The
ODHNER HISTORY

AN ILLUSTRATED CHRONICLE
OF "A MACHINE TO COUNT ON"

In commemoration of the 100th Anniversary
of W.T.Odhner's Birth in 1845

PRINTED IN SWEDEN
Wezäta
GOTHENBURG 1951

CONTENTS

PREFACE

When the management of Aktiebolaget Original-Odhner, Gothenburg, the Directors S. Carle and Z. Guthe, entrusted the task of preparing an illustrated chronicle of the expansion of the Odhner industry to me in collaboration with Wezäta-Göteborgslitografen AB, I was forced to trouble a number of people for the acquisition of material. Very little pictorial material has been preserved from the Russian period of the Odhner invention's development, due to the sudden end of that period. The fact that in spite of this I have been able to procure some material from that period is to be credited to members of the Odhner family in Stockholm and Gothenburg who have carefully preserved letters and similar souvenirs of their famous relative, W. T. Odhner, the inventor of the Odhner calculating machine. Much appreciated assistance in collecting personal and material data has also been given me by the Royal University of Technology, the Royal Patent Office, and the Technical Museum, Stockholm. The author is also greatly indebted for valuable pictorial material regarding calculating devices of earlier periods to Dr. K.-G. Hagstroem of Stockholm, well-known as the author of several works on the history of mathematics.

The bulk of the material for this little historical review has come from AB Original-Odhner. I therefore cordially thank Mr. Gustaf Liljeström for his aid in regard to various technical data, and last but not least, Mr. Carle and Mr. Guthe for a collaboration which has been wholly pleasant.

Gothenburg, September, 1945
Henry Wassén, D.Ph.

I

Glimpses of the History of Calculating Machines

In the case of the calculating machine — one of the indispensable accessory machines of our day — as for most of man's important inventions, one can point to a number of links in a chain of evolution leading up to the latest model on the market.

The calculating device of the Incas

In very early times various peoples and civilizations felt the need for mechanical aid in making complicated calculations. The Incas of Peru, carriers of one of America's most remarkable civilizations, had a system of "knot" calculation based on the decimal system. What they called a *quipu* in the Quichua language consisted of groups of vertical strings suspended from an horizontal main string. Knots of a certain type were made on the vertical strings to represent numbers. At the bottom, units were indicated, above them tens, and on up to thousands or more (see picture). A *quipu*, however, was only used for recording the sum or sums of a calculation. For practical calculation such as long additions, these Indians, according to recent findings, used calculating boards with grains of corn, pebbles, etc., for markers. *Guaman Poma de Ayala*, a half-breed Indian, writer and illustrator of a late 16th century chronicle about ancient Peru, which is extremely interesting to modern historians, describes this in the text and in his

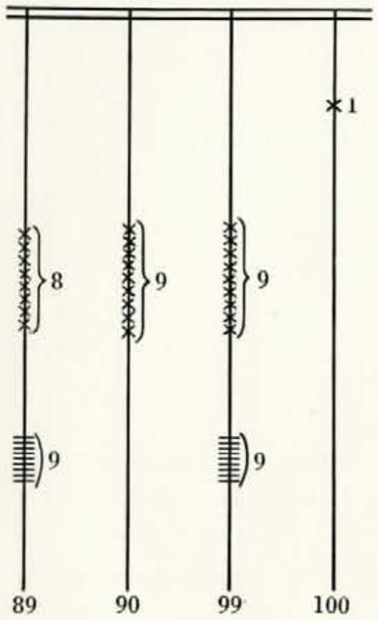


Diagram of an ancient Peruvian quipu. From Erland Nordenskiöld.

pictures.[1] Another very picturesque description is given by the Jesuit Father Joseph de Acosta who personally visited the high culture area of Western South America, and wrote of it in his history, first printed in Sevilla in 1590. He says, in short, that the Indian method of calculating with corn grains surpassed in speed as well as in accuracy what a proficient Spanish calculator could achieve with a pencil on paper.[2]

Calculating aids of classical times

Comparatively well-known since classical times are the calculating tables, the *abax* of the Greeks, and the *abacus* of the Romans, whose importance to western culture has been

[1]) The original MS, "El primer nueva coronica y buen gobierno", is at the Royal Library, Copenhagen, where it was discovered in 1908 by the famous American, Dr. R. Pietschman. AB Original-Odhner has had the pleasure of sending their friends, especially those in Latin America, a scientific work published in Gothenburg in 1940 "El antiguo abaco peruano según el manuscrito de Guaman Poma", in which the author has proved the use of abaci in ancient Peru.

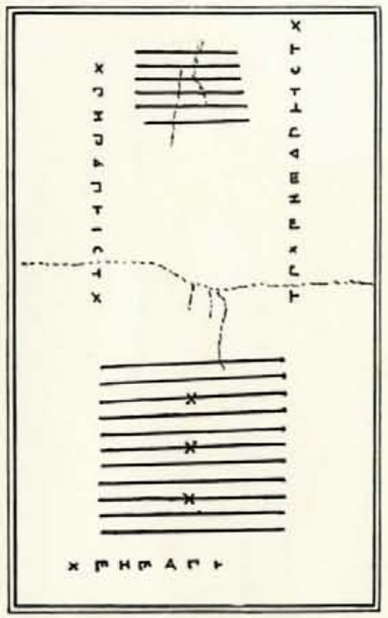
[2]) Joseph de Acosta: Historia Natural y Moral de las Indias, Madrid, 1894, Part 2, pages 167—168.

Accountant with quipu in the Peru of the Incas. In the lower left-hand corner, a calculating board.

epoch-making. Every traveller in the East will also be familiar with the calculating frames of the Chinese and the Japanese, called *suan-pán* and *soroban*, respectively.

The Greek abax

The ancient calculation devices are probably best known through their preserved specimens. A Greek calculating table or *abax* has been found on Salamis in the form of a marble table measuring 75 by 149 centimeters. (The Greek word *abax*, incidentally, may be connected with the Semitic word *abaq* meaning sand, because in its most primitive form a calculating table is most simply drawn in sand.) The first information in print about the Salamis abax was published by Rangabé in *Révue Archéologique* III, 1846, later by Daremberg and Saglio in *Dictionnaire des antiquités grecques et romaines* and others. The Swedish mathematician, K.-G. Hagstroem, in his book *Sagan om de tio tecknen* (The Tale of the Ten Signs) has



Greek abax from Salamis in the form of a marble board for stone counting. From Hagstroem.

published a drawing of the Salamis table from a photograph of the original in the Epigraphic Museum in Athens (drawing reproduced here). Of the Greek calculation with pebbles on an abacus Hagstroem writes, speaking of the table (op. cit. pages 52—53):

> "It is clear that some stones have been used to signify units, others tens, others hundreds, etc., according to the logics of the decimal system. To separate them from each other there were straight lines drawn on the calculating tables so that the area to the far right referred to units, the one adjoining it to the left, to tens, etc. Within each area, space was reserved in a certain manner for the fives, *i.e.* within the unite area there was a separate space for stones signifying five, within the tens area for those that signify fifty, within the hundreds area for those that signify 500, etc. It is possible that the crosses of the table are meant to divide the areas in one upper and one lower half. The 'elevated' stones may also have been specially marked by being placed at the side of the units, for instance on the borderlines between the areas."

The so-called Dareios vase, an amphora found in Canuto, in 1873, now in the Museo Nazionala, Naples. In the bottom row a scene with abax counting.

Detail of the counting scene on the Dareios vase. From Hagstroem.

An operation on such a calculating table must have been done in successive reduction by moving the pebbles. This fact is very important for, as Hagstroem has pointed out, the so-called Herodianic numerals (from the Byzantine grammarian Herodianos in the third century A.D.) on the table from Salamis as well as the Roman system of numerals have "resulted as reflections in writing of the pebbles of the calculating table". This fact logically explains the existence of symbols for fives in the writing. Hagstroem writes further in his interesting study (op. cit. page 57):

> "It would not seem to be at all unnatural to presuppose the existence of calculation on abaci before the numeral systems in question. On the contrary, we find it very probable that the practical calculation with pebbles or similar objects dates back to the early ages of mankind. The invention of the method of simplifying this calculation by the introduction of pebbles placed

Abacus scene on a Roman marble sarcophagus in the Museo Capitolino, Rome.

> in a special manner to signify fives may well have been made by the Greeks. It is quite obvious that this procedure must be termed an invention, inasmuch as the logical construction of numbers within the languages is exclusively based on tens as units."

The Roman abacus

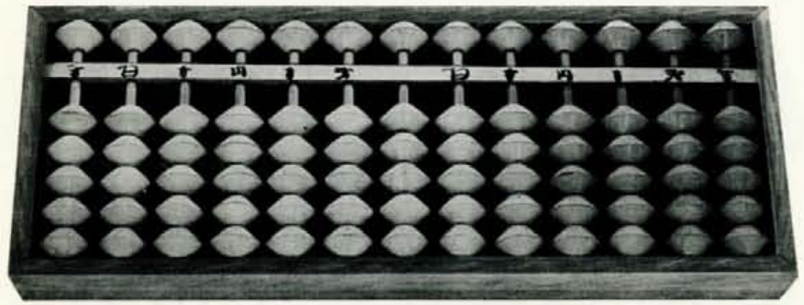
The Romans have borrowed the main principle of their abacus system from the Greeks, some of the Roman calculating tables were simple, chequered boards where counters, etc., called *calculi*, were used in the same way as the Greeks used their *psefoi* or calculating pebbles, others were actual calculating machines — probably the first in history — in the form of metal boards (bronze) having vertical grooves in which counters were moved. Fortunately, a few of the latter calculating devices have been preserved, one of them is reproduced here from an original in the Museo Nazionale in Rome where it was brought with the collections of models, instruments, etc., of the Jesuit Professor Atanasius Kircher (1602—1680).

Just as in the case of the Greek abax (see the reproduction of the Dareios vase) the Roman abacus calculation has been illustrated in pictures. Thus on a stone engraving reportedly in the Cabinet des médailles in Paris a man is seen calculating with the aid of calculating pebbles while in his left hand he is holding an abacus (see the picture on the cover). Another example is a scene on a sarcophagus in the Museo Capitolino, Rome, where a *calculator* is depicted holding an abacus with moveable calculi. The scene is supposed to represent the Emperor Trojan and his wife, Plotina, (see picture).

The suanpân, the computing device of the Chinese and the soroban of the Japanese

Regarding the origin of the Chinese abacus, the *suan-pán*, which replaced a very old form of calculating table, is held to have reached China from the West by way of India, most probably in a form resembling the Roman abacus, and possibly as late as c. 1300 A. D. A suan-pán, as will be seen from our reproduction, consists of counting beads running on vertical rods. The introduction of an horizontal dividing beam with the value of five of each order for the beads above it has simplified the marking of the numbers. Originally each rod had ten beads just as the Russian number frame, the *s'choty*. The number 9, for instance was indicated by moving nine beads in the unit rod. After the introduction of the horizontal "five" beam it was enough to mark 9 by moving one "five" and four "ones".

