The two larger models were also furnished with electric drive. The motor is located on the left side of the machine, while the plus and minus operating keys are at the right side of the keyboard. If the electric current should fail, which is known to happen, the hand crank may be slipped on and the machine may be operated manually. Machines for fractions and for English currency are also available.

Manufacturer: Monroe Calculating Machine Company of Orange, New Jersey. (The company took over the facilities and the equipment of the Pike Adding Machine Company in Orange.)

Tourtel (1911)

The Tourtel is a printing adding machine with setting levers just like the pinwheel machines. It is equipped only for English currency. The lever on the right side of the machine is marked F (farthings), followed by D (pence), 1 (shilling), and finally 10 (shillings). The remaining three levers are for pounds—the machine is thus capable of adding up to £999. The setting levers

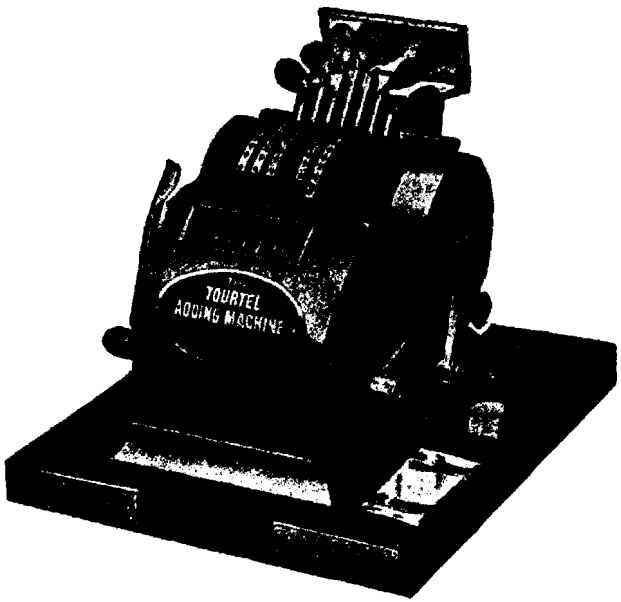

Figure 218

are, as usual, placed next to the setting slots, and the values are entered in the normal way. The result can be read from the wide window at the front of the machine, In order to print and add the value entered, the printing lever (on the left of the entry slots) must be pressed, which then forces the paper platen against the calculating gears. The crank on the right side of the machine must then be turned. This adds the value and brings the setting levers back to their rest position. On the front of the machine are two mirrors by which it is possible to check whether the correct value has been entered. To print the total, the lever next to the result window must be pressed and the zero setting crank on the left side of the machine must be turned—this causes the value in the result mechanism to be printed. To reset the machine to zero, the zero-setting crank must be turned without the total lever being pressed.

The weight of the machine is 5.5 kg. The designer is John Mesny Tourtel, London. and the manufacturer is The Tourtel Adding Machine Syndicate, Ltd.. 57 Chiswell Street, London E.C. In 1912, the German patent was tendered at £2000, although it was later sold by the designer for considerably less. Even in England the machine was not considered to be a significant one, and it has not been manufactured for some time.

Thales (1911)

The Thales is a well-established calculating machine with pinwheel gears (see the section in the introduction on pinwheel machines) that has been produced in four models.

Model A: nine places in the setting mechanism, thirteen in the result mechanism. eight in the revolution counter; weight: 4.5 kg.

Model B: nine places in the setting mechanism, eighteen in the result mechanism. ten in the revolution counter; weight: 5.5 kg.

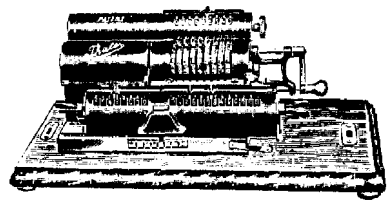

Figure 219

Model C: nine places in the setting mechanism, thirteen in the result mechanism, eight in the revolution counter. This model has tens-carry in the revolution counter and does not need any reversing lever; weight: 6 kg.

Model D: twelve places in the setting mechanisms, eighteen in the result mechanism, ten in the revolution counter. This model also has tens-carry in the revolution counter and does not require any reversing lever; weight: 9 kg.

The manufacturer is the Thaleswerk, Rechenmaschinen-Spezialfabrik G.m.b.H. in Rastatt (Baden), (formerly Landau in Pfalz). (See also Tasma.)

Hermes (1911)

The Hermes is similar to the stepped drum machines. However, the main feature of the former, namely the stepped drum, has been replaced by horizontally adjustable toothed rods. This means that the individual viewing windows are placed closer to one another, and values are therefore easier to read from them. The values are entered by means of the usual setting slides. A lever attached to the left of the machine can bring all of these back to the zero position in one movement. The change from addition-multiplication to subtraction-division is carried out by means of a lever.

The whole machine is cased in a metal box, which is suspended in a frame. A simple device allows the machine to be positioned at any desired angle.

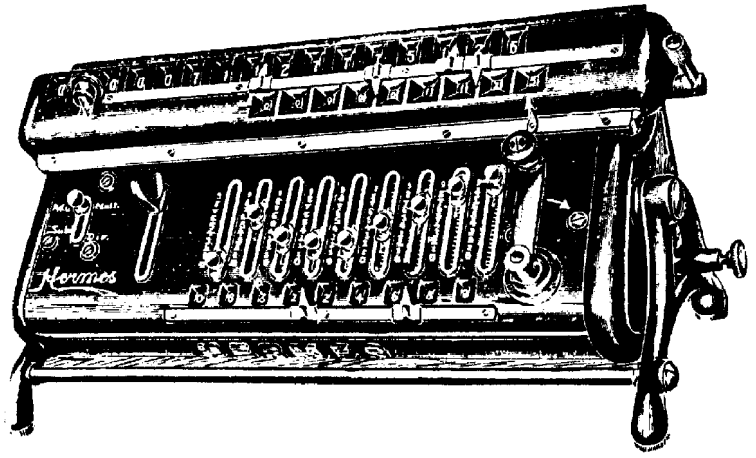

Figure 220

The machine is made with fifteen places in the result mechanism and nine places in the setting and revolution mechanisms. The entered values can be read off in a straight line from underneath the setting slots. There are also machines equipped with two calculating mechanisms, the second of which is placed underneath the setting slots. The manufacturer is Benno Knecht, Lüssow Strasse 105, Berlin W 35. Manufacture has ceased since the outbreak of the war.

Calculator (1911)

This pinwheel machine is manufactured by Joseph Kopfer und Sohne G.m.b.H. in Furtwangen (Baden) and is distributed without any special advertising. The locking device on the machine has been patented—it prevents the crank from being turned before it is in the correct position and also prevents the machine from being damaged by incorrect handling. There is also a locking device attached to the machine that makes it impossible for the crank to be turned back in the middle of a rotation—most errors result from this sort of incorrect handling. Production was stopped because it did not fall within the manufacturing scope of the factory involved. They had a shortage of precision mechanics and foremen. Furthermore, as far as their own specialty was concerned, the factory was already swamped with work, so that there was simply no space to extend production. The factory would also have come into difficulties with important clients at that time: namely, the calculating machine factories and clock factories (which also manufactured calculating machines) that they had, until then, supplied with their earlier specialties: cutting machines for gears, drives, worm gears, and racks.

In the autumn of 1912, the factory and a supply of complete machines and parts were offered for sale in London and Paris. At about the same time production of Calculator machines ceased. There is good reason to suppose that one of the large manufacturers of pinwheel machines purchased everything simply to get rid of new competition. The price of the machine was only 350 marks, and this was likely the main selling point.

Sirius (1912)

This machine was brought onto the market by Sirius-Werk, Wilhelm Keil in Nördlingen. It is shaped like a cash register with vertically positioned calculating gears. In place of the setting windows, the calculating gears have han-

dles with knobs by means of which data entry can be carried out manually. The machine had nine places and cost 150 marks, but it has now disappeared from the market.

Moon Hopkins (1912)

The Moon Hopkins is not a new machine. As early as September **1902** it was completely ready for production and was on display in St. Louis in October **nf** that year. In January 1903 its patent was pending in America, although the patent was not granted until 24 September 1912 (in Germany it was granted in 1907), so that production could not be started any earlier.

The designer was Hubert Hopkins in St. Louis, and the financier was James L. Dalton in Poplar Bluff, who later became the adding machine manufacturer. In 1903 Hopkins sold his share to the American Arithmometer Company (today the Burroughs Company), from whom Dalton bought it back and founded the Adding Typewriter Company. Out of this arose the Dalton Adding Machine Company. In 1903 (after he had sold his share to the American Arithmometer Company), Hopkins interested John C. Moon in the manufacture of the machine. The latter provided him with the money and later brought the machine onto the market. After this, there ensued a rather lengthy patent dispute between the new Moon-Hopkins Company, which manufactured the machine on a large scale, and the Dalton Company, which held the patent.

Figure **221** shows the design of the machine as it appeared on the American market in **1912.** The description of the machine and all other illustrations refer, however, to the original model. The difference between the two is quite insignificant and relates principally to the drive mechanism. Whereas in the earlier machine the drive was provided by means of a hand crank, like several calculating machines it later came to be electrically powered. The carriage return is also automatic in the later model.

As should already be clear from what has preceded, the Moon Hopkins machine consists of a typewriter connected to a calculating machine. Whereas the Ellis, already described, has a front typing action and thus has visible printing. together with a calculating keyboard with nine rows of keys, the earlier Moon Hopkins has typing action underneath as did the original Remington, and furthermore has only a calculating keyboard with two **rows** of keys.

Figures 222 to 225 give some idea of the interior of the machine. especially the calculating mechanism.

