Proceedings of the 23rd International Meeting of collectors and researchers of slide rules and other historic mathematical instruments
Bonn, September 22–24, 2017

Overlooked Beauties

RST community project

Slide rule collectors are always looking out for a lost gem or the big find. Many of us follow eBay every day and ever hopeful often scour flea markets and go to car-boot sales. Why do we do this? Perhaps it is to find that item still missing from our collection. But we also want to find something previously never seen. And if we are honest, we are always just looking out for any big find! Maybe a Faber-Castell Mathema, a 20 inch slide rule or maybe an English gauging rule from the 18th century for next to nothing. But nowadays it is almost impossible to find such items at knockdown prices. Nevertheless we continue our searching and dreaming. Today I will find something exciting! Today will be my day! Will I go home with another copy of William Oughtred's 'Circles of Proportion'? Will I find Alexander von Humboldt's slide rule with his name written on it? But no such luck, once again our dreams are shattered. We return home empty-handed or with a slide rule only bought out of sympathy to a seller offering some former top-selling slide rules for schools. Or even worse, we return with an 'ugly duckling'. Not William Oughtred's model, but a cardboard or cheap plastic slide rule with just a few logarithmic scales needed by some craftsman or for the use with a simple machine. They are nothing special and ostensibly not worth collecting.

Karl Kleine (editor)
Calculating in Everyday Life
Norderstedt: Books on Demand (BoD), 2017, isbn 978-3-7448-1056-2

The following pages show many of these ugly ducklings and you will find out that most of them are overlooked beauties or 'swans'. Despite their limited use they have a clever and interesting layout of scales for a very special purpose. They form a collection of every day slide rules with a limited number of special scales but intuitive enough so that they could have been used by anyone. Each one has a use or function that most people would have found useful in going about their 'daily lives'. The choice of the examples shown is somewhat arbitrary – i.e. it is illustrative of its type/use and many others, made by other makers, may also exist.

Maybe after reading about them you will be surprised and agree that such ugly duckling slide rules are interesting and were perfect aids for calculating in everyday life.

PH

The RST community project for IM2017, an introduction by the editor

At the RST spring meeting in april 2017 in Bielefeld Peter Holland came up with the idea of a community project for this International Meeting in Bonn. Typically, the papers given at an IM are of highly technical nature, with a large part of them centered around some theme or motto set by the organizers. For 2017 Karl Kleine, the organizer of the meeting as well as the editor of the proceedings and author of these lines, had chosen *Calculating in Everyday Life* as theme as a contrast to the usual ones.

So here we have a colorful gallery of short presentations of slide rules for the proverbial 'man in the street', hobbyist, craftsman or technician, not the engineer, scientist or other professional. According to Peter's proposal, a number of RST members sent in a photo of the object and a brief description / explanation. Our goal was to provide a wide variety of subject areas where someone had seen the need or usefulness of a slide rule specific for that subject. By general agreement the project restricted itself to types of logarithmic slide rules, but we also have a few exceptions. If you peruse the following pages and come up with the thought "Oh, there's even a slide rule for that!", then we have hit our target.

For an editor, such a wide ranging and heterogeneous collection is a challenge, but in the end I found a couple of themes and subjects under which I was able to group a number of submissions. There are no clear cuts between these

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groups, and a couple of submissions are unique, not fitting any of them. So, enjoy the mixture and the sometimes odd arrangement!

Finally, the contributors. To keep the descriptions concise, but acknowledge each of them, there is a mark consisting of their boxed initials at the end of their contributions. In alphabetical order: DR David Rance, GK Günter Kugel, JP Jacques Perregaux, KK Karl Kleine, PH Peter Holland, WR Werner Rudowski.

The descriptions of the contributions are only mimimally edited, so there is a wide variation is length, detail and style. Short introductions to a group are by the editor and not marked. KK

Slide rule gallery

Health & medical issues

"Whatever your other problems are, your health shall come first! Period!" We shall follow the good advise and start our collection with slide rules for this subject.

The Body-Mass-Index (BMI) Calculator by AOK

A very common formula to check if one has the optimal weight is the BMI, defined as

$$BMI = \frac{Weight \in kg}{(Height\ of\ Body \in m)^2}$$

The value recommended by the World Health Organization (WHO) depends on the sex and the age. Health Insurances, interested in healthy members, donate cheap logarithmic calculating discs usually made of cardboard to their members. This one has a diameter of 100 mm and consists of two discs; the smaller inner one can be turned. It may have been produced approximately in the year 2000.