The essential difference between a Chinese suan-pán and its Japanese variant, the *soroban*, is simply that the Chinese use two rows of beads above the horizontal dividing beam where the Japanese use a single row. The Chinese, however, only rarely use the upper of the two "five" bead rows. The soroban here reproduced from the original in the Ethnographical Museum, Gothenburg, seems to be especially intended for money counting, inasmuch as it carries signs both for numbers and for coin units on the dividing beam.



Japanese soroban in the zero position. The Ethnographical Museum of Gothenburg, No. 1880.

European predecessors to modern calculating machines

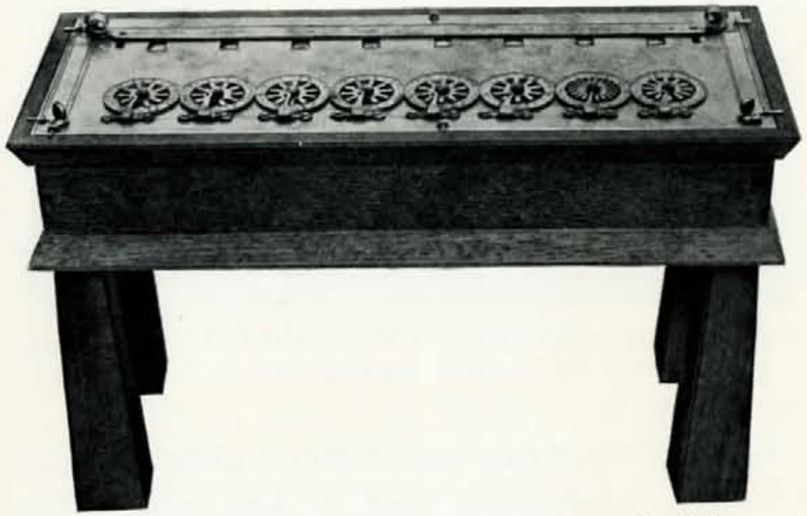
We shall now pass from these simple computing devices to those types of instruments which are more or less direct predecessors of the modern calculating machines. Naturally, however, we cannot give a technically exhaustive description of these instruments here as this is intended only as an outline of some of the types which are important historically and for the development of modern machines.

Napier's numbering rods

First we should perhaps mention briefly the mechanical aid for multiplication which is called "Napier's bones" after the inventor, the Scottish mathematician *John Napier* or Neper (1550—1617) of Merchiston, near Edinburgh. Napier, perhaps best known by his discovery of the logarithms, never won great success for his numbering rods or "virgulae numeratrices" as he himself called them in his writing on this subject.

Pascal's calculating machine of 1642

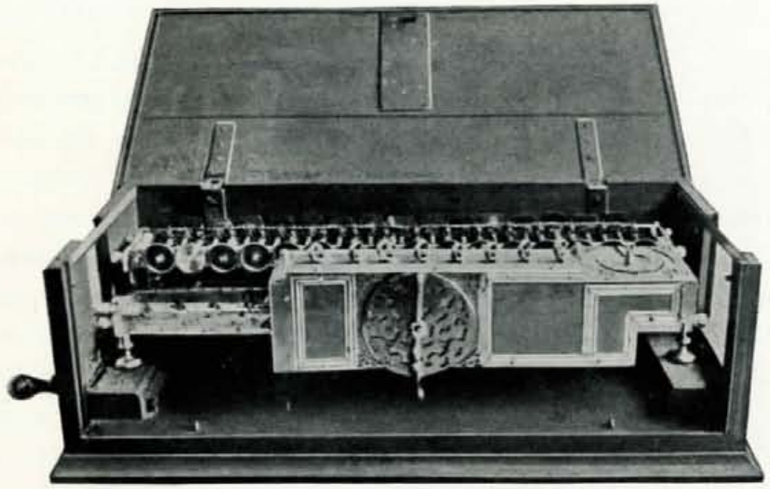
An actual calculating machine, even though primitive in many respects and chiefly meant for addition and subtraction (multiplication on it was very complicated) was the device invented at the age of nineteen in 1642 by the brilliant Frenchman *Blaise Pascal* (1623—1662). It is said that his machine was made in order to help his father, a Rouen tax collector, to master the cumbrous tax rolls. In other words, here a



A copy of Pascal calculating machine. The Technical Museum, Stockholm.

practical need was the basis of the invention of a calculating machine. In the same way we shall see later on how a practical need gave the impetus to Odhner's invention of his machine.

Pascal's machine was first described in Diderot's Encyclopédie (1751), and a number of these machines, although very unlike each other, are still extant. The machine consisted of figure wheels placed side by side and carrying symbols for coin units such as "livres", "sols" and "deniers". The wheels, first six and later on eight or more, were operated by a stylus. There is one machine of the six-wheel type, made in 1652, in the Conservatoire des Arts et Métiers at Paris. An original of a ten-space type has been preserved in the Mathematisch-Physikalischer Salon at Dresden. Pascal, who was a contemporary of Queen Christina of Sweden, is reported to have presented her with a machine in 1652, but all traces of this machine have been lost. The reproduced picture of a Pascal machine is of a replica at the Technical Museum of Stockholm.



Leibniz' stepped wheel machine, preserved at Hannover.

It is particularly interesting to note that one of the most important details of a modern calculating machine, the tens-carrying device, existed on Pascal's machine even though it was in a primitive form and was not consistently used.

Of the three operation principles chiefly used in modern multiplying machines (*the stepped wheel*, *the peg wheel* and the *proportional lever-rack* principles, see pages 29—32), the first one is the oldest, closely followed by the other two. Each multiplication is a series of repeated additions (for instance, $3 \times 27 = 27 + 27 + 27$), therefore, after Pascal's invention, the task was to create a type of machine which could perform all four orders of arithmetic, that is by automatic repetition of a set number, for instance once at each turn of a handle.

Leibniz' stepped-wheel machine of the 1670's

The well-known German philosopher and mathematician *Gottfried Wilh. Leibniz* (1646—1716) was first to solve the problem, at least theoretically, though his machine could not be operated faultlessly due to certain deficiencies in the

mechanical design. He had begun to work on it in 1672 and continued his designing work in Paris where he was a German diplomat. In the years 1676—1694 he is said to have employed a mechanic by the name of Olivier. Later on a Professor Wagner and a mechanic, Levin, worked on the design at Helmstedt for ten years, after which the mathematician Teubner in Leipsic took over in 1715. It is said that three machines were more or less completed during all those years, but as far as is known only one of these has been preserved. That is the machine which, after lying for more than 200 years in the attic of the University building at Göttingen, was discovered during restoration work there. In 1893 it was repaired by the Burkhardt firm at Glashütte, on which occasion a record was made.[1] This machine has been kept at the Kästner Museum, Hannover.

According to one source, Leibniz reported his plan of design to the Royal Society in London, 1673, and a few years later exhibited a completed machine in the Académie des Sciences at Paris. The Leibniz machine, *inter alia*, had a simple tens-transmission mechanism and a crank which was to be turned in one direction for adding and multiplying and in the reverse direction for subtraction and division. There was a series of stepped wheels in the fixed counting works and another series in the setting portion. The latter could be moved along the former with the aid of a crank.

Hahn's design of 1774

A long time elapsed after Leibniz before anyone again set about developing the calculating machine designs with any success. In 1774 the Rev. *Philipp Matthäus Hahn* (1739—1790), Pastor at Echterdingen, Germany, developed a machine with vertical stepped wheels arranged in a circle. This machine

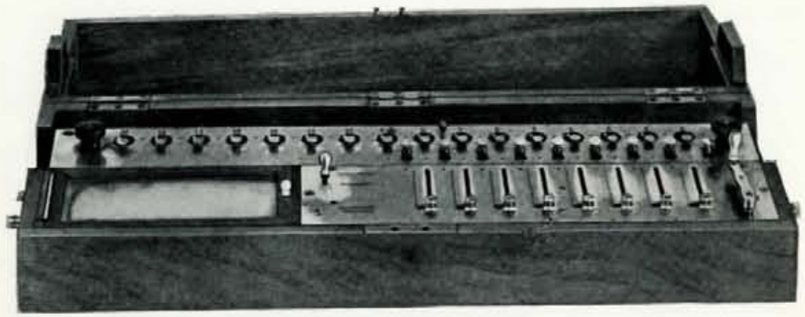
[1]) Ernst Martin, *Die Rechenmaschinen und ihre Entwicklungsgeschichte*, Pappenheim 1925, page 45, cites an exhaustive report of Burkhardt's reparation of the Leibniz machine in *Zeitschrift für Vermessungswesen*, 1879, page 392.

One of Hahn's calculating machines with vertical stepped-wheels.

was entirely successful but only a comparatively small number were built. In 1925 an author on the subject of calculating machines, Ernst Martin, emphatically stressed that it was Hahn who succeeded in designing the first entirely practical machine. Moreover a number of copies of Hahn's machine were made, some of which are still in working condition. A description of the use of the machine, published by Hahn, has been preserved, and at an exhibition in South Kensington Museum in 1876 when an original Hahn machine was exhibited the catalogue stated that one of the copies had probably been a model for the Thomas machine and that the Hahn machine on an exhibition worked faultlessly for numbers up to 12 digits.

Thomas' machines in 1820. Industrial production

Paris, however, soon became the center of attempts to develop industrially the principle of the calculating machine as it existed in the stepped wheel system. The man who was to take the lead in this respect was *Charles Xavier Thomas* (1785—1870) of Colmar in Alsace, director of an insurance company. In 1821 he demonstrated before the Société d'Encouragement pour l'Industrie National in Paris, the design of



Improved design of a so-called Thomas or (after 1878) Burkhardt arithmometer, made in Stockholm about 1895. This machine made according to the Thomas principle, was used in an office until 1928. Size 590×200×120 mm. The Technical Museum, Stockholm, No. 5340.

an "Arithmometer" which he had made the previous year. Up to the 1880's the Thomas products had practically no competition, and it is reported that in the years 1821—1865 500 machines were made, while during the next five years production numbered 300 machines. Up to 1878 a total of 1,500 machines of the Thomas type had been manufactured and distributed to a large number of places in the world. It is from this manufacture that the machines of the stepped-wheel type have been called "Thomas machines", although, as has been demonstrated, the honour of having developed this detail of design should properly be attributed to Leibniz or Hahn.

The Burkhardt arithmometer

An improvement of the Thomas machine was the so-called *Burkhardt arithmometer*, named after *A. Burkhardt* who, from 1878, continued the manufacture at Glashütte in Saxonia.

The peg-wheel system

The oldest data on the *peg wheel system* for calculating machines are rather obscure. It has been reported, for instance, that even one of Leibniz' designs was based on a peg wheel principle, and that as early as 1709. *Poleni*, Professor of mathematics at Padova, described in his *Miscellanea Venetiis* a big wooden machine where a form of peg wheel is said to have been employed. Weights were used as the motivating

force for the machine which, regrettably, was later destroyed by the inventor himself.

