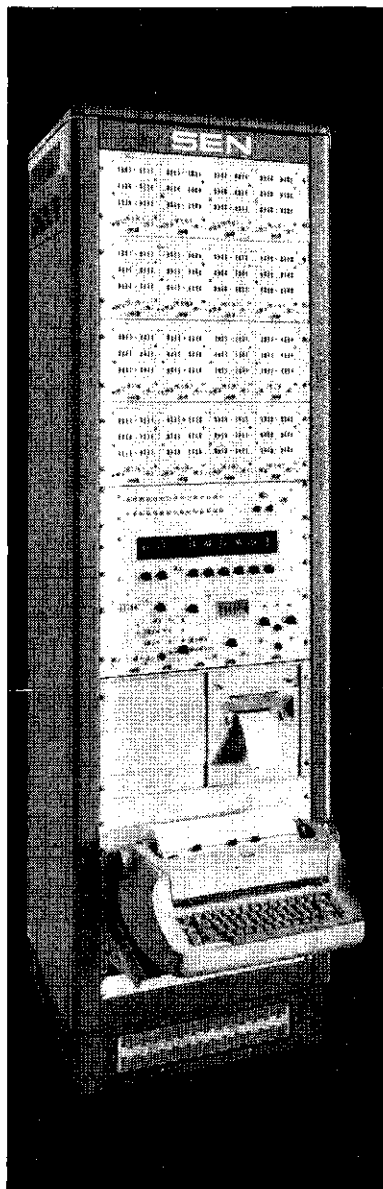
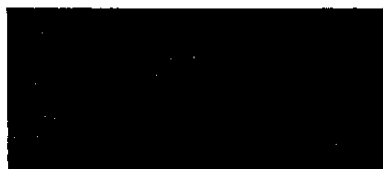
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