The disc shown in figure 1 was presented by AOK, one of the largest Health Insurances in Germany. AOK stands for **A**llgemeine **O**rts**K**rankenkasse (General Local Health Insurance). To find the BMI one has to place the body height in metres (green inner disc) opposite to the weight (Gewicht) in kg. The white arrow shows the BMI. When it is located in the green band one has the normal (optimal) weight, if in the yellow field one is *untergewichtig* (underweighted).

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Overweight persons are classified into three categories:

- pink: *übergewichtig* (overweight)
- red: *stark übergewichtig* (heavily overweight)
- dark red: *sehr stark übergewichtig* (seriously overweight)

WR

Figure 1: BMI calculator by AOK

BMI calculator by BERLIN-CHEMIE

Similar to the BMI Calculator by AOK the one distributed by BERLIN-CHEMIE (figure 2), a company for pharmacological products, allows a quick check of one's BMI. It is less accurate than the one by AOK. For the same values (75 kg and 1.8 m) the resulting BMI is 24 instead of 23.

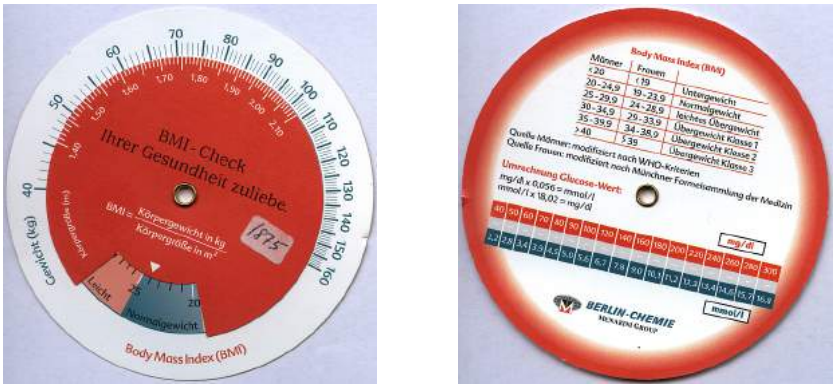

Figure 2: BMI calculator by BERLIN-CHEMIE

The normal weight here is given in blue, the underweight in light pink. The overweight, however, is divided into four categories:

- Leicht = little overweight (pink)
- Klasse 1 = class 1 (light red)
- Klasse 2 = class 2 (red)
- Klasse 3 = class 3 (dark red)

In a table on the back allowances for differences between men (Männer), women (Frauen) and for age are listed. WR

Slide rule disk for body surface

This litte disk (∅ 9 cm, figure 3) determines the approximate body surface of a person given its height and weight. One side for adults, the other for children. KK

Figure 3: Body surface calculator

Money

The old saying "Money doesn't make you a happy man, but it helps a lot." remains valid. Money plays a significant role in our lifes, so it's not surprising that there are slide rules for its handling in everydays life, next to professional ones for merchants and bankers.

Slide rules for particular goods or services, like petrol for our cars are handled in the subsections on these; here we handle general monetary transactions.

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Inglis Flash Bank Interest calculator