Wertheimber's patent

The latter half of the 19th century was to see the practical realization of the peg wheel principle. But as early as 1843 the English inventor *Wertheimber* is said to have been granted a patent for an experimental design with peg wheels, although the idea was never used in practical production. That, however, is partially true about the patents for a peg wheel machine which the American *Frank Stephen Baldwin* declared in Washington in 1872—73. Despite the fact that Baldwin used a peg wheel with adjustable pegs, his machine which was put on the market in 1875 was too expensive and contained a number of delicate parts.

Baldwin's machine of 1875

Besides the inventors mentioned here, it is also reported that a designer by the name of *Didier Roth* in the 1840's made an experimental machine resembling Hahn's but containing a form of peg wheel. A machine of this design is said to be preserved at the Conservatorie des Arts et Métiers, Paris. Thus, it is clear that several inventors in several parts of the world were from the middle of the 19th century thinking of a calculating machine embodying the peg wheel and that, as far as can be ascertained, they worked independently of each other.

As is known the Swede Odhner by his brilliant adaptation of the peg wheel principle was to give his name permanently to this type of machine. According to one source, *Willgodt T. Odhner*, a Swedish engineer and inventor and the founder of *the Odhner system*, saw the peg wheel principle applied to a machine as early as 1866, at an exhibition in Sweden. Research for the details of this account has proved that at the Art and Industry Exhibition at Stockholm in 1866 a calculating machine designed by a mechanic, C. Petterson, was exhibited, but its design is not known. It may therefore be quite possible, that Odhner then studying at the Technological Institute of

Odhner's designs of 1874

Stockholm, saw this machine and may have been influenced by it when making his own first designs in Russia.

In his work *Die Rechenmaschinen*, Ernst Martin, who has been quoted earlier in this work and who appears to be very thorough, reports that Odhner had a machine completed as early as 1874. Martin describes this machine and publishes a reproduction of it (op. cit. p. 71 and fig. 35).[1] Another reproduction shows a model of 1876 which, in contrast to the first one, bears the characteristic arrows showing in which directions the crank handle should be turned for addition-multiplication and subtraction-division. The first German patent, D. R. P. 7393 of 1878, is based on both these designs. In this connection one should bear in mind that the German Patent Office began its activities only in 1877. The German patent, however, was not applied for in Odhner's name but in that of a partner of his, Mr. *Königsberg*, and it corresponds to the first Swedish patent, No. 123, of 1879. Only a small number of machines of the first design were manufactured. The multiplying machine, which was to make world famous the name of Odhner, was based on a later German patent (D. R. P. 64925, Sw. patent 3264) which was applied for on September 26, 1890. For certain parts of Europe, the Odhner patent rights were later handed over on license to the firm of *Grimme, Natalis & Co.*, Brunswick, which in 1892 began manufacturing the Brunsviga machines according to the Odhner system. Since the expiration of the patent rights in 1906, this type of machine has been manufactured under a number of names in Germany as well as in other countries.

We shall return to the first years of the Odhner designs in the following chapter.

[1]) Cf, however, Odhner's letter of May 21, 1876, quoted on page 34 of this book. There is the possibility that in this letter Odhner refers to the model of 1876, which Martin also mentions.

The brothers Scheutz, and Mr. Wiberg

For historical interest we may mention here a few of the earlier Swedish designers of calculating machines. Among these, the brothers *Georg* and *Edvard Scheutz*, in the middle of the 19th century perfected Babbage's English so-called difference engine for the calculation and recording of logarithms. Mr. *Wiberg*, in 1863, completed a machine for calculating and printing tables of logarithms. His work, "Logaritm-Tabeller uträknade och tryckta med räknemaskin af D:r M. Wiberg", (*Tables of Logarithms* Calculated and Printed with the aid of a Calculating Machine, by Dr. M. Wiberg), was published in Stockholm in 1875 on subsidies from King Oscar II among others. King Oscar II, even as Duke of Östergötland, had taken the initiative in forming the so-called Wiberg Tables Company Ltd. The cover of the Wiberg book carries a reproduction of his machine which was exhibited at the Institut de France, and is described in the publication "Comptes rendus des séances de l'Académie des Sciences" by Messrs. Mathieu, Chasles, and Delaunay under the heading "Rapport sur la machine à calculer presentée par M. Wiberg".

A few inventions from the 1880's

From the period of the 1880's the number of inventions in the field of calculating machines begins to grow rapidly. We shall here only mention a few of the more important.

Burroughs' adding machine of 1884 and 189

The American, *William Seward Burroughs*, had been working in St. Louis since the early 1880's on an adding machine, of which a model was completed in 1884 and patented in 1888. It was an adding machine which registered its additions in printing. The production of Burroughs' adding machines in greater numbers, however, is based on a later patent of 1892 recorded for a machine which is said to have been completed in 1891. Through his patents Burroughs laid the foundation of the world's greatest industry for recording adding machines, but in his work he had to wrestle with great economic difficulties. He died in 1898. The great significance of his work

Original-Odhner's first adding machine of 1928. Designer, Karl Siewert.

lies in the fact that he succeeded in designing the first really practical recording adding machine. However, it should be kept in mind, that even before Burroughs, much valuable work had been done in experimentation with adding machines by *Dorr E. Felt*, who under the firm of *Felt & Tarrant* built his first recording adding machine in 1889. If one leaves Burroughs' experimental design of 1885 out of consideration, this machine is the first recording adding machine. Felt's machine, the "Comptograph", is now in the National Museum, Washington.

Felt & Tarrant, 1889

Recording adding machines of the ten-key type (one key for each digit) were designed by several inventors in the 1890's. However, not until 1902 was the first successful manufacture begun when the *Dalton Adding Machine Co.* of the United States undertook production with a design by Hubert Hopkins.

Recording adding machines of the ten-key type

Dalton, 1902

AB Original-Odhner's first ten-key adding machine was designed in 1928 by Mr. *Karl Siewert* (Swedish patent No. 70779 and others). The present ten-key machine was designed by Mr. *Gustaf Liljeström* in 1935 (Swedish patent 91280 and others).

Original-Odhner's first ten-key adding machine, 1928

A multiplying machine with a keyboard of ten keys has been designed at *AB Facit*, Åtvidaberg, and has become very popular for export as well as for the domestic market.

The Facit 10-key multiplying machine

The most recently known, really original invention in the field of calculating machines was made by the Norwegian *R. Hofgaard*. The design, patented in 1924, is based on an electric principle and the calculating parts consist of electric relays.

Entirely electric principle

It will have appeared from the foregoing that in the calculating machine industry there are two main groups of machines, namely *multiplying machines* and *adding machines*. The first also do division and the latter subtraction. This division into the two main categories is the natural consequence of the fact that the mechanical operation of multiplication and division is so essentially different from addition and subtraction that it is not expedient to use the same machine for all the four orders of arithmetic. Such an allround machine would be less well suited to one or other of the orders than the two specialized machines, and as a rule would be more expensive than two separate machines which can be used simultaneously by two operators.

Types of multiplying and adding machines

Here follows a systematized list of the two main types and their subdivisions:

I. Multiplying machines:
   a) The stepped wheel or Thomas type
   b) The peg wheel or Odhner type
   c) The proportional lever-rack type
   d) The multiplying body or Millionaire type

II. Adding machines:
   a) With stylus setting
   b) Key machines, non-recording (Comptometer type)
   c) Recording machines with complete keyboard (Burroughs type)
   d) Recording machines of ten-key type

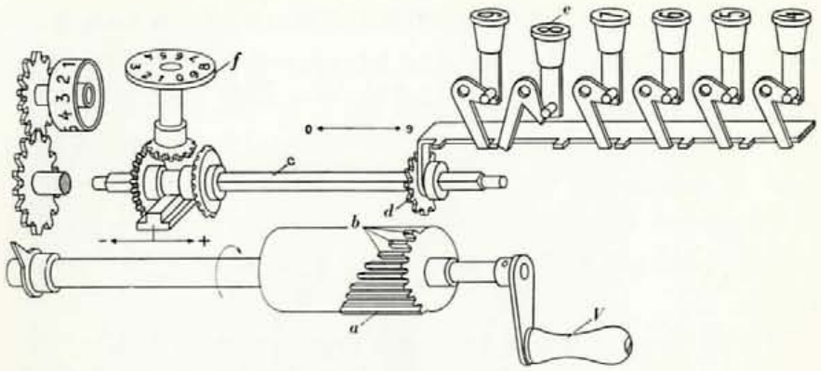


Diagram of the stepped-wheel system for calculating machines.

Technical data

Group I. (a—c) includes the most important multiplying types. Therefore we shall here give a short review, with special illustrations, of the most important technical features of these types and a list of the brands of each group, including those that may have long since disappeared from the market.

The stepped-wheel system

The stepped wheel (marked *a* in the figure) is the fundamental construction detail of the system of this name. It bears nine rows of teeth *b* each varying in length, the second row being twice the length of the first, the third three times as long as the first, etc. Above each stepped wheel, on a square spindle *c*, is a toothed wheel *d* which can slide back and forth along *c*. According to the position of *d* it engages a greater or smaller number of teeth *b* at the turn of the wheel *a*. The wheel *c* is set with the aid of setting levers or keys *e*. After the operator has set the multiplicand in the setting portion, he turns the handle *V* one clockwise turn for multiplication, after which the number set will appear in the sight holes of the product register *f*.

Manufactures according to the stepped-wheel principle

A few manufacturers of pure-type stepped wheel machines are: Leibniz 1673, Hahn 1774, Thomas 1820, Burkhardt 1878, Saxonia 1895, Peerless, Badenia 1904, Gauss 1905, Archimedes

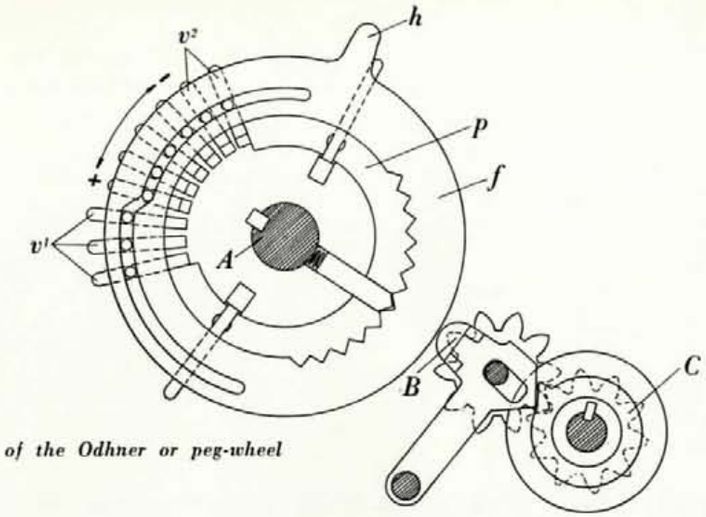


Diagram of the Odhner or peg-wheel system.

1906, X x X, Austria (1906?), Mercedes-Gauss 1907, Ensign, Tim, Unitas, Madas, Bunzel-Delton 1908, Record 1913, Calculatrice Fournier-Mang 1919, Rheinmetall 1924.