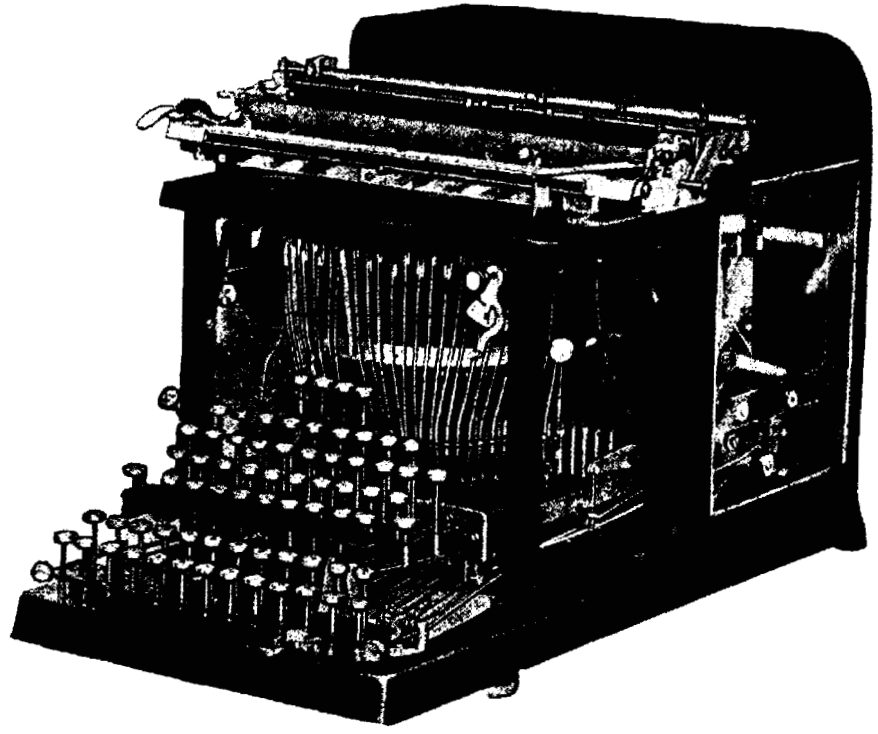

Figure 221

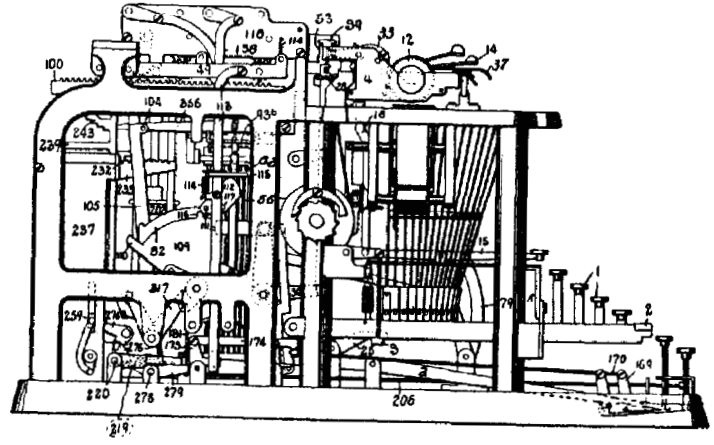

Figure 222

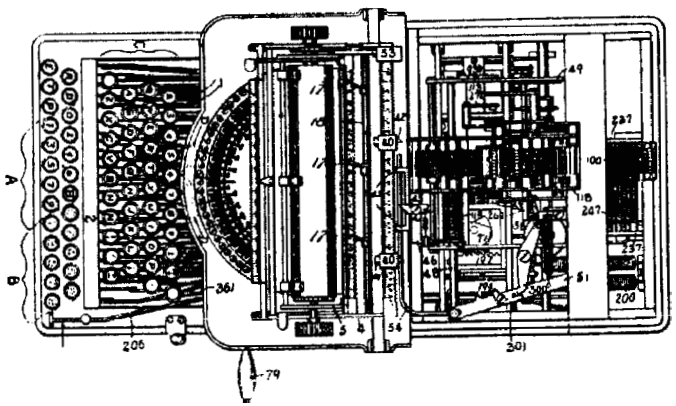

Figure 223

Apart from the letter, digit, and symbol keys, which are attached to a keyboard. the Moon Hopkins is equipped with two more rows of keys, including digit keys arranged into two groups. In addition to these digit keys, there are others, each of which is provided with a letter. By pressing these down, the adding mechanism of the machine is affected in different ways. The machine is designed *so* that, for example, figures can be printed in several adjacent columns and at the same time be registered in the sum gears **of** the adding mechanism, *so* that by pressing down the totalizer key, the **sum of** each column of figures is printed independently of the others at the foot of the column. The individual sums can be registered in other sums gears and can be combined into one total sum, which can then also be printed by pressing one **of** the letter keys. The figures registered in the sum gears and their sums can be retained in the sum gears by pressing one of the additional keys, even after printing has taken place, so that they can be printed at a later time.

As already mentioned, the typewriter resembles the Remington with its nonvisible typing action, although here the type levers are not attached in a circular fashion, but rather in a semicircle. That is, the machine does not print both upper and lowercase but only capital letters, a situation we have seen before in various other bookkeeping (or calculating typewriter) machines. The Moon Hopkins is **not** specially built for correspondence but rather for accounting. The lowercase letters are therefore totally dispensable. It has the universal keyboard with forty-one keys. The carriage runs on rollers. In order to read the typing, the carriage must be raised. It is pulled by the standard

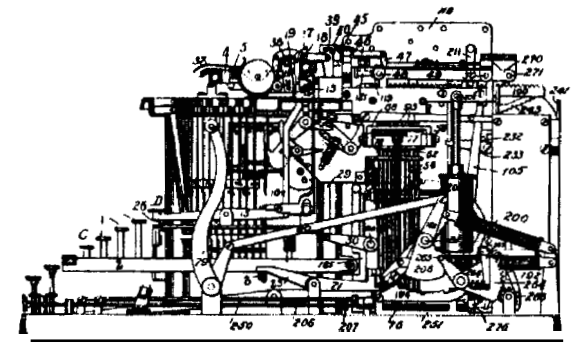

Figure 224

tension cord connected to a tension spring, while the release is handled by two small blades under the toothed rack. On the right side of the platen is the platen gear to which a cam lever is connected — this is used for setting the spacing **as** usual and at the same time for shifting the carriage to the right, back to the starting position. Next to it there is a lever connected to one of the disks in front **of** both blades. With the aid of this lever it **is** possible to remove the blades from the toothed rack, so that the carriage can be easily pulled against the tension spring as far as it is allowed to travel. Above the keyboard are four tab keys (marked ***D*** in figures **223** and **224)** that also operate both blades; that is, take them out of contact with the rack. The corresponding stops sit on a scale attached behind the platen. When the carriage is freed by one **of** the tab keys and is pulled to the left by means of the tension cord, the srop corresponding to this key halts the carriage at the place where the respective column should begin.

The calculating machine **is** built **on** the typewriter. It is protected from dust by a massive case made of metal with glass walls. On the right side there is a hand lever that moves the platen one line space.

It should be mentioned that the machine is equipped with three groups of sum gears, or totalizers. These are attached **to** a shaft that is free to be shifted across the machine frame. Each of these three groups **of sum** gears has ten such gears lying adjacent to one another. According to how it is set, either the left, middle, or right group is within range of the movable toothed racks (marked 100 in figures 223 and 224), on the front ends of which there are the type heads **of** the adding mechanism. The shaft is attached by means of connecting Iinks to the paper carriage of the machine. As with standard type-

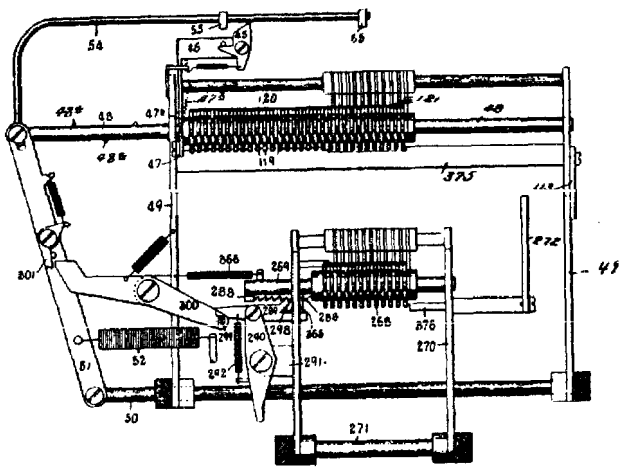

Figure 225
Partial view. calculating mechanism seen from behind

writers, this carriage is automatically shifted one space by pressing down a key and takes with it the above mentioned shaft. The connection between the paper carriage and the shaft bearing the sum gears can **also** be released. so that the sum gears do not shift simultaneously with the carriage.

Behind the three movable groups of sum gears is yet a fourth group. which at all times occupies a fixed position with respect to the toothed racks carrying the type heads and. together with these type heads. can be brought into gear with each of the front groups. When it is in gear. the number registered in the respective front group is also registered in the fourth back group. In the same way, the sum registered in each of the front groups can be registered in the fourth back group so that the sums that have been registered in the different front groups are all registered in the rearmost group, from which the total sum can then be printed.

Addition: Figures to be added are entered by means of the keys of the calculating machine keyboard (see group **A** on figure 223). These carry the figures into the first of the three front calculating mechanisms and, in this way, as many items **as** required can be added. The key T, in the lowest row of keys of the calculating machine keyboard, is used to print the result. Errors can be corrected by means of the correction key (206 in figure 223).

It **is** also possible to add up several parallel columns. With **two** such columns, the tabulator key is used to shift the carriage in such a way that the second calculating mechanism is brought into operation. The results are then recorded and printed in the way described above. In order to add columns together. keys *T* and *D* are pressed down and the hand lever **(79)** pulled forward; while the hand lever returns to starting position, the ***D*** key is held down. If the *T* key is held down, then the front sum gears remain in operation with their toothed racks, so that the total sum **is** recorded in the front sum gears. It is **also** possible to record the total sum in the back sum gears.

Horizontal addition is carried out in the same way as addition in columns. with the difference being that the tab keys are not used. The machine's spacing key is used to make the intervals between the numbers. The sum is printed in the same way as outlined above; namely, by pressing the *T* key and pulling the hand lever.

Multiplication: If the key marked ***R*** is pressed after keys from group **A** have been pressed down, the corresponding number is recorded **in** the front sum gears and at the same time is entered in the machine's multiplication device. If the number entered is to be multiplied by 9, then the key marked 9, in group B **of** the keyboard, must be pressed down. With two subsequent turns of the hand lever, (1) the back sum gears are connected to the toothed racks but not the front sums gears, as is normally the case, and (2) the printing of the number keys, which would otherwise result, fails to take place. The result then appears in the back calculating mechanism. In order to print the result, the *P* key is pressed down and the hand lever **(79)** is pulled toward the front. Through **this** action, the product is simultaneously recorded in the front sum gears, so that if more products are to be added. the total sum can be printed by pressing down the ***T*** key. If, in pressing down keys in group **A** and the ***R*** key, **a** figure is incorrectly recorded in the multiplication device, then it can be shifted back to its original position by pressing down the *P* key and pulling the hand lever. **If** the incorrect key in group B has been pressed down after a number has been recorded in the multiplication device, this error can be corrected by pressing down the so-called correction key.

This multiplication device, which has been mentioned several times, is nothing more than **a** multiplication table mechanism (see **also** Bollée, Millionaire).

If a number which has been recorded in the front sum gears is to be carried over into the multiplication device. then key ***E*** is used.

Addition in columns with multiplication:

123	x	12	1476
456	x	**54**	24624
789	×	35	27615
I368			53715

In this example, the number 123 is recorded and printed by pressing down the relevant keys in group A and by pulling the hand lever. However. before the hand lever is pulled, the R key is pressed down, which then records the number 123 in the multiplication device. As 123 is to be multiplied by 12, this number can be printed in line with 123 on the page by pressing down the respective keys in the machine's keyboard. But in order to retain the product of 123 x 12—namely, 1476—the following procedure must be carried out. To begin with, out of those keys in group B equipped with digits 0 to 9, the key marked 1 is pressed down and then the hand lever is pulled forward twice. The key in group B marked 2 is pressed down and the hand lever is again pulled twice more. This ensures that the product of 123 × 12 is recorded in the back sum gears. After the paper carriage has been shifted sideways, the product can be printed by pressing down the *P* key and pulling the hand lever. When the *P* key is pressed down, the product is recorded in those groups of front sum gears that at this point in time are situated opposite the toothed racks.

The paper carriage is then shifted to the right and, when the spacing has been set, the second number, 456, is recorded and printed in the manner already described. The multiplication of this number by **54** is carried out in the same way as the multiplication in the first row. When the number has been printed by the keys of the usual typing mechanism, both the key marked 5 and then the key marked **4** are pressed down and the hand lever is pulled twice. This records the product in the back sum gears.

After the paper carriage has been suitably positioned, the sum of the numbers can be printed in the first column by pressing down the T key and pulling the hand lever. In the same way, the sum of the products, which have all been recorded in the front sum gears, can be printed at the foot of the product column by pressing down the T key and pulling the hand lever (after prior setting of the paper carriage). If both sums are to be recorded in the front sum gears, the T key is held until the hand lever has returned to its original position.