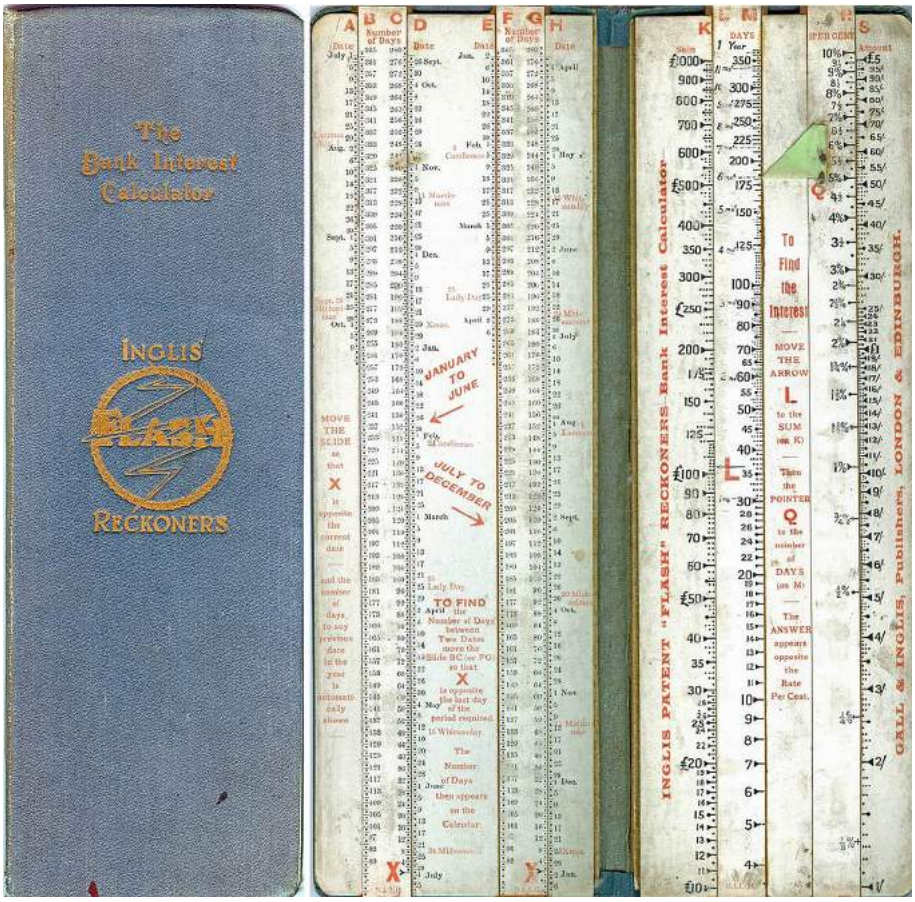

Figure 4: Inglis Flash Bank Interest Calculator

Harry Inglis was granted a patent (GB 191201533) for the design of his *Flash Bank Interest Calculator*, which was produced 1909–1924. He was part of the famous Scottish family printing and publishing business: Gall & Inglis. It was founded in 1810 and was known for its ready reckoners, atlases and maps. The business was sold in 1960. The Bank Interest Calculator (figure 4) was one of 12 Flash Reckoners and with it is possible to calculate the interest due on pre-decimal deposits from £10 to £1000. It can also be used to discount bills or find the number of days before a prepayment call.

The scales were printed on paper before being mounted on thin wooden

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strips/slides 24 cm long. The left-hand page is a folded date scale – January to June on the left and July to December on the right. However, there is no February 29th. So in a leap year it is necessary to add an extra day. The right-hand page is for calculating the interest for rates ranging from ⅛% to 10%.

DR

UNIQUE Monetary

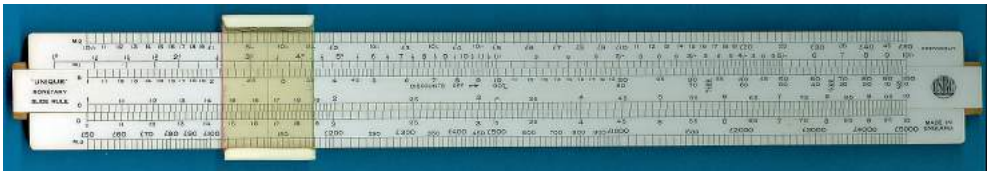

Figure 5: UNIQUE Monetary

UK maker UNIQUE is often dismissed as a maker of poor quality cheap slide rules. But like Lawrence, they also made many technical and highly innovative models such as the Monetary model. It uses the standard UNIQUE slide rule construction of wood coated with paper and laminated with plastic.

UNIQUE first recognised that British pre-decimal currency units (£sd) did not lend themselves to scales on a slide rule when developing their Commercial model C. The UNIQUE model M – Monetary (figure 5) is a stripped back (fewer scales) version of the Commercial, with a scale length of 10 inch. It concentrates solely on calculating in pre-decimal £sd and optional discounting, made 1946 until decimalization in 1971.

The C and D scales take no part in such calculations and are only included for regular multiplication/division calculations. Unusually the monetary scales (M1, M2 and M3) are three parts of a single folded scale (1d–£5000), folded at 10/- and £50.