The Odhner system (peg wheel)

The Odhner system: The special characteristic of this type of machine is the "peg wheel". It consists of two discshaped parts *p* and *f*, attached to each other but revolving independently. Of these two discs, *p* is fixed in connection with the axis *A* of the crank. With the aid of the setting arm *h*, *f* is turned along a scale on the cover-plate of the machine, while *p* remains stationary. As *f* is brought forward-downward, pegs v^1 protrude from the periphery of the wheel. In the figure, the machine has been set for the digit 3, and therefore three of the nine pegs have protruded while the remainder, marked v^2, are inside the periphery. When the crank is now turned counter-clockwise, the three protruding pegs or cogs engage in the cogwheel *B* which, in its turn, actuates the digit wheel *C* so that the digit 3 appears in a sight hole in the product register.

Machines of the Odhner type

A few manufacturers of pure-type Odhner machines are: Odhner 1874, Baldwin 1875, Brunsviga 1892, Berolina 1901, Triumphator 1904, Thales, Köpfer-Calculator 1911, Sanders

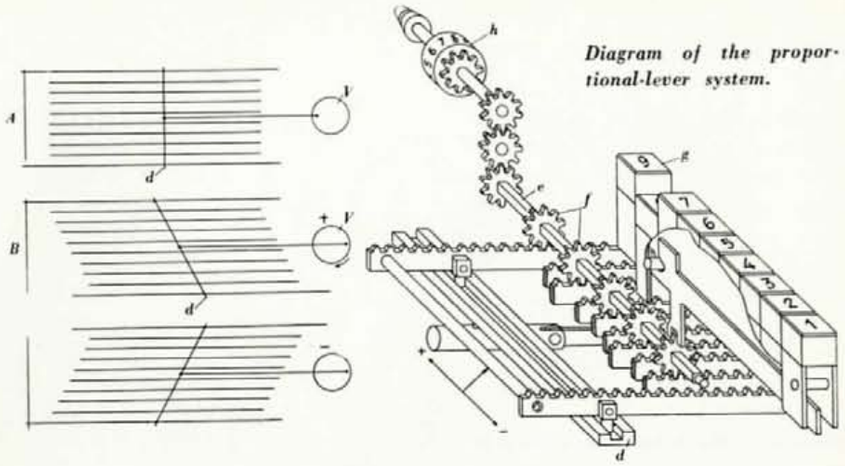


Diagram of the proportional-lever system.

1912, Lipsia 1914, Facit 1918, Orga Constant, Hannovera 1921, Britannic 1922, Monos, Kuhrt, Rapid Calculator 1923, Cosmos, Demos, Eos, Gauss, Mira, Muldivo, Omiag, Summograph 1924, Melitta, Walther 1925, Fridén 1935.

Proportional lever-rack system

The German *Chr. Hamann*, is said to have invented the designing principle which we may call *the proportional lever-rack system*. Instead of stepped wheels, this machine has ten parallel racks arranged so that they are normally in line (shown in diagram in *A*). With the aid of a so-called proportion lever *d* the racks can be moved so that while the upper rack remains stationary its neighbour is moved one step, the next rack two steps, etc. The tenth rack will then have been moved nine steps or cogs (shown in diagram in *B*). Above these racks are a number of square spindles *e*. These spindles carry cog-wheels *f*, which can slide back and forth on *e* and are operated either by setting arms or keys *g*. The position of *f* determines which of the racks will be the driving one. After the multiplicand has been set in the setting register, the crank *V* is turned for multiplying, after which the number set will appear in the sight holes in the product register *h*.

The most important machine of this type is Mercedes-Euclid which began production in 1905.

II

W. T. Odhner, founder of the Odhner System, and the Russian period up to 1918

The preceding chapter has related how Pascal was spurred to design his calculating machine in an attempt to facilitate his father's work as a tax collector. Here a practical need set a thinker and practical designer to seek the solution of the problem involved. In the same way it is related of the Swedish engineer, *W. T. Odhner*, who was working in Russia from the 1860's to 1905. He got the idea of creating a mechanical aid for computation after he had witnessed the partition of community lands during his first year in Russia. This work of parcelling out the land, of course, required complicated geodetic calculations. It is well-known that Odhner succeeded in his intention of creating the aid to the calculator, and we shall precently return to how he did it. First, however, we shall give a little personal information about this man who holds a position of note in the history of world industry.

Biographical data

Despite the fact that his activities were located to Russia, Willgodt Theophil Odhner[1] was of pure Swedish descent, born

[1]) Odhner signed his name Willgodt Odhner, or with initials on office stationery etc. W. T. Odhner. The Dalby parish birth register for 1845, however, lists him as Theophil Willgodt Odhner, proving that he has later changed the order of his given names. In accordance with his own initialled signature we here write W. T. Odhner.

The inventor of the calculating machine, W. T. Odhner, while a student at the Royal Institute of Technology, Stockholm, 1864—1866.

at Westby, parish of Dalby in northern Värmland province, on August 10, 1845. He was the son of Th. D. Odhner, the steward of an ironworks, later Principal Clerk and Secretary of the General Office of Surveys, and his wife Fredrika Sophia Wall. His family's sphere of activities and the environment in which he was brought up probably directed his interest at an early age to questions regarding the refinement and technical use of iron. His first professional training, however, was in the field of commerce, at 12 he was employed in Stockholm by his uncle, Aron C. Odhner, a lamp merchant. But soon we find the mechanically inclined youth an apprentice in a mechanical workshop and an employee of the instrument maker Lyth in Stockholm. Finally, he received the necessary theoretical education at the Royal Institute of Technology. Here he matriculated as a regular student on September 3,

1864. According to the registers he was promoted to the third year's class in 1866. There were only three departments at the Institute at the time when Odhner was a student there, and he belonged to a group which "principally devote their studies to Practical Mechanics and Mechan. Technology".

Employment in Russia

Like so many other Swedish engineers of his age Odhner, after completing his technical studies, sought employment in one of the firms founded in Russia by the Nobel family. Oil production in Baku required much technical material, and young Odhner was first employed in Ludvig Nobel's workshops in the then St. Petersburg. He later got a position in the Russian Imperial Workshops in the capital.

Beginning calculation machine designing

Even while employed by Nobel and with Nobel's support Odhner began to work in earnest on the invention of a calculating machine. He had played with this idea for some years intending, as mentioned above, to make an instrument for calculations in the partition of Russia's community lands. At that time there were only Thomas machines in the market, but they were rare and not too practical. Odhner wished to design and manufacture an industrial calculating machine that was to be small and simple, easy to operate and so inexpensive that practically anyone who needed a mechanical aid in computing would be able to buy one. It was no easy task. The young Swedish engineer in the foreign country, however, succeeded in solving the problem by his mechanical talents and hard work mostly during his leisure hours. We know little about his toils during these years of experimenting because the documents that could have illustrated this and other stages of the development of the Odhner system were lost in the Russian revolution. Letters to relatives in Sweden, however, contain some of the inventors own thoughts about the calculating machine. He wrote in a letter dated "St. Petersburg, $\frac{21\text{ May}}{3\text{ June}}$ 1876", to his sister Anna Odhner, later

Odhner's demands on a good calculating machine

married to Captain Arvid Åhlin, who was to become the first agent of the Odhner machines in Sweden:

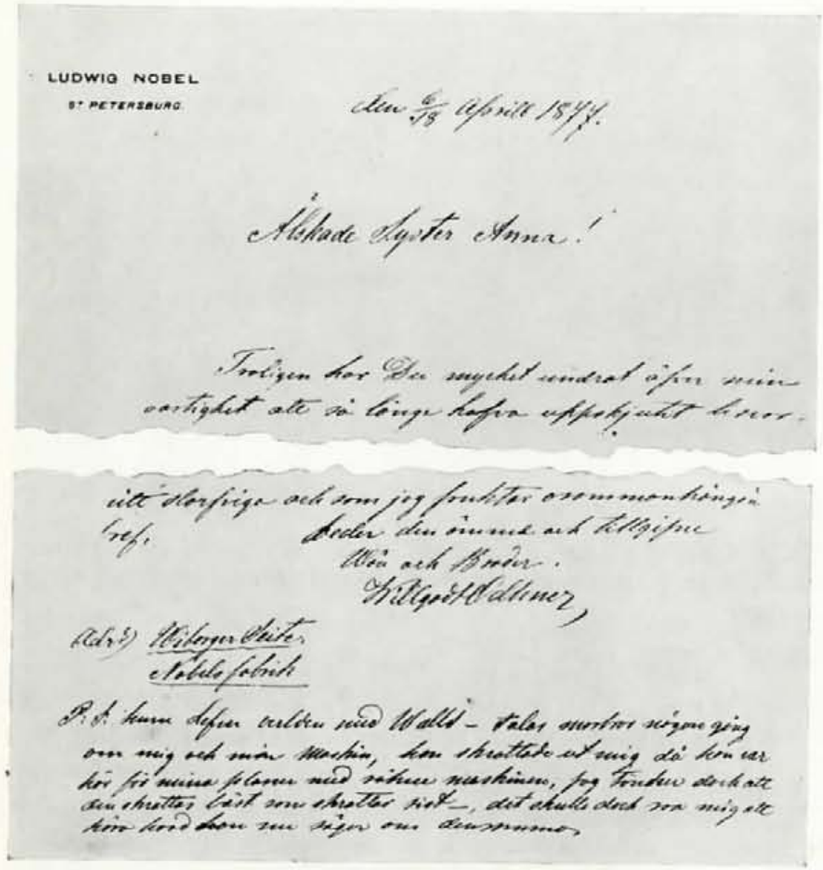
> ". . . but the persistent and worrisome work with my machine has so absorbed my time and my thoughts that I have not had any inclination to start anything else. These worries, however, are now a thing of the past for my first machine is now completed and successful in every respect. It was our intention to send this machine to the Physical Exhibition in London, but upon consideration I have changed my mind — for I hope to be able to improve the machine still more and make it more comfortable, and do not want to make it public before it has reached the highest degree of perfection — and secondly I do not think I shall have any practical advantage from displaying it unless I had a few hundred machines ready to sell simultaneously — and thirdly it might be unwise to show it before the idea has been patented. I am now busy with a new, and in many respects improved, machine which I hope will be completed in a couple of weeks, and hope that the business will then start."

Scarcely a year later in another letter to his sister Anna, dated "$\frac{6}{18}$ April, 1877", and written on stationery marked "Ludwig Nobel, St. Petersburg" he concludes with a P.S. which we quote:

> "P.S. How are the Walls (Odhner's mother's family) getting along. Does Uncle talk of me and my machine sometimes? He laughed at me when he was here, because of my plans with the calculating machine, I think, however, that the last laugh is the best — it would be fun to hear what he says about it now."