Subtraction: The multiplication device will only store amounts and is therefore not a regular calculating machanism. It can also be used to store subtraction figures. Those sums from which subtractions are to be made are either transferred directly or by one of the three front calculating mechanisms into the back calculating mechanism. Then the subtraction key is pressed and, by pulling twice on the lever, the subtraction is carried out. The difference stays in the back calculating mechanism and can then be printed or carried over into one of the front calculating mechanisms.

The original Moon Hopkins, which is the machine that has been described so far, was manufactured by the Moon-Hopkins Billing Machine Company, 2235 O'Fallon St., St. Louis; however, they had to stop production. In 1923 it went over to the Burroughs Adding Machine Company, which only made machines with electric drive. Today they supply machines with one to five front calculating mechanisms and one back calculating mechanism. The machine is now equipped with a ribbon color change key *so* that, if necessary, it is possible to print amounts in red. There is also a special key available that sends the carnage back to the starting position and at the same time causes a line feed. The four column positioning keys can be found above the keyboard of the typewriter.

Price: Machine without multiplication device (therefore only for the addition of amounts without fractions with a front eight-place calculating mechanism ten-place result mechanism) and one nine-place back calculating mechanism (ten-place result mechanism), 25-cm-wide carriage with electric drive and motor, with automatic carriage return: $650.00.

The same machine, but with three front calculating mechanisms, subtraction, and multiplication device, 30-cm-wide carriage: $950.00.

Additional front calculating mechanisms: **$50.00** each.

These machines can also be supplied with fractions (eighths and tenths).

Sanders (1912)

Designer: Roberto Taeggi Piscielli in Naples. Manufacturer: Société Industrielle des Téléphones, of Paris. Sales agency: S. A. des Anciennes Etablisements Nico Sanders, 92 rue de Richelieu, Paris 2me.

Originally the machine bore the name L'Eclair. It has a remarkable pinwheel construction with electric drive.

On top are twelve long setting levers that may be moved in slots in the usual way; directly below are an equal number of checking windows (marked

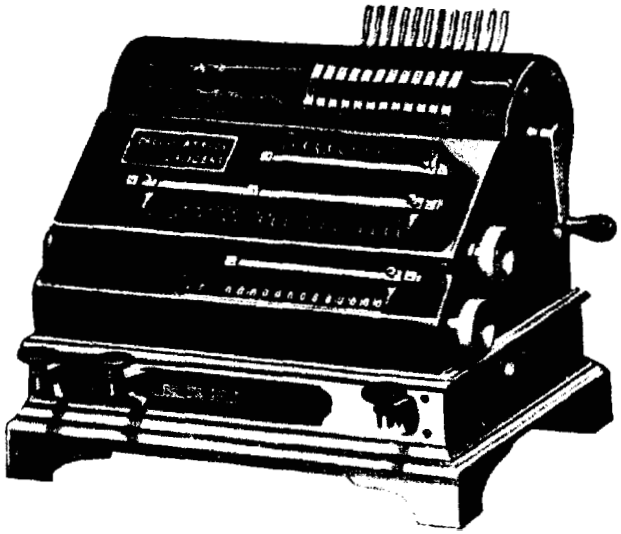

Figure 226

1 in figure 227) in which the entered value may be reexamined for accuracy. Below these is the result mechanism (2) with twelve windows, while to the left is a revolution counter (3) having seven decimal places. A little further down is an additionai result mechanism **(4)** having thirteen places, and to the left of this is a revolution counter (5) having two places. The switch for the electric current is on the right side of the base, and on the front are keys B. A, and C—the use of which will be explained.

Addition: The first item is entered in the usual way, it is checked for accuracy, and the lever **A** is shifted to position 1; it is then pressed, which connects the electric current, whereupon lever **A** is allowed to rise, the value having appeared in the windows of result mechanism 2. Further items may be added in the same manner.

Subtraction: The larger amount is entered and is transferred into result mechanism 2 in the same way as described under Addition, then the smaller item is entered, key B is pressed, key A is pressed into position 1, and the result is obtained from mechanism 2.

Multiplication: The multiplicand (e.g., 76) is entered by means of the setting levers, then, in order to multiply by 24, key A is pressed into the units

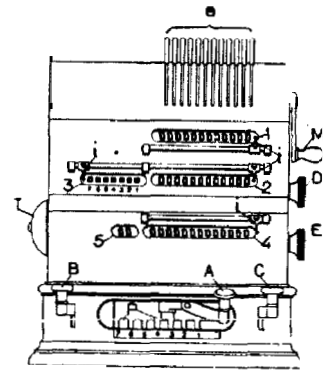

Figure 227

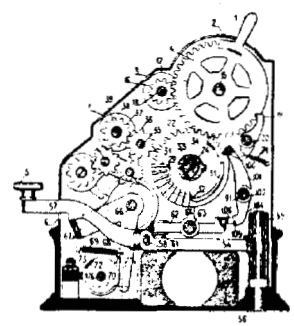

Figure 228

gap (1) until the electric motor has caused four revolutions; key A is then shifted into the tens gap (2) where it is left until the electric motor has caused two revolutions. The following values may then be read from the machine: the multiplicand from the checking windows (1), the multiplier from the revolution counter (3), and the result from the result mechanism (2).

Division: The dividend **is** entered in the result mechanism (2), and the divisor **is** then entered in the windows (1). Key B and key **A** are pressed in the appropriate positions until the signal bell (T) sounds, whereupon both keys are released. This operation is repeated with key A being pressed in each of the successive decimal places until the division is complete.

As previously explained, the machine is provided with a second result mechanism and a second revolution counter, the use of which is explained in

the introduction. Key C serves for transferring an item from the first to the second result mechanism. Crank M is used for clearing the checking windows, while drum buttons D and E are for clearing the first and second result and revolution counter mechanisms. The machine has no externally visible carriage; the pinwheels and revolution counter, which are mounted upon one shaft, one moved to different digit positions by lever A, which fits into seven gaps shown in the lower part of figure 227. The price of the machine was originally 1250 francs and later 1500 francs (prewar prices).

Wrenn (1912?)

lust like the Triumph, described earlier, this machine has continuous loops of chain acting as the setting device. These are pulled down from the number to be added as far as they will go and then held there to stop them from springing back. It is then possible to immediately read off the number entered from the viewing window of the corresponding position; this value will be added to the number already stored in this position. The numbers must be entered in columns, otherwise the eventual tens-carry will go astray. Subtraction is done with the aid of complementary digits. Even the individual calculating gears have complementary digits, which is a great advantage in subtraction. Multiplication is carried out according to either the multiplication table method or the counting method. It is hardly worth considering the machine as far as division is concerned. Returning the machine to the zero position is done by turning a crank.

The machine is available in two sizes: eight-place at $47.50 and five-place at $30.00.

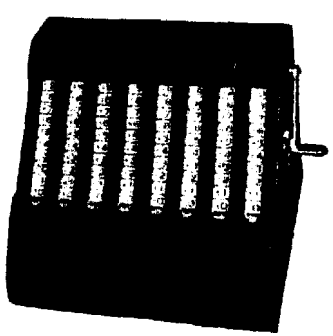

Figure 229

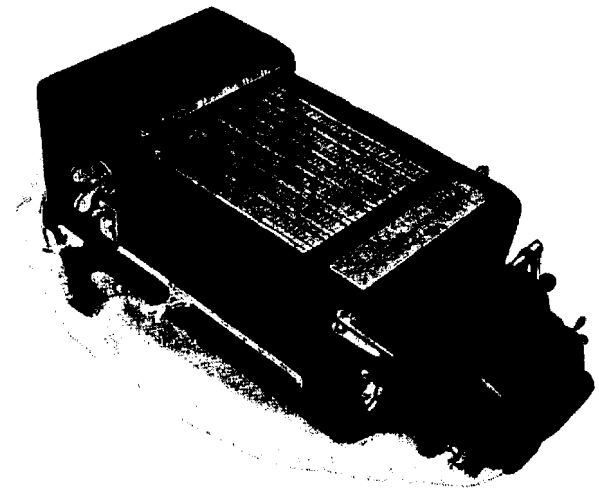

Figure 230

The dimensions of the machine are 20 × 25 cm and its weight is 5.5 kg. As yet, it has not been introduced into Europe. Manufacturer: Wrenn Adding Machine Company, 4th and Channing Streets NE, Washington.

Procento (1912)

The firm Procento, Ungarisohe Rechen-und Schreibmaschinenfabnk A-G in Kassa, used this name for both a stepped drum machine without any special features and a pinwheel machine as represented in figure 230. The latter was designed especially for calculating interest, but further details are unavailable. Today, the business carries the firm name Laplace Rechenmaschinenwerke und elektrische Uhrenfabrik, Inh. Victor Bernovits, Komenskeho ustav, Kosice, Czechoslovakia.

Austin (1912)

This is a nonprinting ten-key adding machine of the Austin Adding Machine Corporation, 927 Linden Avenue, Baltimore.

The amount entered can always be read from the lower adding mechanism; that is, it can be checked a second time before it is transferred into the larger calculating mechanism when the crank is pulled. There is a cancellation lever

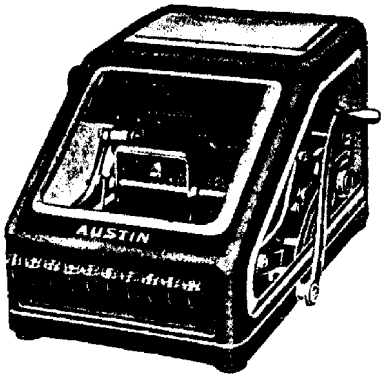

Figure 231

on the left side, as well as an item counter and correction key. The weight of this machine is 18 kg. It was offered for sale from Vienna at 600 marks, although the machine itself has never been of any great importance either in America or here. Production has now been discontinued.

Teetzmann (1912)

The Teetzmann machine is distinguished from other pinwheel machines largely by the fact that it has nine setting levers and control windows in front of the carriage. It is possible to operate the setting levers with the left hand only. while the right hand remains on the crank. Because of this arrangement, the interior mechanism is well protected from dust. The setting slide digits can easily be distinguished because they are kept in red and white sections. Digits of the result mechanism are red, while those of the revolution counter are white. The machine has fifteen places in the result mechanism and eight places in the revolution counter. The setting levers are brought into the zero position by pressing on the lever underneath the crank and moving the large knob next to the setting slots.

The machine is 20 cm long and 17 cm high. While there are only a few of these machines in Germany. a large number of them have been supplied from Manchester in England, and overseas. under the name of Colts Calculator. Manufacturer: Teetzmann and Company, G.m.b.H. Charlottenburg. Frauenhofer Strasse 18/19. In July 1915, this firm went into liquidation and the machine is no longer being manufactured.