DR

Slide Rule for Merchants — 'Rechenstab des Kaufmanns'

The Klawun 1001/T (125 mm scal length, figure 6) was the 'child' of the slide rule family No. 1001/ (among others No. 1001/S (250 mm) and 1001/U (500 mm)). It was made by Nestler 1930–1935 and branded by the distributor Klawun. But there were also some astonishing 'cousins' made obviously earlier by A.W. Faber-Castell: 322, 322N, 1/22/322 (250 mm) as well as 63/22 and 64/22 (125 mm). Those Faber-Castell slide rules had the impression as

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'CASTELL DISPONENT 322 für den Kaufmann' (for the merchant)! In 1934 Faber-Castell produced a lot of 322 with the congenial same scale pattern – impressed: 'System Klawun' on the front, respectively in the groove of the body 'Feinmeßinstitut KLAWUN BERLIN-CHARLOTTENBURG 322 A.W. FABER – Disponent –'.

Those merchant type slide rules were recommended as the "Universal-Rechenmittel für den praktischen Menschen" (Universal slide rule for the man in the street); thus not only for the merchant. GK

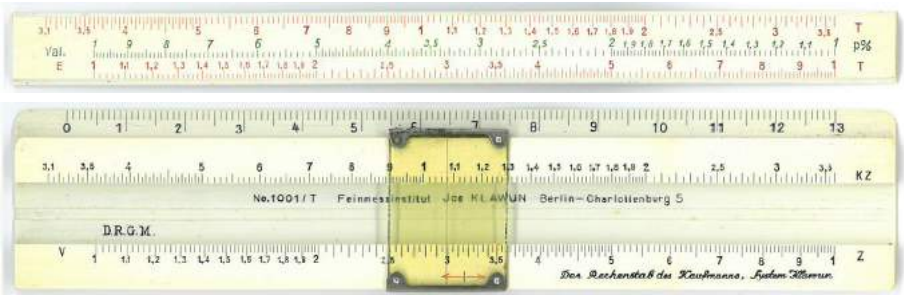

Figure 6: Klawun: Der Rechenstab des Kaufmanns

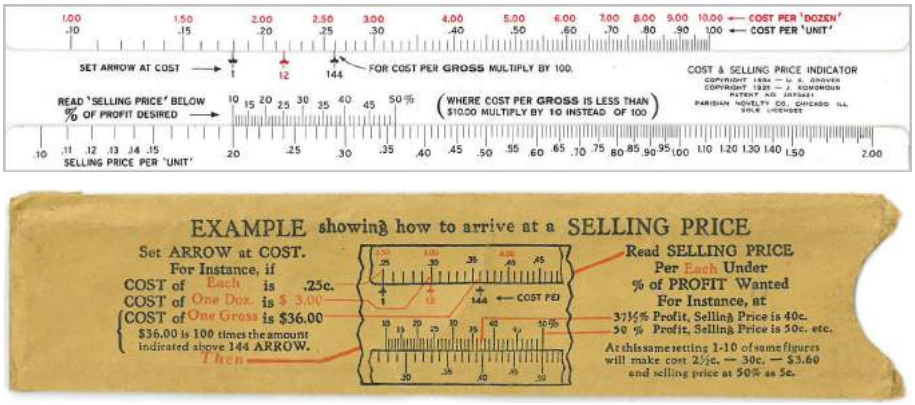

Figure 7: Cost and Selling Price Indicator, slide rule and sleeve

Cost and Selling Price Indicator

This slide rule (figure 7) made by *Parisian Novelty Co, Chicago, IL* around 1934/1935 is an outstanding example of minimized 'efforts' versus maximized 'success': Regard the 'flea-weight' plastic construction elements of the slide

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rule! Furthermore, a lot of instructions and hints for handling the slide rule are printed on the front and reverse side of the low priced paper sleeve. Thus case and instruction leaflet are combined! The large community of slide rule traders/sellers may take much profit.

GK

BRL Pound decimalization and profits / discounts calculator

The Blundell Harling M5368 is a dual function circular slide rule (∅ 14.6 cm, figure 8). On the one hand it is a percentage calculator, as others shown above, on the other hand it is a Sterling / Decimal Pound converter[1]. Instead of a folded scale like the UNIQUE Monetary on page 175 this circular slide rule

[1] *Decimal day*, the date of transition of the United Kingdom from Pound Sterling to a decimally divided Pound currency was February 15th, 1971.