The above-mentioned Captain Arvid Åhlin had visited Odhner in St. Petersburg at about the same time. On May 30, 1877, Capt. Åhlin wrote the following that may be of interest in this connection, from Kronstadt to his fiancée, Odhner's sister Anna:

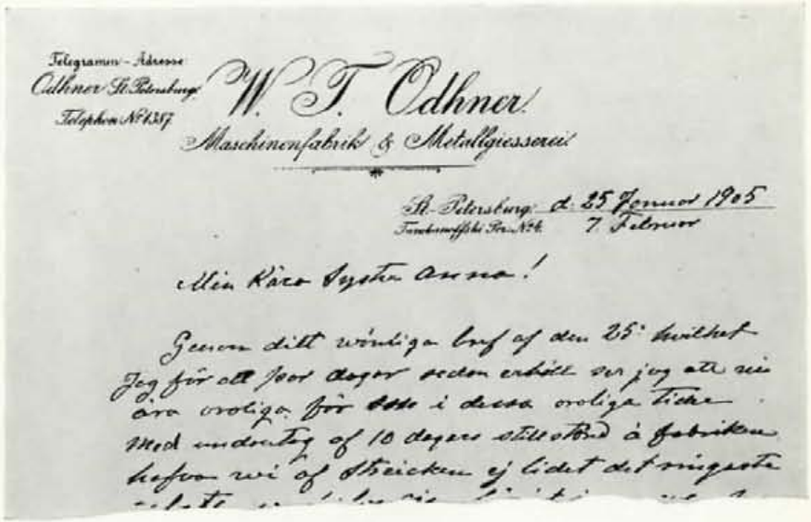
> ". . . About the machine. It is a really ingenious invention, and in my conviction it has a great future. Willgott has the one at


LUDWIG NOBEL
ST. PETERSBURG

Åhlade Syster Anna!

Facsimile of a letter by Odhner to his sister Mrs. Anna Åhlin, in 1877.

> home that he first made by hand, which therefore is not so fine and neat-looking as those he is now making at the factory, but still it is beyond my expectations. . . He is now making 14 machines which are nearly finished, and it is his intention to send them out in the world to be tested and inspected and by means of the newspapers to make the machine known to the world. Nobel has given Willgott the use of a small portion of the factory to work with his machine. Nobel and Willgott have made an agreement that Nobel shall carry all costs to see the business started and until then he is paying Willgott a salary on the condition that


Telegramm-Adresse
Odhner St. Petersburg
Telephon № 1317

W. T. Odhner

Maschinenfabrik & Metallgiesserei

St. Petersburg d. 25 Januar 1905
Tarakanoffski Per. № 4 7 Februar

Mein Käre Syster Anna!

Genom ditt wördiga bref af den 25 förlidet
Jag för att jemt dagar sedan erhållit, ser jag att wi
äro oroliga för dig i dessa oroliga tider.
Med undantag af 10 dagars stillestånd å fabriken
hafwa wi af arbetare ej lidit det minsta

The beginning of a letter on Odhner stationery. This is one of the last letters written by the inventor to his sister Anna. One recognizes the handwriting of the aged man.

> when the business has started they shall share for better or worse and take one-half of the profits each. . . The reason why the going has been so slow at first is that in order to make machines profitably on a large scale, Willgott has had to design and make special machines for manufacturing each part. I was at the factory with him for four hours, and you can well imagine I had not a little pleasure out of seeing everything. I have reserved one machine for myself and also the agency for foreign sales. . ."

Odhner founds his own factory

The collaboration with Ludwig Nobel mentioned in this letter does not appear to have gone so well in the long run for afterwards there is no specific mention of it. It was only in 1886 that the Russian production of calculating machines, or, as they were called, arithmometers, began in earnest but then in a factory owned and directed by Odhner.

This factory, the origin of the Odhner industry in St. Petersburg, had been founded about 1880 in a small workshop located in a backyard building at No. 4, Tarakanoffski Pereulok

(T. Alley). Odhner was then on the staff of the Russian Note Printing Press and had only his scanty leisure hours to devote to his own work. This work, by the way, comprised not only the completion of experiments with, and the building of, calculating machines. Orders were also accepted for industrial production of many other things such as turn-stiles with registering devices for places of amusement and for the mooring places of the small steamboats which, at that time, were a characteristic means of transportation in St. Petersburg. It was in this period, too, that Odhner, in collaboration with Orloff, Russian engineer at the Note Printing Press, designed a multi-color printing press, the patent of which they later sold to England.

New factory in 1894

A direct consequence of the increased demand for Odhner's products, not the least of which were the calculating machines, was the building of an entirely new factory, completed in 1894 beside the old workshop. This factory was built of brick in a "U" shape and the front to the street was three storeys high. The old workshop remained in the backyard and was used for a lacquering works. Also the factory now had special departments for casting, making of models in wood, etc.

Various manufactures

In this factory a variety of things were manufactured. An old veteran of the Odhner enterprises, the foreman *E. Kuikka*, who has supplied part of the data for this chapter, was first employed by the firm in 1900 as a mechanic for cigarette machines. Besides calculating machines the factory made a number of the above-mentioned, so-called Orloff printing machines, which gave an unusually beautiful note print. In addition, nozzles for oil-burners, control devices for railways, phonograph works, and many other products were made.

The production of calculating machines and its progress

The calculating machines, which in this connection have the greatest interest for us, were made on the second floor of the factory. The manufacture of parts and the assembly were

both done in the same department. After the outbreak of the Russo-Japanese war the manufacture of calculating machines had to be largely closed down to make room for large orders of special laying instruments for naval artillery. The manufacture of calculating machines was again resumed in 1906—1907.

About 1907 the first cradle type machines were made and one year later the management developed the rapid zero setting, after which a tabulator design for moving the carriage was worked out. In the manuscript to a speech "A few memories from the old W. T. Odhner factory in Russia" dealing with this period Mr. Kuikka says:

> "Now the calculating machine began to be modified in regard to appearance as well as to the interior. New anchor stops were tried and introduced. The capacity was raised from thirteen digits to fifteen or eighteen. The signal device was redesigned by me. This led to increased possibilities of expanding the capacity of the machine.
>
> The old instruction which had been glued to the cover, was removed, one reason was that it said that the speed in calculating must not exceed a hundred and fifty turns per minute. This was due to the anchor hooks. The types were grouped alphabetically, the smallest one without a bell was marked A, and with a bell Ag, the fifteen-digit type B and Bg, the eighteen-digit type C and Cg, etc. With the introduction of a tabulator and a cradle, the number of types was again increased so that at the end we had twenty-four different types. The introduction of all these new designs made the machines more complicated so that we had to begin making many new parts. . . The market greatly needed our machines but due to the improvement of old designs and the introduction of new types the production could not be raised much in quantity. . . "

Mr. Odhner's death in 1905

The founder of all this, Willgodt Odhner, was not granted to see the end of the period of which Mr. Kuikka gave an eyewitness narrative in the above paragraph. He dies of a

Odhner and his wife, Alma, née Skånberg, on their thirtieth wedding anniversary in 1903, two years before Odhner's death.

heart disease in St. Petersburg on September 15, 1905, after which the management of the factory was taken by his son, *Alexander Hj. Odhner*, and his son-in-law, *Karl Siewert*. The wife of the inventor, Mrs. Alma E. Odhner, *née* Skånberg (1855), survived her husband by twenty-two years. She died in Leningrad in 1927.

Succession in the management

Odhner, the old engineer, had retained an ardent interest in his factory and its products until the last moments of his life. Mr. Kuikka relates that only a few days before his death the ailing Odhner was wheeled on a stretcher to the second floor of the factory, the centre of the calculating machine

W. T. Odhner, a personal characteristic

A few publicity leaflets for the Odhner machines, by Captain Arvid Åhlin, the general agent, and a wooden case for the early models.

production, where he wanted to see how a newly-acquired tool for drilling square bottom holes worked. Mr. Kuikka in a few personal words has also characterized the old factory manager. Strictly speaking, his words are unique in the source material in giving something of the man behind the inventor of the Odhner system, and we therefore wish to quote him:

"As a man he was very quiet and modest, as a chief, popular among his subordinates whose services he appreciated. He set great stock by skilled workers but was inclined to judge by their outward looks. He was a Swede to the core which was shown by the order he kept everywhere in his factory."

The Russian firm becomes a limited liability company

Early in 1912 the firm was reorganized into a limited liability company with the character of a family firm which appointed the engineer Karl Siewert to the post of managing director. Under Siewert's management the task of consolidating the firm and developing production still more was begun with great energy. The number of Russian calculating machines up to 1917 has been estimated at about thirty thousand. The greater part of this production had been absorbed by the Russian market but exports were also made, especially to Europe. Many Russian Odhner machines were sold in Sweden, for instance, through a general agent and other representatives. One Odhner representative, well-known at the time, was the above-mentioned Captain Arvid Åhlin. In his advertising he made several Odhner booklets (see picture), among others one called "120 Training Examples for W. T. Odhner's Calculating Machine", printed in Stockholm in 1891. In the preface of his now rare booklet, the author says: "The examples no more claim to be arithmetic subtleties than the calculating machine makes any claim to be a master of Arithmetics. On the contrary, the calculating demands that its operator know the general arithmetic rules and signs." And of course we must still agree even though we may suspect that Captain Åhlin could now have used the term "arithmetical subtleties" for the advanced mathematical problems which, according to Original-Odhner's modern "Instructions in Machine Calculation", actually can be solved very easily on a multiplying machine.

Russian Odhner machines sold in Sweden and elsewhere

Assistants during the Russian time.

Above: The eldest son of the inventor, Alexander Hj. Odhner, born Sept. 12, 1873, died Oct. 2, 1918. Center: Karl Siewert, born Aug. 31, 1882, married in 1905 to W. T. Odhner's daughter, Julie Odhner. Below: Edvard Kuikka, the foreman, born Oct. 17, 1879.

An opinion of the Russian Odhner product

AB Original-Odhner's present export manager, Karl Siewert, a son of the above-mentioned engineer of the same name, in the manuscript of a speech, says the following about the exports of calculating machines during the Russian period:

> "Even today it sometimes happens that you find 'old Russian Odhners,' as they are popularly called, in various countries, and even though they may be forty to fifty years old they are doing good service so that the owners only unwillingly replace them with more modern machines. Thus, the products of the old Russian factory are doing great credit to their producer."

The epilogue to the Russian period

With the outbreak of World War the Russian firm, for the second time in a comparatively short existence, was forced to leave peace production in order to devote most of its capacity to war production. Orders from the state were so big and so many that the factory space was insufficient. A new, big hall for machine tools was built. But in it not calculating machines were made but automatic presses for cartridge-cases, fuses for handgrenades, etc.

At the end of this period came the familiar dissolution of Russian participation in the war, the revolution of 1917, and the socialization of the Russian people. When the completely changed conditions very soon made impossible a continuation of the activity and development of the firm, the management of the Russian company decided in favour of a transfer of production to Sweden. One of the telegrams sent to Sweden by the factory management at the end of 1917 from the Russian capital, then renamed Petrograd, may well serve as a witness of the excited atmosphere in Russia:

> "Our factory in hands of the workmen I hope that not for a long time don't wait for calculators dispatching impossible send letters and telegrams on my private address all families allright = Odhner."