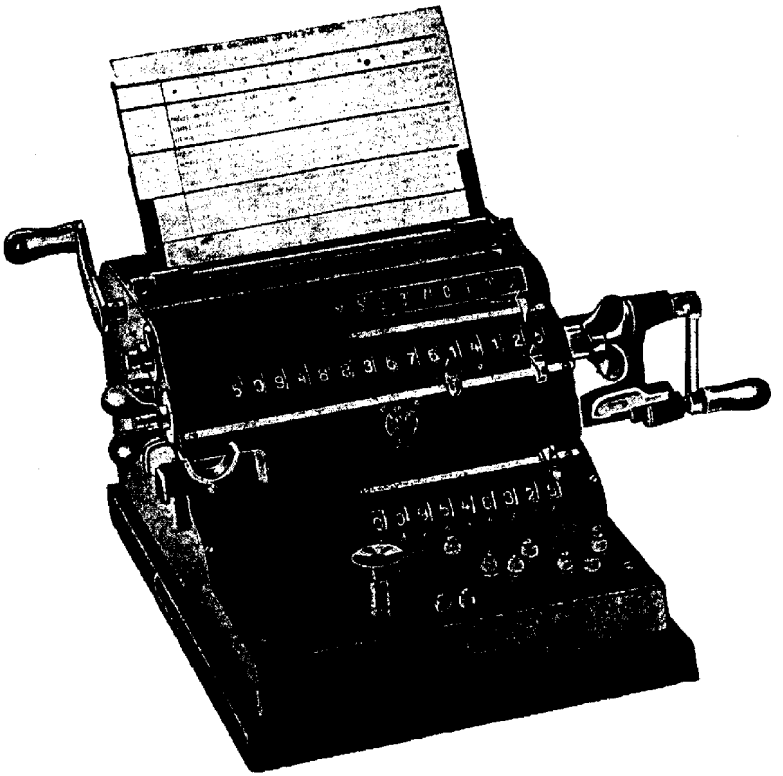

Figure 232

Burroughs Calculator (1912)

The Burroughs Calculator closely resembles the Comptometer described ea - lier. It is a calculating machine in which the keys directly operate the calculating mechanism, which is underneath the keyboard, so that neither crank nor electric drive is necessary. Several keys can be pressed at one time without causing the tens-carry to go astray, which is a real advantage in multiplication and division. It is impossible to press down several keys in the same column at one time; as soon as one key is pressed, all other keys of the same column are locked until the original key has come back up again. The machine is only available in seven-place or thirteen-place versions; both models have an extra place in the result mechanism. There are special models available for fractions and English currency.

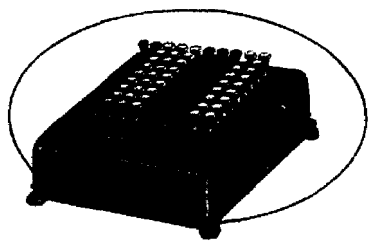

Figure 233

Price:

nine-place machine	$200.00
thirteen-place machine	$300.00

The machine does not need any more desk space than that required for a sheet of note paper. Manufacturer: Burroughs Adding Machine Company, Detroit.

Conto (1912)

Manufacturer: Carl Landolt, Thalwil near Zurich.

This is a cogged disk adding machine. On the cover plate are circular groups of digits placed very close together. In the middle of each circle is a rotating lever. or needle, which is moved by hand. Setting up a value is carried out by manually placing the needle on the digit to be entered for each position and clicking it into place. On the right, above the cover plate, is a thumb iever that must be operated after every setting. This causes the setting needles to spring back to their rest position while the result can be read from the viewing windows above the digit disks. There is a control available for every needle setting; by simply pressing it once, it brings all the viewing windows back to zero. Dimensions: 33 × 5 × 3.5 cm. Price: approximately 250 francs. This machine is available with six, eight, ten, or eleven places and for English currency with either nine or ten places. Apparently production has now ceased. Outside of Switzerland, the machine has never been well known.

Schooling (1912)

This is a special purpose machine for the calculation of net weights of railway cargo. especially coal, iron ore, etc. The gross weight is entered by shifting

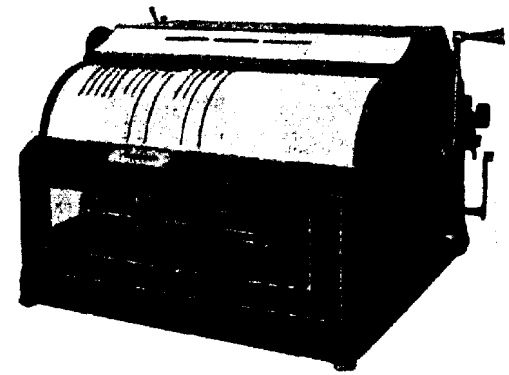

Figure 234

the setting levers in the setting slots. The tare weight is recorded in the same way beside it. Once the crank has been pulled and let loose again, the machine establishes the net weight, and the three weights are printed on a sheet of paper that is slipped into the machine from behind. It is also possible to add more weights in the same way, and in so doing the respective gross, tare, and net weights are added and printed. In order to print the total, the total lever is pressed and then the crank is pulled. The machine has only been made for English tons and hundredweights. There is also a version available for use in bookkeeping with English currency that both adds and prints debit and credit amounts as well as the balance. It is possible to add vertically and horizontally with this machine and, in fact, this can be done in three or more columns. Manufacturer: The Calculating Machine and Engineering Company Ltd., Welsbach House, 344/354 Grays Inn Rd., London WC. It seems, however, that the machine is no longer manufactured.

The Michel Baum Adding Machine (1913)

In appearance this machine resembles the Pebalia, but it is of a fundamentally new design and new patent. It was brought onto the market by Michel Baum, Hohenzollern Strasse **54,** Munich.

In this machine the setting digits are crowded together into semicircles, which results in the machine being considerably shorter. It is, in fact, the flattest (rulerlike) machine in existence with a height of only 1 cm. It is a seven-place machine and costs 75 marks. Each digit position has a calculating gear and control gear on top of each other. These are simultaneously held by

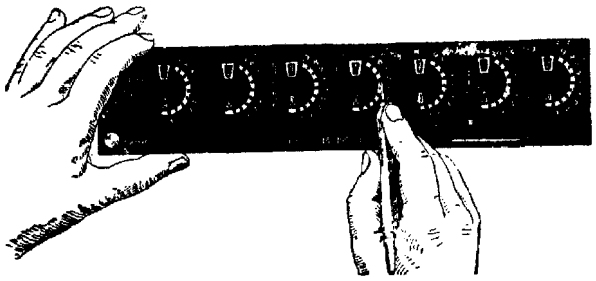

Figure 235

the calculating stylus, with which the machine is operated, and pulled down as far as they can go. Despite all this mechanism, it is only possible to see holes in the semicircular slots. During operation, the digits of the calculating gears show up as results in the upper viewing windows (these digits are on a red background), while the digits of the control gears show up in the lower viewing windows and are used to check the amount that has been entered. Both the result and control digits are visible at the same time.

Addition: The calculating stylus is inserted into the hole adjacent to the digit to be added, and the calculating and control gears are simultaneously pulled down as far as possible. For numbers of more than one decimal place, the other digits are entered, in the same way, in the semicircles to the left. When this operation is done, the amount entered is initially visible in both the upper and lower viewing windows. A quick glance at the control row is sufficient to check tor accuracy. It too little has been entered by mistake, it is possible to pull again on the relevant position, which will correct the result. If too much has been entered, it is possible to move back the corresponding calculating gear. This is a very practical means of correction in that it is not necessary to wait until entering the next number before taking into account the error that has been made. When the correct setting has been ensured, the knob on the left side of the cover plate must be pressed. This causes the control digits to automatically return to zero. If another item is then entered, the accumulated sum will appear in the upper viewing windows, while in the lower windows the last item entered is visible for checking. If the control item is not printed, then the addition automatically continues for the following settings, although the later items cannot be checked. It is therefore possible to calculate with or without checking, which is advantageous for those who

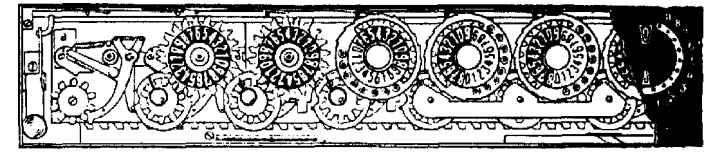

Figure 236

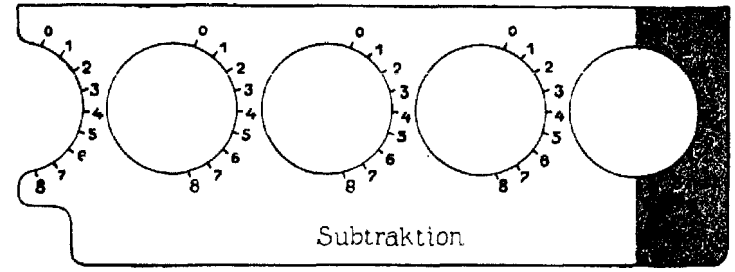

Figure 237

are experienced in the use of the machine. It is possible to add together as many items as required by repeating the process described.

Cancellation: In order to cancel the result, the setting stylus is inserted into the zero position slot situated on the right side of the machine and the slat visible there is pushed to the left until it stops. It must then be let loose and the action repeated a second time. Nothing but zeros should be visible in the upper viewing windows. As already mentioned, in order to cancel the control number, the knob must be pressed.

Subtraction: For this operation. it is necessary lo use a plate placed on the machine (see figure 237) that converts the addition digit disks to subtraction disks (these are arranged in the opposite order). The outermost position on the right has a red panel, and here the complementary digits are numbered from 1 to 9. For the other positions, however, the complementary digits are numbered from 0 to 9. Before subtracting there is. as a rule, already a number (the minuend) registered on the machine. The subtraction plate is placed on the machine in such a way that the red panel is put into the digit position where the subtraction begins. The number to be subtracted is then entered just as in addition, only beginning from the rightmost digit instead of the leftmost. All unused digits to the left of the number being entered are pulled down with

the stylus in the uppermost holes. The resutt of the subtraction can be read at the top.

Multiplication: Multiplication can be carried out in three ways.

1. It is possible to enter the digits of the ones, tens, etc. quickly in succession. in the course of which the tens-shift is dealt with immediately by the machine.
2. As with the cogged rack and chain machines, it is possible to multiply by both the counting or the multiplication table method, where it is not necessary to aiiow the gears to jump back; quite tie contrary—in tact, they turn continuously forward.
3. With the multiplication table method, it is possible to do the carryover in one's head, therefore making the entering of numbers much quicker.

Record (1913)

Designer: Hugo Cordt, of Nordenham. The first machines were sold under the name Tasten-Universal-Rechenmaschine,[73] and manufactured, at that time. by the Nordenhammer Rechenmaschinen A.G. in Oldenburg. The original machine is shown in figure 238. In 1914 the production was taken over by the Rechenmaschinen-Fabrik, H. Ohlmann & Company of Oldenburg, which then moved it, in the same year, to Berlin SO 16 Kopenicker Strasse 72. At present the sole manufacturer, and owner of the patents, is Karl Lindstrom. A. G. of Berlin SO 33 Schlesische Strasse 26.

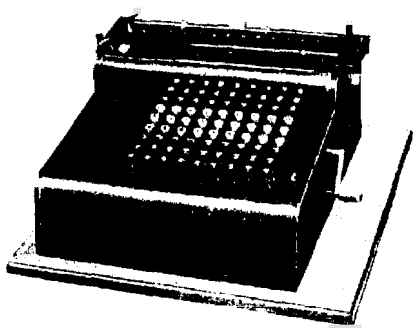

Figure 238

73. **Universal Key Calculating Machine**

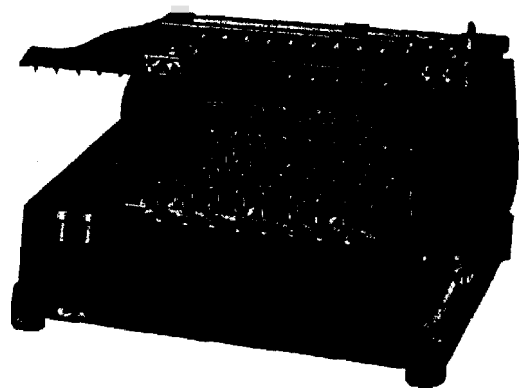

Figure 239
Current model,

The Record is a stepped drum machine, although this is not evident from the outside. In particular it is a stepped drum machine in which the drums are located in the back part of the machine, that is, in the carriage, where they arc positioned sloping slightly forward, arranged in a zigzaglike succession. This entirely novel arrangement permits using narrow upright digit wheels instead of the round counting disks employed in the older stepped drum machines, so that the individual windows of the two counting mechanisms and the setting check mechanism are positioned much closer together. Thus a disadvantage. if only a small one, of the older stepped drum machines is eliminated.