The immediate task was to get the blueprints of parts and other important documents necessary for resuming production, over to Sweden. This was accomplished but only after many hazardous trips between Russia and Sweden by Mr. Karl Siewert who, with the active assistance of Mr. E. Kuikka, managed to salvage the most essential items. While this salvaging was being planned and partially carried out, the son of the inventor, Alexander Hj. Odhner, was working in Sweden to interest persons in taking part in forming a new company. We shall see from the next chapter that these efforts were successful.

III

On Swedish soil

AB Original-Odhner, Gothenburg, is formed in 1918

Later progress

The end of the Russian period

The end of 1917 and the beginning of 1918, as has been indicated, were exceedingly dramatic for the factory management in Russia. The fact that Alexander Hj. Odhner moved to Sweden with his family to find safety during the growing unrest was taken by the workers as a cause for surrounding the factory in armed bands, stopping deliveries from it, and by political pressure preventing payment to the factory for deliveries already made. Karl Siewert has given a vivid description of this thrilling period in the Original-Odhner-Tidningen, a company periodical at the tenth anniversary in 1928 of the foundation of the Swedish company. It was clear that a transfer of the company had to be made to safeguard production. The most obvious course was to move to Sweden. First, the founder of the firm was a Swede, secondly neutral Sweden with its highly advanced mechanical industry offered the best technical opportunities for production of high-quality products of this kind.

Negotiations for transferring production to Sweden

In reality preliminary negotiations had already been taken up during 1917 between Alexander Odhner and his second cousins, the brothers Sven and Erik Wingquist. Sven Wingquist was the world famous inventor of the spherical ball bearing and at that time president of the Swedish ball-bearing

company S.K.F. As early as December 10, 1917, these negotiations had resulted in a "Report regarding the taking over of the Machine Factory W. T. Odhner, Petrograd, and the connected formation of a Swedish joint-stock company". The report was signed by Erik Wingquist, Bengt Fjellman, Olof Palm, and Einar Glimstedt as representatives of Swedish participants. The report concluded with a declaration that rationally organized mass production of standard types and a good sales organization should make the Odhner product a world article.

Proposal for an agreement

A "Proposal for agreement between the founders of a Swedish joint-stock company as representatives of said company for the manufacture of Odhner calculating machines on one hand, and the firm of W. T. Odhner, Petrograd, on the other" was signed on December 13, 1917, by Erik Wingquist, Olof Palm, and Bengt Fjellman for the founders, and by Alex. Hj. Odhner.

The Negotiations were naturally followed with great interest by Managing Director Karl Siewert, who had remained in Petrograd and was kept informed of developments by telegrams and who, despite the upheavals in Russia, was able to send telegrams in English to Sweden. As an example we shall quote a telegram sent on January 5, 1918, to Alexander Odhner in Stockholm:

> "My journey to Stockholm impossible stop area cornerplace * minimum fifteen thousand square meters enlargement supposed stop building surface about seventy by seventy meters three floors high with basement story if possible and one court inside stop cubic capacity about seventy five thousand meters stop situation at old factory still without change stop already three weeks I sit home stop to send calculators just now absolutely impossible — Siewert.*"

Evidently in this telegram the essential features of a new factory building were outlined by the managing director who

could not make his suggestions personally in Sweden. Later in January, however, an opportunity for him to go to Sweden was offered. He arrived in Stockholm at the end of the month and within a few days left for Gothenburg to conclude the negotiations, accompanied by Director Hadar Schmidt who had been the general agent of the Russian firm for many years. The spirit of enterprise among Swedish industrialists was at that time, in the midst of booming business, very high, and no difficulties were encountered in signing a final contract. This was done on February 1, 1918, by Erik Wingquist on behalf of the founders, and by Alex. Hj. Odhner and K. Siewert on behalf of the firm of W. T. Odhner. As an addendum and explanatory note the signers, on February 2, drew up an agreement in five sections, which essentially served to elucidate a few questions of interpretation in the aforesaid contract. A later agreement of April 10, 1920, between the firm of W. T. Odhner and AB Original-Odhner nullified sections 6, 7 and 8 of the main contract and sections 2 and 3 of the additional agreement.

Contract signed between the Odhner family and Swedish participants

The contract suggested the name of *Aktiebolaget Original-Odhner* for the new Swedish company, a name which the company has borne since then except for a short period in 1923—1924, when the name of the firm was *AB Nestor*.

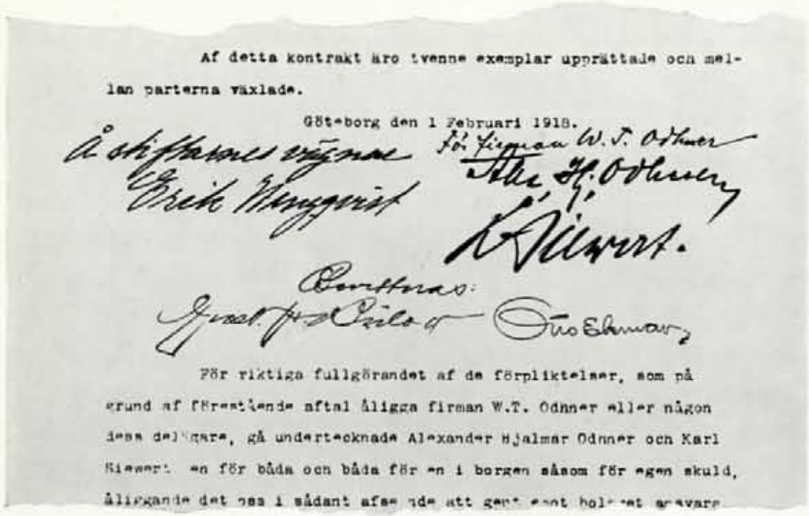
The name of the Swedish company

The founders of AB Original-Odhner were the following men, well-known within industrial and financial circles at Gothenburg: Director *Alexander Hj. Odhner*, *Mr. Ernst Krüger*, architect, Mr. *Willgodt Kullgren*, city broker, Mr. *Geo. Seaton*, Director *Sigurd Larsson*, Mr. *D. Dickson*, Mr. *Sten Mark*, Mr. *Bengt W. Fjellman*, engineer, Mr. *Ivar Lignell*, engineer, and Mr. *Olof Palm*.

The founders

The first board of directors was composed of the following: Director *Axel Carlander*, Director *Sigurd Larsson*, Director *Erik Wingquist*, Mr. *Bengt Fjellman*, Director *Anders Hellström*, Mr. *Hugo Schaumann* who was appointed managing director.

The first board of directors



Af detta kontrakt äro tvenne exemplar upprättade och mellan parterna växlade.

Göteborg den 1 Februari 1918.

Å aktiebolaget Original-Odhners vägnar
Erik Wingquist

För Firman W. T. Odhner
Alex. Hj. Odhner
K. Siewert.

Bevittnas:

För riktiga fullgörandet af de förpliktelser, som på grund af förestående aftal åligga firman W.T. Odhner eller någon dess delägare, gå undertecknade Alexander Hjalmar Odhner och Karl Siewert en för båda och båda för en i borgen såsom för egen skuld, åliggande det oss i sådant afseende att gent emot bolaget avsvara

Facsimile of the signatures on the contract of February 1, 1918, at the formation of the Swedish company.

Alexander Hj. Odhner, one of the founders, was not granted to devote his energy to the new company for long. On October 2, 1918, he died unexpectedly from a heart attack.

Death of Alex. Hj. Odhner in 1918

The company, naturally, had taken over all legal rights of the Russian firm and it was decided that its direct successor in Sweden should devote the production entirely to calculating machines.

The report of the board of directors covering the first year of the company's activity 1918, was signed in Gothenburg, March 29, 1919, by Messrs. Axel Carlander, Sigurd Larsson, Bengt W. Fjellman, Erik Wingquist and Hugo Schaumann. We quote from it:

The first report of the board of directors

> "The Company was founded on February 12, 1918.
>
> Thanks to the favour of Gamlestadens Fabrikers AB, the Company immediately succeeded in renting provisional factory space where production of tools and special machines for rational manufacture of calculating machines was started without delay, after which various parts of the calculating machine began to be produced, and the Board has reason to hope that the products will find a good market."

The board of directors' report further mentions the purchase of lots for factory buildings and the erection of quarters for the workers.

Factory building

The factory buildings mentioned by the board were opened for operation in due course, in September, 1919 the so-called "small factory", which was to house stores, foundry, and forge was opened, and the big factory, built in five storeys of armoured concrete facing the Gamlestadsvägen, was first used in early 1920. Thus the external housing requirements for large production were at hand, but the consequences of the world war, (scarcity of high-quality raw materials, etc.) contributed to the comparatively slow expansion of production during the first years. This period was utilized, however, to train the workers and the technical staff thoroughly which naturally proved to be of the greatest value for the subsequent greatly increased turnover.

Hans Herlitz, Managing Director

Managing Director Schaumann left the company in early 1921 to be succeeded by *Hans Herlitz*. Mr. Herlitz, a very efficient businessman and organizer who benefitted the company by serving as its director until his death on April 11, 1942, was extremely well fitted for his task. Under his farsighted management AB Original-Odhner was to undergo the industrial expansion which has long since made its products well-known all over the world.

During the greater part of Herlitz' directorate the board consisted of Mr. *Uno Forsberg*, director of AB Svenska Kullagerfabriken, Mr. *Assar Gabrielsson*, director of AB Volvo, and Mr. *Erik Magnus*. Director Forsberg, in particular, supplied the firm support which was needed at that time to develop the company and to lead it forward to the favourable position it now holds.

Data about Hans Herlitz

Hans Herlitz is probably the man who is most responsible for the company's progress in Sweden, and it may be of

Office staff at the factory, April 1, 1919. In the front row Mr. Sixtus Petersson and Mr. Karl Siewert (2nd and 3rd from the left, respectively). At the extreme right: Mr. Gotthard Andreasson, engineer, and Albin Kling, foreman. Mr. E. Kuikka, foreman, is third from the left in the top row.

interest to include some data about him. One of his close collaborator wrote of him under the initials Z. G. in an anniversary number of "La Revue Original-Odhner":

> "Director Hans Herlitz was born in Stockholm on December 29, 1891, the son of Judge Karl Herlitz. The origin of the family is in the province of Gotland.
>
> H. went to school in Almqvist Preparatory School and continued his studies at Norra Latin Secondary School. His longing, however, was for the sailor's life, and he therefore matriculated at the Naval College in 1905, and left it with his officer's commission in November, 1911. No one among us who know our chief will be surprised to hear that he was No. 1 of his class. Work in the Navy, however, probably did not carry life-long attraction for Captain

Herlitz, the problems he was set to solve may have been too petty for a man of his talents and capacity. Therefore he deemed that business would offer him better opportunities to use his energy and resigned his commission in 1917.

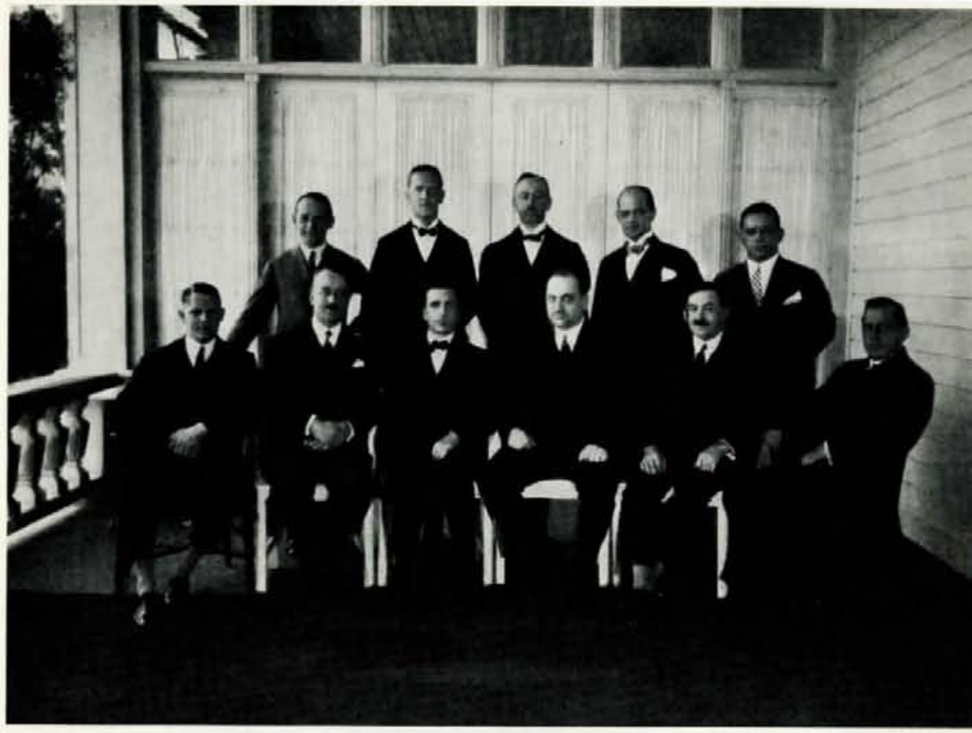
He first spent a year in banking (Stockholms Enskilda Bank) and after thus having obtained fundamental experience in banking and business life, he continued on his set path, applying for and obtaining a post at AB Papyrus, Gothenburg, one of the biggest paper mills of the world, where his theoretical training was profitably deepened and supplemented by experience in practical business.

After half a year's visit to America for studies, Captain Herlitz, was attached to our firm where, after only a few months' work, he was, at thirty, appointed managing director.

The board of directors of Original-Odhner on this occasion made a uniquely happy choice. It may well be said that the firm was then at a low ebb, and before Director Herlitz was set the mighty task of reorganizing the entire firm. It need not be pointed out that he succeeded. Our great globe-encircling sales organization, our production methods which are in the front rank of modern technics, and the high quality of our products, illustrate the work which Director Herlitz performed in the relatively short period of ten years."

Affiliated companies abroad

The above homage to Hans Herlitz on the tenth anniversary of his appointment to the post of managing director also mentions the sales organization of the firm. Herlitz immediately saw the importance of an efficient sales organization and set about creating one. AB Hadar Schmidt the representative firm of the old Russian company, was appointed general agent for Sweden. Affiliated companies were formed in the larger European countries (in others general agents were appointed) so that in 1928 not less than thirteen affiliated companies were active outside Sweden, namely in Denmark, Norway, Finland, Belgium, France, the Netherlands, Italy, Switzerland, Spain,



Sales conference at Original-Odhner in 1927. Photographed at the Trädgårdsföreningens restaurant. Front row from left to right: Mr. Eric Lundberg, Brussels; Mr. G. M. Maselli, Milan; Director Hans Herlitz, Gothenburg; Mr. K. G. Westerlund, Vienna; Mr. Sixten Carle, Zurich; Mr. Karl Siewert, Gothenburg; Back row: Mr. Nils Lundberg, Brussels; Mr. Arthur Jinton, Gothenburg; Mr. Sixtus Petersson, Gothenburg; Mr. Z. Guthe, Gothenburg; and Mr. Leon Karkoff, Prague.

Czechoslovakia, Germany, Hungary, and Austria. At the same time there was ever increasing sales on the non-European markets.

The company takes the Swedish sales under its own management

The good results of the affiliated companies abroad decided the home to take the Swedish sales under its own lead also. This was done in 1928. Sales offices were opened in Gothenburg, Stockholm, and Malmö, from which offices sales were conducted with the aid of staff personnel and sub-agents. This organization has proved very efficient for selling and has gradually been expanded so that now the firm has sales offices in Eskilstuna, Norrköping, Härnösand, and Kalmar, not in-

cluding those in the above-mentioned three largest cities of Sweden.

Original-Odhner with its round-the-world organization was naturally affected by repercussions from the economic world crisis of the early 1930's. Import and foreign exchange restrictions were felt more and more, all of which made export more difficult. For the purpose of economic rationalization it proved advisable to discontinue the foreign affiliated companies which, however, were replaced by general agencies. Through these, with which the mother firm normally has constant contact, the Odhner machines now reach all parts of the globe, and the Swedish calculating machine has become one of this country's most widely sold articles in the world (see map).

Foreign affiliated companies replaced by general agencies

A new product for sale followed in 1928 with the design of a recording adding machine, which was put on the market in 1931. This machine has since undergone various improvements and modernizations. The 1944 model of Odhner's adding machine has an additional number of improvement features which increase its performance and reduce the time of operation. Like all Odhner machines it is in every sense "a machine to count on".

Adding machine, a new product

The following list will give a survey of model numbers and the salient features of the models of multiplying machines which were on the production program at the end of 1944:

Models of multiplying machines on the production program at the end of 1944

Model 7. Standard machine without special equipment
„ 9. With tens-transmission in the quotient works
„ 10. For calculation with £. s. d.
„ 11. Large capacity and tens-transmission in the quotient works
„ 21. Large capacity
„ 22. Control register for number set
„ 23. Control register, tens-transmission in the quotient works, and single-hand zero setting

Chart of Original-Odhner's Export Organization, from 1941. The photo shows the export manager, Mr. Karl Siewert, Jr.

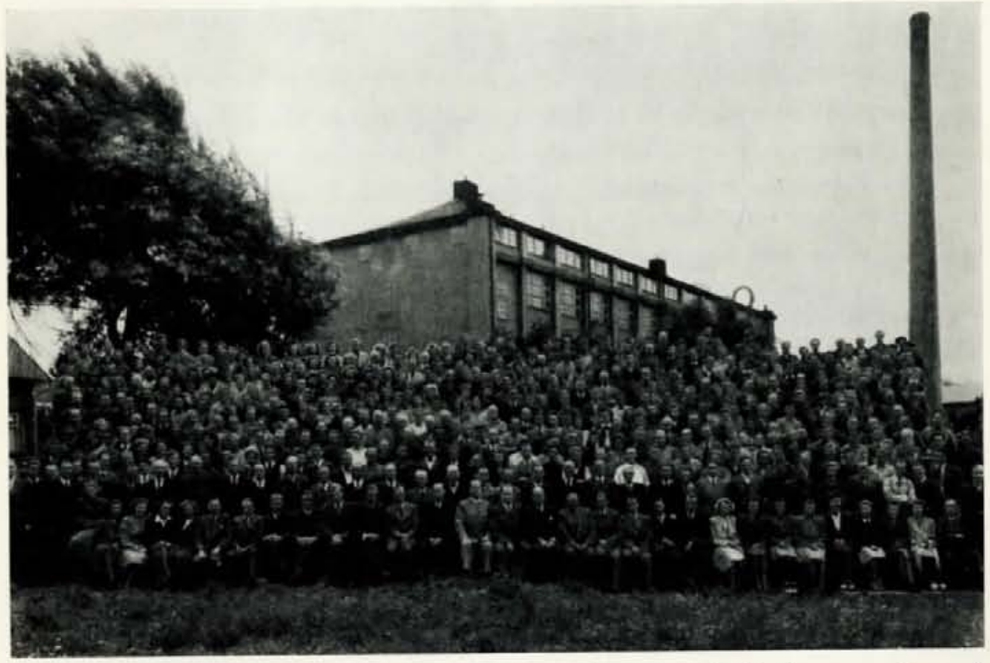
Model 25. Large capacity, control register, tens-transmission in the quotient works, and a device for re-transfer of numbers from the resultant works to the setting works
„ 27. With device for re-transfer
„ 29. Identical with model 27, but also equipped with tens-transmission in the quotient works
„ 30. With rapid zero setting
„ 35. Tandem machine with two setting works, two resultant works, and one quotient works, including tens-transmission
„ 37. Re-transfer device and control register
„ 39. Re-transfer device, control register, and tens-transmission in the quotient works

Adding machine models at the end of 1944

The corresponding list of Odhner adding machines contains the following models:

Model H-8-A. Hand-operated, 8-digit capacity, non-subtracting
„ H-9-S. Hand-operated, 9-digit capacity, subtracting
„ X-9-S-3. Electrically operated, 9-digit capacity subtracting
„ X-11-C-3. Electrically operated, capacity: 10 digits in setting, 11 in the results, subtracting and registering credit balance.

The main factory and, at the left, the office building erected in 1943.



The Gothenburg personnel of Original-Odhner outside the factory on August 4, 1944. The photo shows 418 persons.

AB Åtvidabergs Industriers acquires the majority of the stock

After the death of Director Hans Herlitz in 1942, the majority of the stock was acquired by AB Åtvidabergs Industrier. AB Original-Odhner now cooperates with the other factories of this office machine concern, especially in the technical field, a rationalization which by increasing the technical resources, has been of obvious advantage to the company.

Appointment of Directors Carle and Guthe

In connection with the acquisition by the Åtvidaberg concern of the majority of AB Original-Odhner's stock, one of the former sales managers of the company, Director Sixten Carle, was appointed local manager with Director Z. Guthe as assistant local manager.

The board of directors in 1945

The board at present is composed of the following members: Director Axel Adler, president of the board; Mr. Elof Ericsson, Mr. Gustaf Larsson, Mr. Rolf Dencker, and Mr. Albert Engvall.

New buildings etc.

A chronicle of a modern industrial firm is not complete without mention of the factory and its buildings, the more so in this case as AB Original-Odhner can point to a number of new buildings and equipment. In 1943 the entirely new office building was completed on a plot adjacent to the factory (see picture). This beautiful and practical office building, a two-storied brick house, contains modern office premises for all categories of clerks, engineers, and draughtsmen (see the pictures of the drawing office and the correspondence office). Another important new construction is the storehouse which was erected in 1943 in direct communication with the main factory building.