The crank is attached at an angle to the right side of the machine. It may be removed in order to prevent someone from playing around with the machine. Reversing from addition to subtraction occurs using a lever located on the left side of the carriage. which may be also used for raising the carriage to allow an ordinal shift. In more recent models ordinal shift of the carriage in both directions may be effected by means of two keys provided in front. The machine is available in two models for either manual or electric operation. The customary decimal point slides are provided; also the keyboard may be subdivided in any way to facilitate operation with large values. On the right side of the top surface is located a U-shaped slot in which a lever is mounted. This lever serves for clearing the values set up on the keyboard. When the lever is in the right slot, the keyboard is automatically cleared with every turn of the crank to allow for repeated addition of lists of numbers. For

multiplication and division, the lever is positioned in the left slot. The keys are self-correcting.

A new model for a printing calculating machine along the lines of the proven system just described, combined with a new patented arrangement suitable for all types of calculations that automatically prints individual totals as well as intermediate products and final totals, is already in production and will shortly appear on the market. A new model with electric drive is also already in production.

Argos (1913)

This is a small adding machine with chain setting. The manufacturer was Gesellschaft fur Präzionstechnik G.m.b.H, Aite Jakob Strasse 20, Berlin SW 68. It was sold principally in Germany and, to a lesser extent, in France.

The result mechanism is to be found above the setting control mechanism below the setting surface. Zeroing the setup mechanism is brought about by pressing the thumb on a lever protruding from underneath the machine. By pressing it down and sliding it, the setting control mechanism can be changed for subtraction and multiplication. Subtraction is possible with the aid of complementary digits, which are to be found in red on both side panels of the machine. In setting up the units place, the otherwise standard correction procedure is not needed because the digits on the right side panel have been

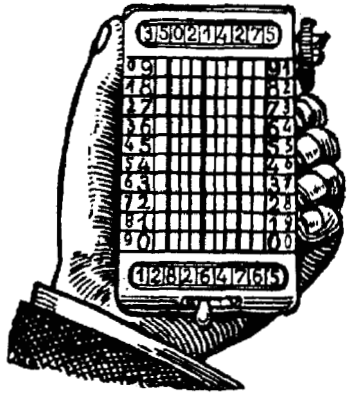

Figure 240

Figure 241

shifted one digit. On the other hand, the places that follow must always depend only on the remaining complementary digits.

Setting the result mechanism to zero: the small knob on the right side is pressed. and the wheel is turned until all the digit gears are on zero. The two rightmost columns show only red digits because it is clearer. The price is 125 marks. Production was started at the beginning of the war, but the firm no longer exists.

Klaczko (1913)

This is a small adding machine operated directly by hand without using a stylus. The result appears by simply setting the calculating digits, without turning a crank or carrying out any other operations. It is best to calculate with the index finger of the left hand so that the right hand is free to write, check. etc.

The most important thing about this machine is the fact that it can be operated totally mechanically. Each of the nine calculating rods has two groups of teeth: the subtracting teeth, located on the upper section, and the adding teeth on the lower section. There is a plus sign printed on the lower section and a minus sign on the upper section of the machine. On the right is attached

an adding disk and on the left a subtracting disk. The result windows are situated in the middle. This machine has no spiral springs, hinges, etc. It was an intentional design decision that the calculating rods were unable to operate the digit keys with or without a reversing gearbox, that there was no printing mechanism, nor is there a device for the carryover of tens. Somewhat later an improved model with tens-carny came out. Resetting to zero is done by a lever on the lower part of the machine. The decimal point slides are located on the upper section. On request, a small writing board can be attached above the decimal point slides. Multiplication is carried out with the aid of a table. The designer of this machine is Max Klaczko, Riga, 19 Scheunden St.

American (1913)

This machine was originally manufactured by the American Can Company in Chicago, which began production of the printing model on May 1, 1922. The nonprinting model is now distributed by the American Adding Company, 35 South Dearborn St., Chicago. This machine was introduced into all the most important European countries in 1914.

It differs from all other adding machines in its setting mechanism. It has neither key nor slide setting, but instead has stepped finger supports upon which are printed the digits. To add, the tip of the index finger is placed on the digit to be added and the thumb of the same hand lifts up the corresponding lever, which is right underneath, until it strikes the index finger. It is possible to check the accuracy of the setting after all the digits to be added have been entered. If one or more digits have been incorrectly entered, the correction crank on the right side of the machine is needed: this returns the

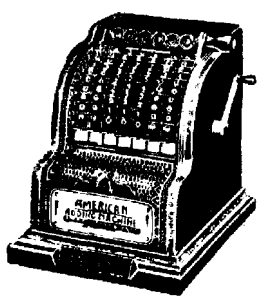

Figure 242

entire setting to the starting position without disturbing the result in the upper windows. The large lever next to the row of unit digits is used to transfer the entered value to the result mechanism; that is, to be added to the value that is already there. Another pull of this lever resets the entire calculating mechanism to zero. For subtraction and division, the small subtracting digits must be used.

After the value to be multiplied has been entered, the repeat lever on the left of the machine is pressed, then the larger lever next to the row of unit digits is pulled—as many times as the value of the number being multiplied. Before the last movement of the lever, the repeat lever must be raised. The number of movements of the lever is, at all times, shown through a small window on the front panel of the machine.

The dimensions of the machine are 19 x 23 x 24 cm and its weight is 7.8 kg.

Models:

0 nonprinting, 7 × 7 places, without repeat lever

00 nonprinting, 7 x 8 places, without repeat lever

1 printing, 7 x 8 places, release key, total and correction lever, double-colored ribbon with provision for 6-cm paper strips

3 the same as model 1

4 provision for 6-cm paper strips, double-colored ribbon, total and correction lever, visible printing (this model was also sold in combination with a till)

5 nonprinting, 7 × 8 places

Prices: Model 1, $88.00; model 4, $150.00; model 5, $39.00.

Federal (1913)

This machine came on the market in 1913, but at that time it was under the name White. Its designer was also the builder of the Wales machine of the time. The original manufacturer was the White Adding Machine Company in New Haven, Conn., but later the patent went to the Federal Adding Machine Company Inc., 33 East 21st Street, New York. They looked after the retail side themselves, but let the Colt's Patent Fire Arms Manufacturing Company in Hartford, Conn. manufacture the machine.

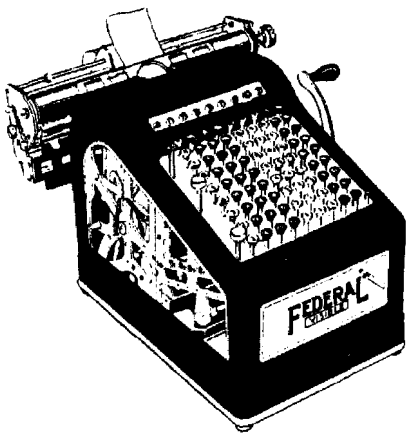

Figure 243

It is a full-keyboard adding and subtracting machine with self-correcting keys that are colored in groups. Subtraction and division are carried out with the aid of complementary digits, which are not, however, inscribed on the keys. Correcting, total. subtotal, nonaddition, and nonprinting keys are all found on the left and a repeat key is on the right of the keyboard. The subtotal key also serves as the correcting key. The machine is provided with a two-colored ribbon, and ribbon reversal is automatic. Totals, subtotals, and items not added are indicated by special symbols. Another symbol beside the first item printed indicates that the calculating mechanism was clear previously. Before it is turned, the crank lies parallel to the uppermost row of keys so that it has only a short way to travel. Returning the machine to the neutral state before printing the total is not necessary. The carriage accepts 33-cm-wide paper but must be shifted by hand—it is not automatic. The machine can be set for single and double spacing. It also adds across. On request, the machine can be equipped with electric drive: these models are produced with seven and nine places. The prices are $190.00 and $290.00 respectively.

Federal B (1913)

The designer was Fred. M. Carroll and the manufacturer was originally the White Adding Machine Company in New Haven, Conn., which distributed the machine under the name Commercial. It is now manufactured by Colt's

Figure 244

Patent Fire Arms Manufacturing Company in Hartford, Conn. and retailed by the Federal Adding Machine Company at 33 East 21st Street, New York. but up until now it has not had wide distribution.

The machine is used primarily for the preparation of statements of account, etc. The printing is immediately visible, and the machine prints in two colors so that the debit items can be written in black and the credit amounts in red. It is possible to see, through the large glass window on the front of the machine, the values that have been entered (before they are carried over into the result mechanism) as well as the total that is in the adding mechanism, the sign for whether the machine is set for addition or subtraction, and other possible specifications such as the date. Subtraction in this machine follows from pulling down a lever. The machine is not only equipped to print the date but also other designations such as debit, credit balance, etc. The total is printed after the total key has been pressed down. There is also a release lever and repeat key. The price is $300.00. If required, the machine can be supplied with electric drive.

Logarithmus (1914)

Logarithmus is a full-keyboard machine that, as compared to other similar machines, has the advantage that it multiplies directly and also prints the result. At this time the designer of the machine is unknown: in any case, it is not being manufactured. The following data has been taken from a preliminary description that appeared in *Bureau-fndustrie* in 1914. There it says:

The Logarithmus is not a multiplying adding machine but is a true multiplication machine that, however, adds as well as a true adding machine. The new machine has a full-keyboard so advantageously arranged that a depression of only 4 mm is all that is necessary to reliably operate the mechanism. In no other machine has it been possible to provide such a comparably short distance of descent, which has the particular advantage of enabling speedy operation. The machine possesses a double carriage and thus permits performance of additions and subtractions at the same time. The double carriage also offers an additional control as to whether the values were properly entered.

All result mechanisms, including the revolution counting mechanism, possess full capacity tens-carry. The printing of individual items is effected directly by the keys, whereas the final result is printed by the result mechanism of the carriage. The carriage shift is completely automatic. In designing the machine, care was taken to require a minimum number of different parts, but to employ those to the maximum possible extent in order to make the construction simple and advantageous for mass production. The machine combines the advantages of the best existing machines and has a number of novel features:

1. The machine has keyboard setting instead of lever setting.
2. The digits pressed are immediately visible.
3. Automatic clearance is provided for inaccurate settings
4. The double result mechanism enables simultaneous setting of two different columns of addition, simultaneous setting of two equal columns of addition, and simultaneous setting of two different operations.
5. The printing device enables printing of the individual values entered by the keys, printing of the total result from the result mechanism, i.e., without any need for again keying in the total result obtained, the setting and printing of any desired amounts without results. the setting and printing of the individual values and of the result, and the printing of the result without individual values.
6. The printing mechanism may be completely disconnected
7. The machine performs all four arithmetic operations directly without any different settings.
8. The machine may be used as a perfect adding machine. When the same values are being repeated, it is only necessary to operate the crank once for each item.
9. Simplified multiplication requires only the setting up of the two values to be multiplied, and then the machine produces the result by a single pull of the lever, where numerous turns of the crank were necessary on previous machines. The machine may also be provided with electric drive.

Lipsia (1914)

The Lipsia is a miniature calculating machine built according to the pinwheel machine system.

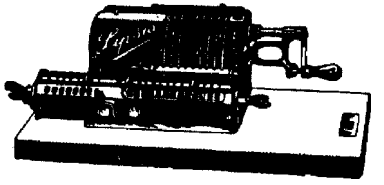

Figure 245
Machine without automatic carriage slide.