New office and buildings storage

The main factory

The main factory building with its five storeys in concret remains practically unchanged since its erection, but the disposal of the premises has been altered by successive stages in the light of experience gained. At present the premises are apportioned as follows:

Bottom floor: press, tool, and repair halls, and automatic lathe department. First floor: milling, lathe, and grinding departments. Second

Assembly department

Drawing office

Pressing department

Correspondence office

Tempering shop

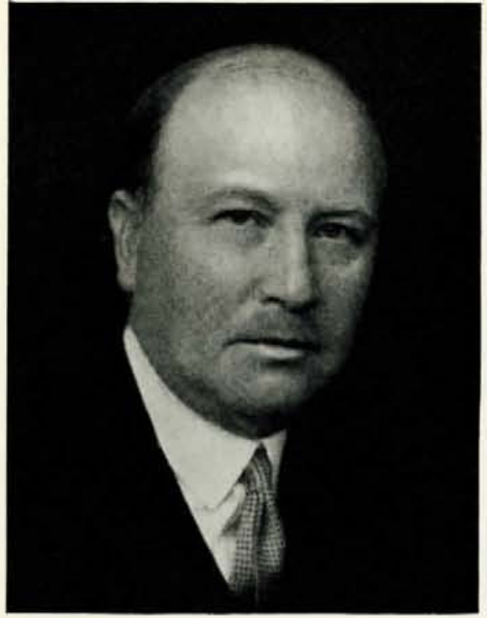
floor: bench works, special department for digit wheels and control of parts. Third floor: lacquering, nickel-plating, emery grinding, galvanizing, tempering, and sub-assembly of parts. Top floor: assembly and control, parts store.

Naturally any of these special departments might be worth a description in detail, but it would contain too many factory-technical particulars for the general reader. We are confident that the quality of any finished Original-Odhner machine, wherever it is found, will reveal that its passage from a chunk of raw material to the finished product has not been made at random. Its course from one department to another has been carefully planned in detail and just as carefully controlled, ending in what we may be permitted to call the "road of triumph" of Odhner products through the world. A considerable number of machines have thus carried the name of Original-Odhner all over the globe. In an interview with the management just before the printing of this chronicle it was estimated that the number of multiplying machines alone that have been exported was more than a quarter of a million. All over the world, in offices, banks, institutions of any kind, wherever there is a need for a calculating aid, you may find an Original-Odhner in action. This little handy machine is daily filling an important function in the economic life of the world. Its range of capacity may, of course, have been somewhat misused by those clerks of a certain South European bank who, unknown to the bank management, played roulette with the little multiplying machine. They gave the handle a violent twist to see what figures were registered when the rotation stopped. As ill luck would have it, Original-Odhner's omnipresent representative caught them in the midst of a game after the bank had made complaints that the machine frequently broke down in the daily work. Of course a stop was put to the roulette playing, and that was the end of complaints about the machine.

Associations within the firm

This may be the proper place to include a few words about associations and clubs within the firm which aim at fostering closer relationship among the personnel for common comfort and well-being. Without this the chronicle would be incomplete. Apart from the trade unions of the workers and their educational circles, etc., there are two associations of the office staff that should be brought up. One is Original-Odhner's "Tjänstemannaförening", formed as early as 1926, which has practically one hundred per cent membership among the clerks, engineers, etc., although membership is not obligatory. The aim of this association is to foster esprit de corps and good relationship among the office staff.

MEN OF PROMINENCE IN THE HISTORY OF ORIGINAL-ODHNER



Uno Forsberg

Axel Carlander

Assar Gabrielsson

Hans Herlitz

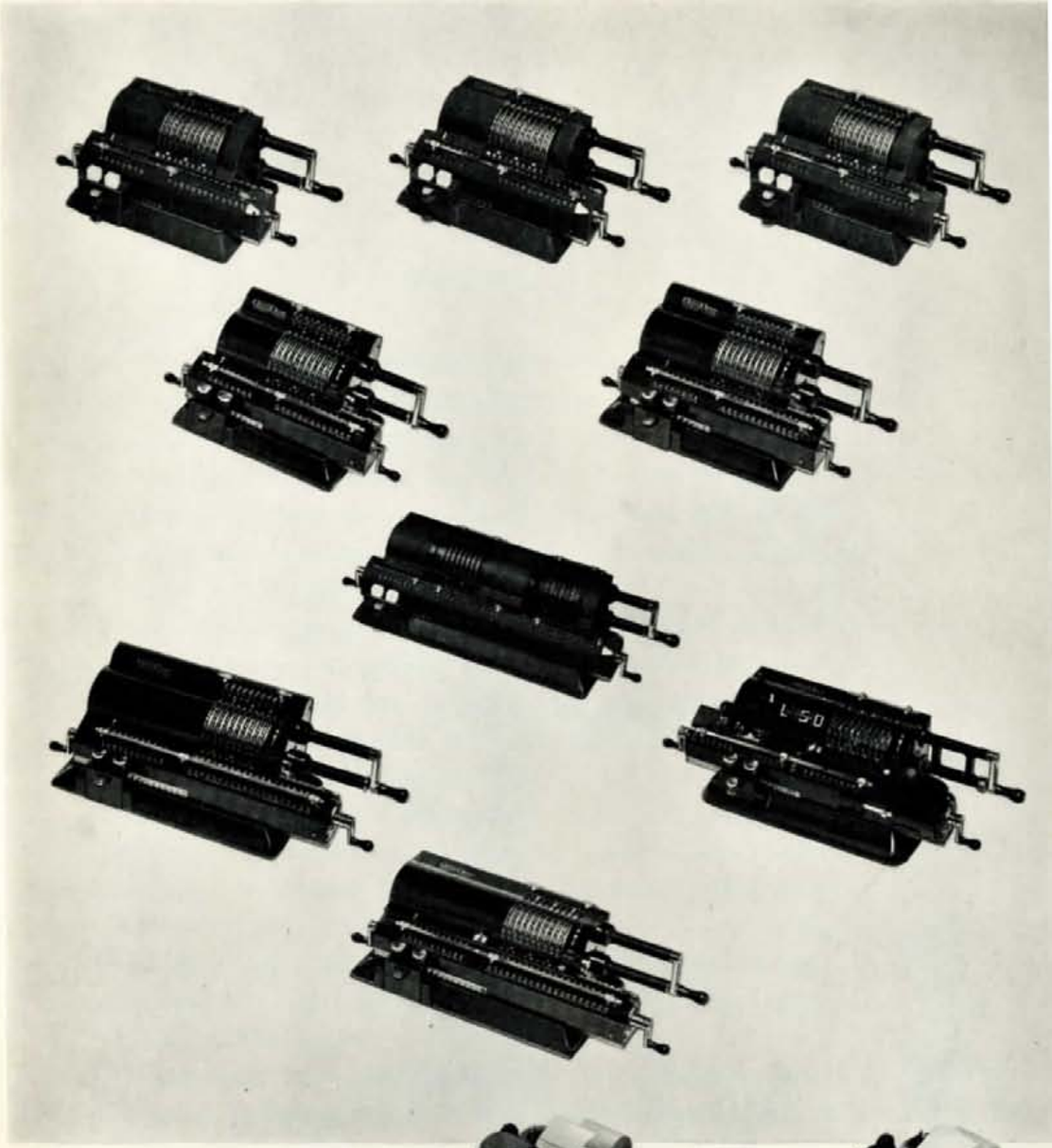
The second association has a name fit for an organization within a calculating machine firm, namely the Arithmos Club. It was formed in October, 1941, and is open to officers of the firm from the rank of chief of department up. As a rule meetings are held once a month, and common problems in conjunction with the work are discussed in good fellowship. Each meeting elects a chairman for the next meeting. Thus the chair is constantly rotating and stagnation is avoided, a thing which, in the wider sense, every firm seeks to avoid in its constant efforts to expand the market for its products.

THE PRESENT MANAGEMENT OF AKTIEBOLAGET ORIGINAL-ODHNER

Elof Ericsson

Sixten Carle

Z. Guthe



Original-Odhner at present makes fourteen different types of calculating machines, and five different types of adding machines.

CONCLUSION

The preceding chapters are intended as a review, at least in general outline, of the establishment and activities of Aktiebolaget Original-Odhner. Along with the development of the calculating machine and Mr. W. T. Odhner's functional solution of these problems the firm has been able to offer a modest contribution to the knowledge of a rather remarkable chapter of Swedish industrial history.

Thanks to the efficiency of the Odhner system, Sweden has taken a prominent position in the world calculating-machine industry. The last war naturally put great obstacles in the way of this industry and also made impossible the obtaining of comparative statistics. But if we go back to the last pre-war year, 1938, when reliable statistics were still published, we find Sweden taking second place in world exports, preceded only by the United States with its enormous office machine industry. Swedish exports slightly exceeded those of the highly industrialized Germany, and was considerably ahead of Switzerland, the fourth-ranking country exporting calculating machines to the world.

Somewhat like a mechanical brain, the calculating machine executes the most complicated mathematical operations. It is obvious that a machine with these features must be the result of a complicated and very difficult manufacturing process. Even the most simple model requires the assembly of thousands of small parts, based on infinitesimal tolerances, and on specially trained personnel, if the entirety is not to fail the

confidence which the designers, the manufacturer, and the customers have a right to demand. Nothing must be left to chance, nothing to negligence or inadequate control and skill.

Good traditions incur a duty to maintain a standard in industry as well as elsewhere. The preceding historical chronicle will have given the reader the assurance that Aktiebolaget Original-Odhner has these traditions. They will be maintained, so that an Odhner machine, in quality and practicality, will always be what it has been and is — *a machine to count on.*

ORIGINAL-ODHNER

Arithmos

SVERIGE

Odhner

BOOKS OF REFERENCE

Information about various types of calculating machine is given in the following publications:

D. BAXANDALL: *Calculating machines and instruments.* Catalogue of the collections in the Scientific Museum South Kensington. Mathematics I. London 1926.

K.-G. HAGSTROEM: *Sagan om de tio tecknen* (The Tale of the Ten Signs), Stockholm, 1931.

— *Talens vetenskap.* (The Science of Numbers), Kunskap, Universitet för alla, IV. Stockholm 1929.

K. LENZ: *Die Rechenmaschinen und das Maschinenrechnen.* Natur und Geisteswelt, Bd. 490. Leipzig — Berlin 1915.

S. LILLEY: *Machinery in Mathematics.* A historical survey of calculating machines. Discovery, Vol. VI: 5—6. London 1945.

W. LIND — R. BERGER: *Büromaschinen.* Lehrbücher der Feinwerktechnik, Bd. 5. Leipzig 1940.

E. LUNDGREN: *Några drag ur räknemaskinens historia* (Some data about the History of Calculating Machines). Kraft och Drift, Sept. 1935 and foll. Gothenburg.

ERNST MARTIN: *Die Rechenmaschinen und ihre Entwicklungsgeschichte,* Bd. 1. Pappenheim 1925.

R. MEHMKE: *Numerisches Rechnen.* Encyklopädie der mathemathischen Wissenschaften, Bd. 1:2 Leipzig 1900—04.

MERCEDES BÜROMASCHINEN-WERKE A.-G.: *Die verschiedenen Rechenmaschinen-Systeme.* Zella-Mehlis i. Thür. 1937.

AKTIEBOLAGET ORIGINAL-ODHNER: *Instruktionsbuch für die Verkäufer der Original-Odhner.* Gothenburg 1937.

— *Libro de instrucciones para les vendedores de la Original-Odhner.* Gothenburg 1938.

— *Livre d'instruction pour les vendeurs de l'Original-Odhner.* Gothenburg 1937.