It is manufactured in six models:

Model 1: eight places in the revolution counter and thirteen places in the result mechanism; weight: approximately 3½ kg; external measurements: 33 x 15 × 14 cm; price: 500 marks

Model 2: ten places in the revolution counter and twenty places in the result mechanism; weight: approximately 5½ kg; external measurements: 40 x 20 × 15 cm; price: 920 marks

Model 3: corresponds to model 1, but has tens-carry in the revolution counter; weight: approximately 4% kg; external mesurements: 36 x 15 x 14 cm; price: 700 marks

Model 4: corresponds to model 2, but also has tens-carry in the revolution counter, and in the result mechanism the tens-carry goes through the 20th place; weight: 6%kg; external measurements: 45 × 20 x 15 cm; price: 1025 marks

Model 5: eight places in the revolution counter and seventeen places in the result mechanism; weight: approximately 4 kg; external measurements: 40 x 20 x 15 cm; price: 750 marks

Model 3D: has a double revolution counter with eight places and thirteen places in the result mechanism; weight: approximately 6 kg; external mea-

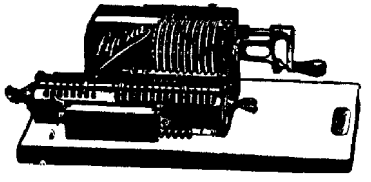

Figure 246
Machine with automatic carriage slide

surements: 45 × 20 x 15 cm; price: 800 marks; this machine has tens-carry in both revolution counters; by using the double revolution counter it saves each changeover in division.

All the models have a nine-place entry mechanism that, upon request, can be increased a few places in models 2, 4, and 5.

The carriage can be moved by manually operating a simple central lever lock or by means of an automatic lever attached to the front side of the machine that permits movement either one decimal place left or right at a time or else movement over all positions.

The numbers in the setup mechanism can be released automatically by a quick press on a locking bar together with a simultaneous half-turn of the crank.

The Lipsia is the product of thirty years of practical experience and theoretical knowledge in the building of calculating machines. It has been well established both in Germany and elsewhere since 1914 and has proved itself to be among the best.

Manufacturer: O. Holzapfel and Co. Leipzig, Dessauer Strasse 13.

Typewriter Calculating Attachment (1914)

This is an adding device that may be attached to several different makes of typewriter. Manufacturer: Typewriter Calculating Attachment Company, Bank of Commerce Building, St. Louis. Production has been under way for a long time.

The device consists of a square base, containing the adding mechanism, on which the typewriter is placed. There are nine noselike attachments sticking out from the surface of the machine. These are attached in such a way that, if necessary, they can be set in motion by the lever mechanism of the digit keys of the typewriter. The total can be read from the two calculating mechanisms at the front of the base. These are placed in front of, and underneath, the front edge of the frame. The addition device is activated by pressing a knob before any of the digit keys are pressed.

Phonix (1914)

This is an eight-place, nonprinting, full-keyboard adding machine. The values entered can be checked for accuracy in the windows under the keyboard be-

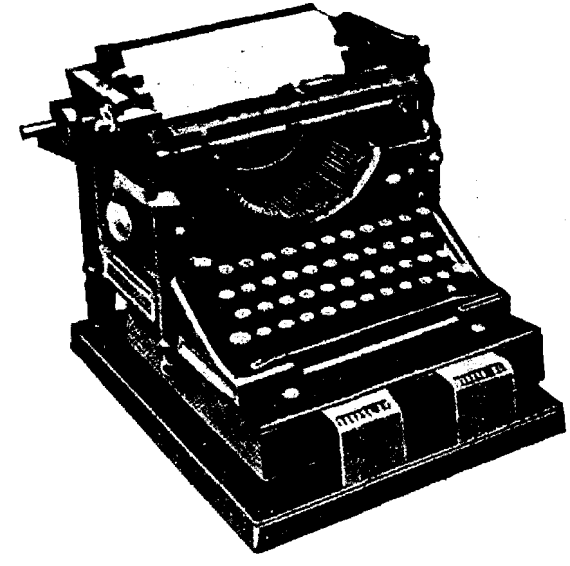

Figure 247

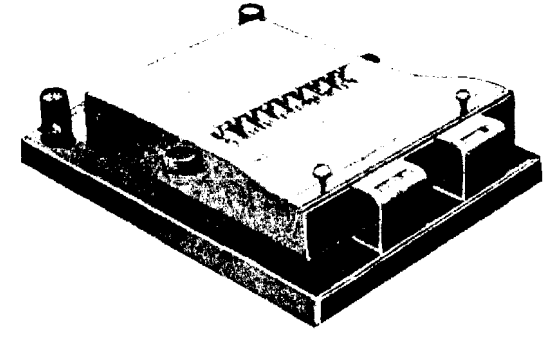

Figure 248

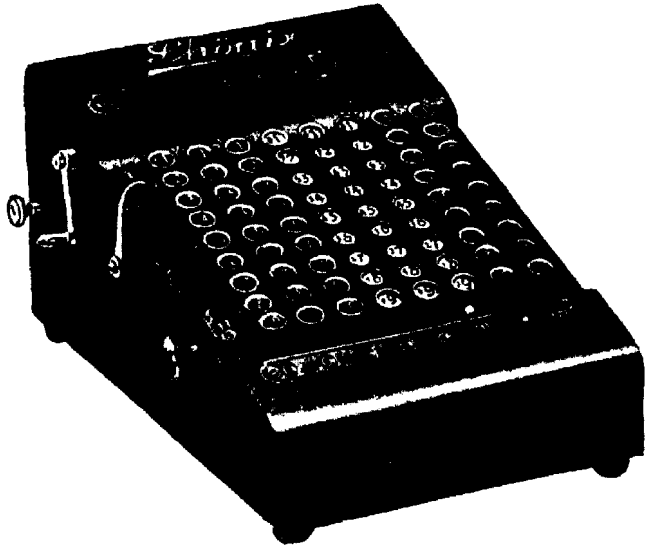

Figure 249

fore they are transferred into the result mechanism. If a correction is necessary, the knob on the left side of the machine is pulled out and the crank is turned once—the whole value is then cancelled. Subtraction and division are carried out with the aid of complementary digits. In order to save counting the number of turns of the crank during multiplication and division, the machine is equipped with a counter, on the left of the keyboard, that releases the pressed keys after the crank has been turned the required number of times. After this release the machine stops accumulating, even if the crank continues to be turned. Resetting the result mechanism to zero is carried out by one turn of the crank.

Manufacturer: Phonix Bureaumaschinenwerke, Robert Laupitz, Radebeul. This business is long defunct. Only a few samples of the machine have come onto the market.

Sundstrand (1914)

Designer: Oskar Sundstrand. Manufacturer: Sundstrand Adding Machine Company, Rockford, Ill.

This machine is a visible printing, ten-key adding machine and comes in

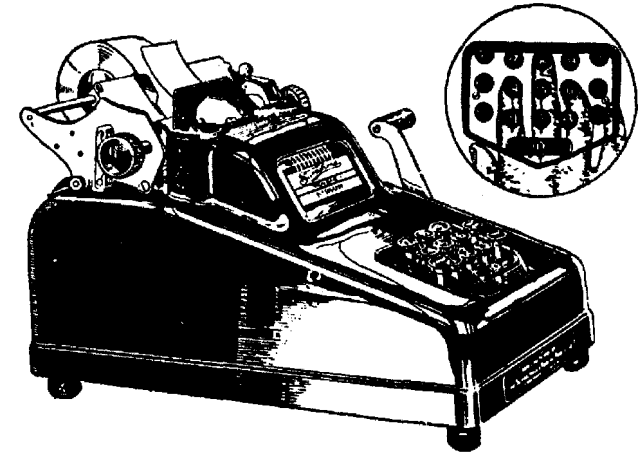

Figure 250

two principal models with either three or six auxiliary or supplementary keys. Models **A,** BS, and CS are equipped with three supplementary keys; namely, repeat, nonaddition, and total keys. Models B, C, and J have, in addition to these, three other keys; namely, nonprinting, error, and lock keys.

The subtotal is written in red by means of a dummy pull on the lever, while the end total is automatically indicated by a special sign. This same sign also serves as a check that the machine is set to zero at the beginning of a new calculation. If the lock key has been pressed down, then all other keys are stopped, so that the machine can no! be used by any unauthorized person. Nonaddition values are indicated by a black star. By pressing down the error key, or the backspace key, the last digit of a number already entered is cancelled. This removal is obvious because the position indicator jumps back one place. This device also serves as a correction key and is also used in multiplication from left to right and in division. Correction possibilities include the following:

1. To cancel an incorrect number that has already been entered, it is only necessary to gently pull on the lever and let it spring back again. This frees the machine,

2. If an incorrect number has been entered, and the lever has already been pulled forward, then it can still be canceled if the nonaddition and nonprint keys are pressed down before the lever springs back into place. If only the

nonaddition key is used, the number will be printed on the paper with a black star next to it, although it is not added.

3. In addition, a digit pressed incorrectly can be canceled from right to left with the aid of the error key. This is very advantageous if a larger number is to be corrected.

With the aid of the position indicator (situated above the keyboard), the operator can establish how many digits he has entered into the machine. As soon as he has pressed down a key, the corresponding indicator shifts one position to the right. If he has written a three-place number, for example, then the indicator points to the digit 3. The position indicator is also valuable in multiplication from left to right. If the error key is pressed to cancel one place, then the position indicator moves one place to the left. Pulling the lever immediately causes the indicator to spring back to zero. This is always the sign that no more of a number will be entered.

Addition: This is carried out in the usual way.

Subtraction (in the typical model): The minuend is entered in the usual way. If the machine in use has nine places, but the subtrahend is only five places, the procedure is that the key with the small zero is pressed four times, then the subtrahend is entered by using the small complementary digits. After this the crank may be turned and the result read.

Multiplication: The number to be multiplied is entered, and the repeat key is pressed. If the entered value is to be multiplied by 23, then the crank is pulled three times (units multiplication), then the zero key is pressed once and the crank pulled again twice (tens multiplication). During this time the repeat key must be canceled before the second turn of the crank. Then the crank is pulled once more and the multiplication is complete. This is multiplication from left to right. It is also possible to do multiplication from right to left.

Division (in the typical model): This is carried out by multiplication of the dividend by the reciprocal value of the divisor. A table of the decimal values of reciprocals is supplied.

Subtraction (in the subtraction model): This follows without the use of complementary digits. After the minuend has been entered, the subtraction key, which is attached in the place of the lock key, is pressed. The subtrahend is then entered and the crank is pulled. In the subtraction model the subtrahend is also printed and is indicated by a minus sign appearing next to the

number. In the typical model the subtrahend is not automatically printed but must be specially printed with the help of the nonaddition key if it is to appear at all on the paper.

Machines with fractions are supplied upon request. The usual keys are used if fractions are to be printed—for example, for ⅝; key 5, then the fraction key next to the keyboard, after which the crank is pulled. Fractions greater than ⅞ are automatically changed into whole numbers. In electrically driven machines with fractions, the fraction key is connected to the motor. To enter a fractional amount it is sufficient to simply press the relevant digit key followed by the fraction key.

Since 1924 the machine has been supplied with wide, automatic carriage return. This model is used in bookkeeping. It is possible to use it, for example, to write the balance forward, credit value, debit value and balance, prepare payrolls, etc. The printing device has been expanded to such an extent that it is possible to print the names of months or other specifications. Finally, the machine may be obtained with two calculating mechanisms. The automatic movement of the carriage places the two calculating mechanisms alternatively in connection with the keyboard and the printing device. The choice of the designated calculating mechanism is also controlled by a key attached at the right end of the keyboard.

The models presently manufactured are:

With three auxiliary keys:

A six-place, 12½-cm carriage

BS seven place, 12½-, 25-, 33-, and 45-cm carriage

CS nine place, 12½-, 25-, and 33-cm carriage

With six auxiliary keys:

B seven-place. 12½-, 25-, and 33-cm carriage

C nine-place, 12½-, 25-, and 33-cm carriage

J nine-places in the calculating mechanism, ten-places in the result mechanism, with 12½-, 25-, and 33-cm carriage

Price: from $100.00 to $315.00, motor drive with stand $100.00

Rema (1915)

The Rema has nine setting levers, thirteen places in the result mechanism, and eight places in the revolution counter. It is only produced to these speci-

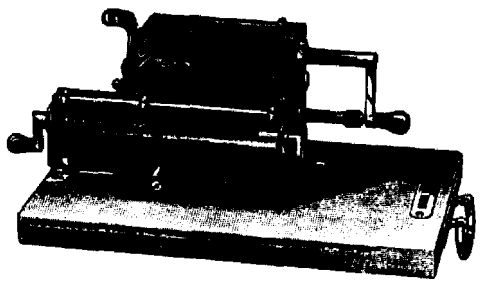

Figure 251

fications. The extraordinarily small size of this machine and its light weight (3.5 kg) allows it to be used on the smallest of writing desks. Its simple operation and safeguards, which rule out any calculating errors, make the Rema a first-class calculating machine.

Entering the numbers in the setting mechanism is done by means of a lever. The calculating mechanism is canceled by short turns of the crank. The Rema is equipped with a carriage return that automatically allows the carriage to glide from position to position or, if need be, over whatever width of the carriage is required. In the newer models of the Rema, the return of the setting levers to their zero position is carried out by a short pull of the left lever. This innovation, like many others, is protected by patent, The earliest model of the Rema had tens-carry in the revolution counter mechanism and was also equipped with windows in the setup mechanism. The firm also constructed a pinwheel machine with key setting; however, this was not produced on a large scale, and the manufacture of this model was soon halted.

Manufacturer: Braunschweiger Rechenmaschinen - Fabrik Rema, G.m.b.H., Braunschweig, Hoch Strasse 17/18.

Denominator (1915)

The Denominator is an adding machine for special uses. It is, in fact, simply a counting apparatus and, at least for the time being, it is produced only for American currency. It has eleven celluloid keys labelled 1, 3, 5, 10, 25, and 50 cents and 1, 2, 5, 10, and 20 dollars. Each of these keys operates a special calculating mechanism with three windows above the keys. The butterfly screw on the left side is used for setting all the windows to zero. The machine is primarily for setting up payrolls in calculating how many 1, 3, 5, 10, etc.

Figure 252

cent coins and 1, 2, 5, etc. dollar bills are needed so that the necessary change and bills are obtained from the bank. The machine does not add the amounts but functions only as an item counter. Each separate item must be specially pressed, and it is possible to press several keys down at the same time. The small machine is also supplied with special labels for keys, so that, with respect to restaurants for example, it is possible to establish automatically how many portions of soup, meat, or vegetables or how many selections from the menu were ordered from the kitchen. This is an effective control on the till that, over an evening. must show the equivalent of the items entered. For restaurants, an eleven-key machine scarcely suffices. In that situation it is necessary to purchase a number of machines and line them up beside one another.

The machine is made for the most part of steel. It sits on a felt pad, so as not to harm the finish of the desk. Price: **$45.00.** Dimensions: 8% x 25 cm. Manufacturer: Denominator Adding Machine Company, 315 Eighth Street, Brooklyn.

Commonwealth (1915)

Designer: Georg Browning. Manufacturer: Commonwealth Adding Machine Company, Muskegon, Mich.

This is a ten-key adding machine of special design. Each number entered appears in a calculating mechanism above the attached keys so that the entry can be checked. The result mechanism is above the control windows. The machine has seven places. Total printing and zero setting are both carried out in one operation — ne presses the total key and the zero setting lever is moved at the same time. All totals appear in red. Correction is carried out by pressing the correction key and shifting the correction lever. A nonprinting machine is also available. The keyboard shifts sideways whenever a key is pressed. Manufacture has been in progress for a long time, although the machine has not had wide distribution, even in America.

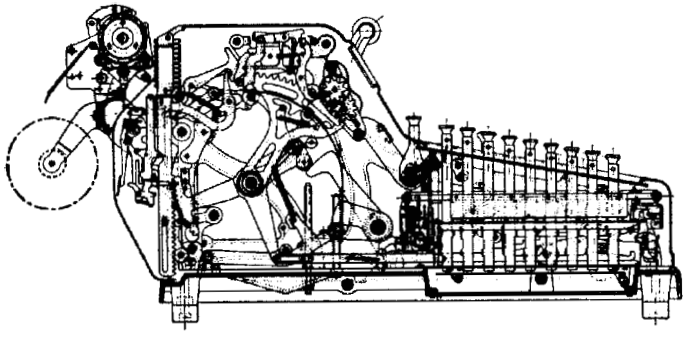

Figure 253
Cross section

Continental (1916)

This is a printing, full-keyboard, adding and subtracting machine produced by the Wanderer Werke, **A.G.** in Schonau b. Chemnitz.

The digit keys are in different colored groups and are self-correcting. The repeat key, nonaddition key, total, and subtotals lever are on the left; the correction, nonprinting, and switch lever for addition and subtraction is on the right side of the keyboard. The printing is fully visible at all times, as is the total calculating mechanism, which also indicates whether the machine is set on addition or subtraction. The machine works with a two-color ribbon, and ribbon reversal is carried out automatically. The machine has the facility for direct subtraction and therefore does not need any subtraction, or complementary, digits. The first item appears in red to show that the calculating mechanism was initially set to zero before the beginning of the calculation. If this is not the case, a zero setting must be generated by means of producing a total. With the exception of the first number, the items added appear in black without any sign after them. Items subtracted also appear in black, but with a minus sign after them. Subtotals (carryover totals) appear in red with the subtotal sign, and final totals are also in red and marked with an equal sign (=).

The carriage moves to the next column by pressing a tab key. It is equipped with a graduated paper locking bar with a disk that is used for setting up the tabs when working with the tabulator and for clear separation of the paper. **A** movable paper guide means that the paper can always be inserted at the same

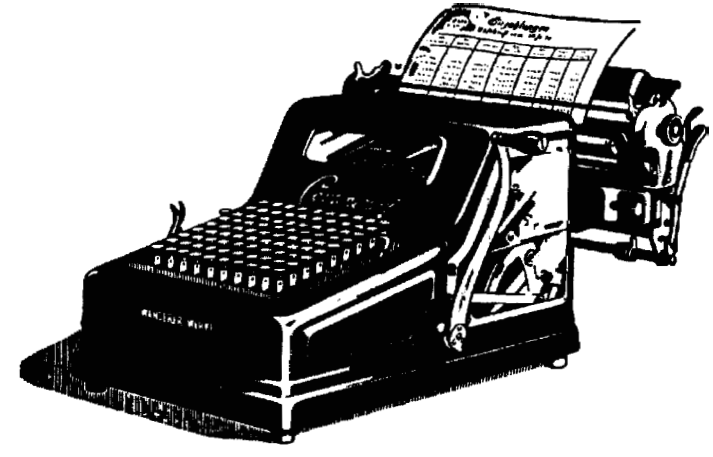

Figure 254
Manually operated machine.

place on the platen. There is a paper release lever behind the right platen knob. Setting the spacing at either *1* or 2 causes the machine to move the paper one or two lines respectively. By setting the spacing at *0*, the machine does not do a line feed and it is possible therefore to do cross additions. By turning the dividing knob (on the right side of the machine), the printing mechanism is divided so that it is possible to print numbers side by side in two columns. The carriage is stopped in fixed columns by the tabulator. There is an item counter on the left side of the carriage that causes a bell to ring after a certain number of items (decided on beforehand) have been printed and at the same time acts as the signal for the return of the paper **to** the first part of the computation.

The standard machine is equipped only for paper rolls. On request it is supplied with a carriage with a 38- or 60-cm-wide paper platen. It is constructed in such a way as to allow paper rolls of 4½- to 10-cm width to be installed, depending upon what the work requires. It is possible to guard against unauthorized use of the machine during a work break by removing the hand crank. Both models are equipped with electric drive if required.

As well as the ten-place machines, the Wanderer-Werke have also brought a fifteen-place adding and subtracting machine onto the market. In addition to the devices already described, it has individual correction keys for each row of figures, and an unrestricted possibility for dividing the carriage into a

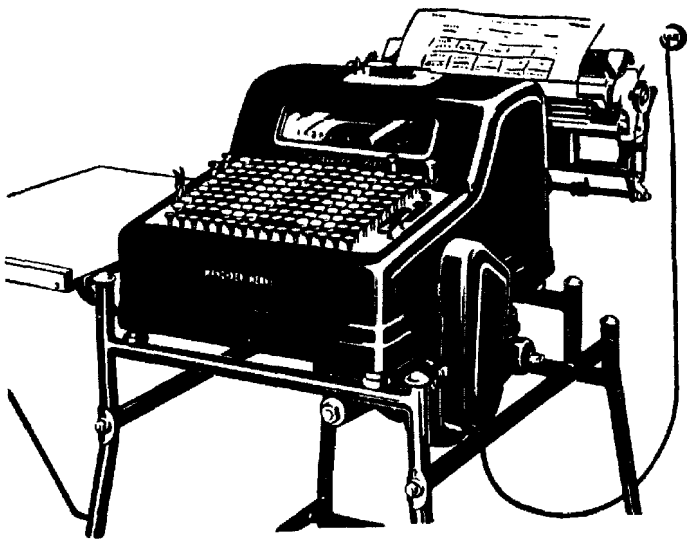

Figure 255
Machine with electric drive.

maximum of five columns. Moreover, if desired, the printing of totals can be switched off in particular columns. Designer: John E. Greve.[74]

Victor (1918)

Designer: O. D. Johantgen. Manufacturer: Victor Adding Machine Company, 3047 Carroll Avenue, Chicago. This is a full-keyboard adding machine. Originally it was supplied with only repeat and zeroing keys and was nonprinting but, at the beginning of 1921, it was replaced by a model equipped for printing. This came in two designs, one using narrow paper strips for printing and the second having a carriage for 30-cm-wide paper (although this carriage was not automatic). The machine was equipped with the usual typewriter keys; however, the model with a wide printing carriage, which appeared somewhat later, was provided with the improved celluloid keys.

Complementary digits were necessary for subtraction, although these do not figure on the keys of the newest models. To the left of the keyboard are

74. A correction, pasted in the back of the book, indicates that this sentence should read: "Designer of the first model John E. Greve, later models by the engineer Walter Hössler."

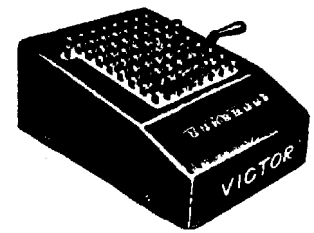

Figure 256

the nonaddition and combined total and subtotal key, and on the right is the repeat key. The calculating mechanism is under the keyboard. The printing is immediately visible, and the keys are self-correcting. The machine uses a two-color ribbon that reverses automatically. Totals, subtotals, and initial items are indicated by red signs. The calculating mechanism is reset to zero by printing the final value. The new model of the machine (which appeared on February 1, 1924), without the wide carriage, has separate total and subtotal keys as well as improved celluloid keys. An improved model with the wide carriage is also being prepared. From the very beginning the machine had eight places.

Price: early nonprinting model $85.00, current model without carriage $100.00, current model with carriage $125.00.

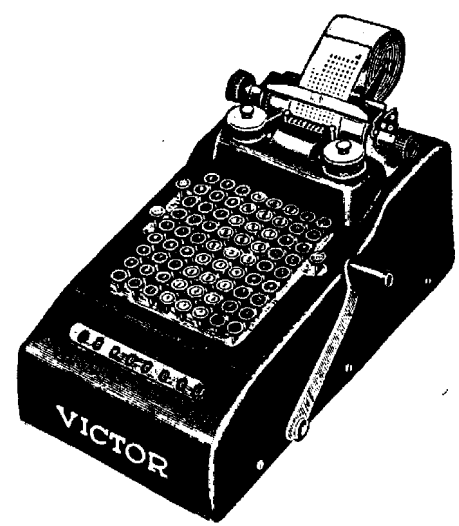

Figure 257

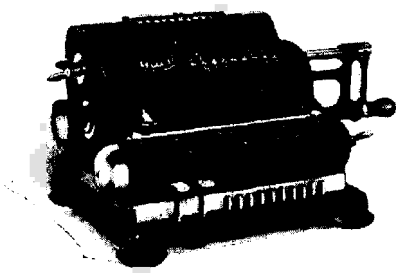

Figure 258

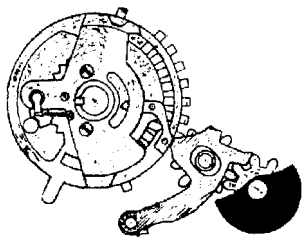

Figure 259

Facit (1918)

A pinwheel machine of the Aktiebolaget Facit in Atvidaberg, Sweden. The cross section, seen in figure 259, shows among other things how the designer eliminates overthrow of the gears without requiring the customary spring power. As is well known, the force of springs adds an extra load to the operation of the machine, so that parts normally subject to wear are worn out much faster.

A lever located to the left of the setting **slots** enables simultaneous return of all setting levers to their initial position. The result mechanism **is** located below the setting slots and the revolution counter is located above the setting slots. This arrangement permits the employment of a shorter carriage and of a greater number of decimal places in the counting mechanism. Both counting mechanisms may be smoothly set to zero by half a turn of the respective wing screws. The setting levers are relatively large and therefore are convenient to grasp. Ordinal displacement from one decimal place to the next is done by two keys; the button on the left **side** of the machine may be used **if** several decimal places are to be skipped. When the crank begins to turn, the setting

levers are locked and are kept in this condition until the crank has returned to its rest position. (As is well known, there are a number of products that do not have such locks at all, or in which the **lock** is released as soon as the crank approaches its home position, a situation that may cause erroneous results.) **If** the operator has commenced a wrong turn of the crank and wants to turn it in the opposite direction, a locking device will prevent such operation, provided the turn has advanced to a point where the accuracy of the result is in danger. When the crank is out of its rest position, the wing screws, the carriage, and the setting levers are locked. **If** the wing screws are not in their home position, the crank and the carriage cannot be moved. If the carriage is not in its proper position, the crank and wing screws are locked.

The machine has nine setting levers, ten decimal places in the revolution counter, and fifteen decimal places in the result mechanism.

The dimensions are 31½ × 18½ × 15½ cm, the weight is 7 kg, the price **is** 650 Swedish crowns.

Calculatrice Fournier-Mang (1919)

Designers: Louis Fournier and Gerald Mang. Manufacturers: same firm, at 19 rue Béranger in Paris.

This is a keyboard, stepped drum machine designed in such a way that a calculating operation is carried out by a single revolution of the crank, that is. wherein every one of the digits of a calculating factor requires only a single revolution. For instance, if the value 45,562 is to be multiplied by **7,** the result may be obtained by performing a single turn of the crank without any other preparatory or setting operations. This is a major difference compared to the other stepped drum machines in which the crank has to make seven revolutions or in which, prior to the turning of the crank, a device has to be brought into a position corresponding to the digit 7 (see, for example, the Peerless, 1904) whereupon a single revolution will suffice for the purpose.

The machine has eight decimal places in the setting mechanisms, fourteen decimal places in the result mechanism, and seven decimal places in the revolution counting mechanism. In order **to** reduce the exterior dimensions **of** the machine as much **as** possible, the keys are superimposed like fish scales. For instance, if the digit 3 is to be pressed in any one of **the** rows of keys, that key will also depress the 2 and 1 keys that lie underneath. This scalelike superimposition of the keys has previously been used in typewriters. The values entered appear below the keyboard in a straight line. The lever, marked

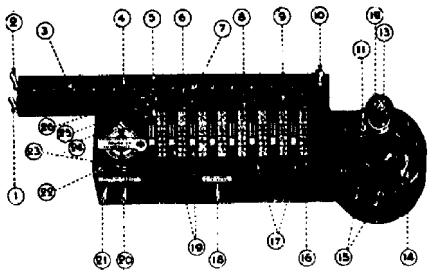

Figure 260

20 in figure 260, serves to adjust the carriage for automatic movement to the left or to the right; it also serves to completely eliminate movement of the carriage. Lever 21 sets the machine at plus or minus. An indication of the direction of the carriage travel and a plus or minus sign appear in small windows above these two levers. The result windows are provided with setting knobs. Zero-setting levers for the two counting mechanisms are located on the left end of the carriage. Lever 10 allows selective movement of the carriage, by hand, in either direction. Both rows of windows, as well as the keyboard, possess decimal point marker slides. Lever 18 clears a value entered in the keyboard.

The crank is mounted upon a drum attached to the right side of the machine. It is turned only once for every addition or subtraction and for every decimal place of the multiplier or divisor. During multiplication and division ordinal displacement of the carriage is produced automatically during operation of the crank.

The plate to which the crank is secured can be depressed into the drum. The edge of the drum exhibits the digits of the multipliers or divisors. Adjacent to each digit is a notch, which cannot be seen in our illustration. Just above the plate, the crank has a small arm, protruding beyond the edge of the drum, which is provided with a small traveling wheel at its end. When the crank is turned, this wheel travels along the edge of the drum. In stepped drum machines, the crank always has a certain distance of idle motion. Its actual operation commences only when the stepped drum has been turned far enough to reach the gear (of the setting or of the corresponding key) that it has to turn to effect the digit change in the window. The designers utilize this idle motion of the machine to compress a spring that is released as soon as the crank meets with a certain resistance and imparts its force to the rotating

crank, thus supporting the action of the crank and facilitating its manual operation.

Addition: If a value has been entered on the keyboard and is to be transferred to the result mechanism, lever 21 is set to plus. Lever 20 is set to make the carriage stand still. The crank with the traveling wheel is turned on the surface of the drum edge to the digit 1, and the wheel is allowed to drop into the notch located there, so that it will now travel within the drum, and the turn of the crank is completed. The total may be read from the result window. In this way any number of values may be added together.

Subtraction: This occurs in the same manner, the only difference being that after the larger item has been introduced into the result mechanism lever 21 is set to minus, the smaller item is entered in the keys, and the crank is rotated in the same manner as explained in connection with addition.

Multiplication: If a value in the result mechanism is to be multiplied by 63. lever 21 is set to plus, lever 20 is set for the appropriate direction of movement of the carriage, the crank is moved over notches 1 and 2, the traveling wheel is dropped into notch 3, and the turn of the crank is completed. Before the crank returns to its initial position, it automatically lifts the carriage and displaces it by one decimal place. The traveling wheel of the crank is then moved across notches 1 to 5, dropped into notch 6, and the turn is completed, whereupon multiplication is accomplished.

Division: This occurs in the same way except that, prior to the first subtraction, lever 21 is set to minus and lever 20 is set to the opposite direction for movement of the carriage.

Dimensions: 50 × 22 × 14 cm, weight: 11 kg.

The machine was given only a small distribution. At this moment production has been halted. Somewhat later, Fournier, together with the engineer Charpentier, designed the simplified Fournier Junior. It is not possible to predict, at this moment, whether this machine will ever appear on the market since Fournier died on 30 March 1925.

Adma (1919)

The Adma is a nonprinting, full-keyboard adding machine that developed from the Bordt (see the entry for 1908). Manufacturer: A.-G. fur feinmechanische lndustrie in Leipzig, Heerstr. 4.

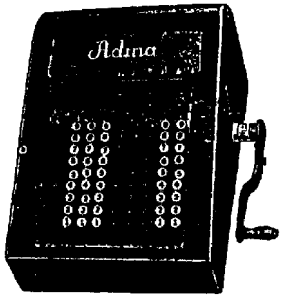

Figure 261

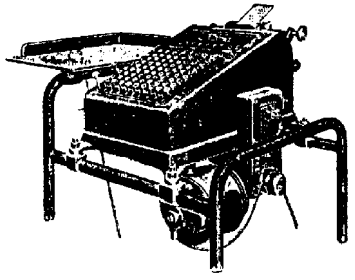

Figure 262

It has ten decimal places in both the result and the setting mechanism. The entered values may be checked for accuracy in the windows above the keyboard. The digits of the result mechanism are particularly large and distinct. Inaccurately set digit keys may be individually cleared by clearance keys located below the digit keys. If all depressed keys are to be cleared at once, the clearance key located to the left of the keyboard may be used. Transfer of the individual values into the result mechanism occurs by operation of a crank, which at the same time sets the digit wheels of the checking mechanism to zero and clears the keyboard. Resetting of the result mechanism to zero is done by a small crank located on the right side of the machine. Depression of a repeat key permits values that occur repeatedly in one addition to be totaled without need for entering the amount each time—the key is also very useful during multiplication. For smaller multiplications the Adma shows multiplier as well as multiplicand and product. Also subtractions and divisions may be carried out on the Adma with the aid of complementary digits.

Since 1921 the machine has been available with an electric motor (see figure 262).

Lehigh (1919)

The Lehigh. an imitation of the Triumphator, was first manufactured in Lehigh. It then was made in Newark from 1921 to 1923 but is no longer produced. In Europe the machine was imported from The Hague in Holland, but the number of machines sold was insignificant. The machine was manufactured in one model only with twelve decimal places in the setting mechanism, twenty decimal places in the result mechanism, and twelve decimal places in the revolution counting mechanism. Sales agency was the Lehigh Corporation, 25 West 43rd Street. New York.

Duco (1919)

In 1914 the Duco was ready to be put into production but, because of the war, it did not appear on the market until the autumn of 1919. Manufacturer is the Duco Adding Machine Company in St. Louis, Missouri. At the present time the machine is not being produced. It never was imported into Europe.

It has nine decimal places and, instead of setting levers or keys, it has indentations into which the fingers may conveniently be placed. The value to be entered is looked up, the finger is placed into the indentation, and the mechanism is pulled downward until it hits a stop. The set value may then be seen and checked in the checking window on the front panel of the machine. Corrections may readily be carried out by a reverse motion as long as the crank has not been moved, because that action transfers the amount set into the result mechanism. Printing of the result occurs by depression of the total key. Totals are printed in red ink. There is also a nonadd key. The weight of the machine is 17½ kg, the price is $150.00.

Addo (1920)

This is a miniature adding machine with rack setting. Manufacturer is A.B. Addo of Malmo. It is manufactured in three versions: model 2 is nonprinting, model 3 is for English currency and is nonprinting, and model 4 prints.

The amount set up may be checked for accuracy in the check mechanism