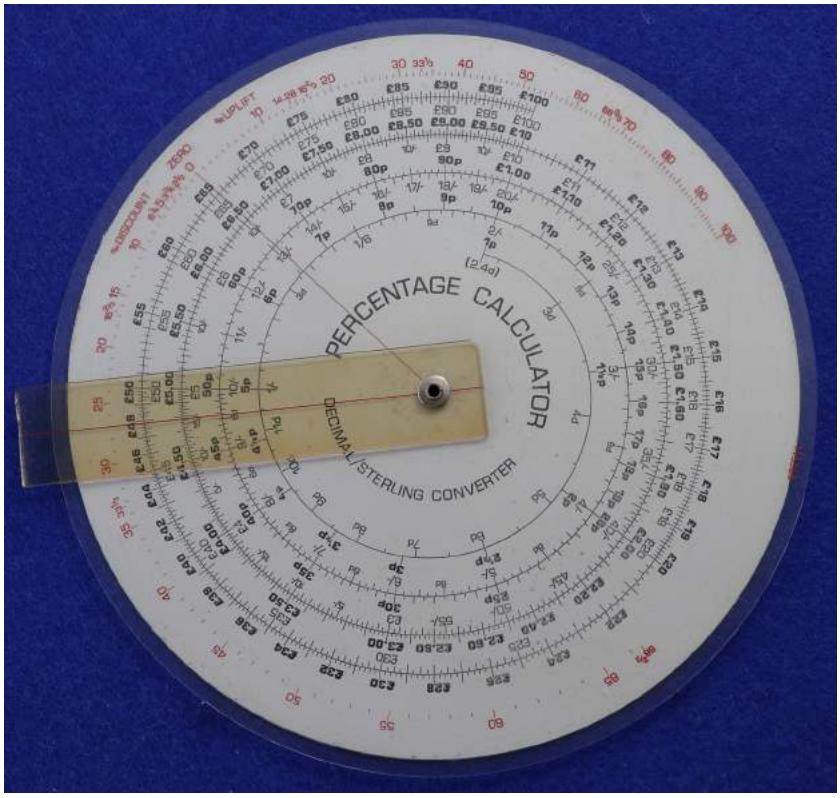

Figure 8: Blundell Harling M5368 Percentage Calculator

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uses a spiral with four windings, for the range from 2½d / ≈ 1p to £100. This spiral carries dual scales, the inner in Pound Sterling, the outer in Decimal Pounds; the outer scale is furthermore labelled in bold type. An interesting construction for a dual purpose slide rule. KK

Euro Calculator

The Euro currency exchange rates with old legacy currencies were determined by the Council of the European Union on December 31st, 1998. Next day, on January 1st, 1999, was the introduction of the €uro for non-physical monetary transactions like electronic transfers, banking, traveller's cheques, etc. replacing the legacy currencies of the participating countries. Cash transactions with the new €uro notes and coins started on January 1st, 2002.

Figure 9: Euro Calculator in credit card format

The front side of the Euro Calculator (figure 9) helps to convert discontinued old European currencies to €uro and vice versa. The reverse side helps to convert €uro and DM to international currencies and vice versa. The credit card sized Euro Calculator was made by IWA, Denkendorf.

It is not known if this Euro Calculator was a free give away or had to be bought, but everyone I know used some kind of exchange rate aid in the first days, weeks, or months after January 1st, 2002. It was a good idea to produce the Euro Calculator as a circular slide rule in credit card format and not as a linear one, because it fits in wallets and is almost self-explaining. PH

Food & Beverages

After health and money, let's address another top subject of many conversions: food and beverages. No doubt, there is need for computation.

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Discounts, VAT and uplifts for the food shopper

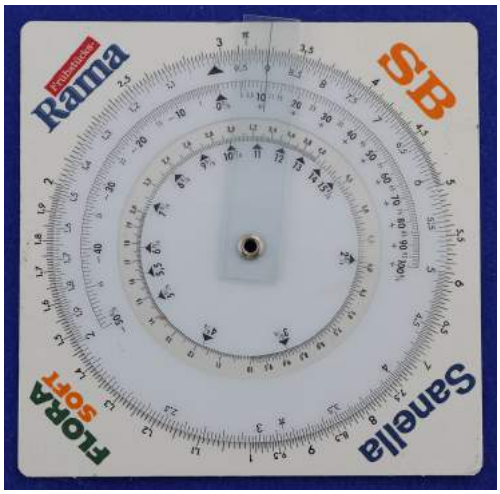

Figure 10: food shopper's %-calculator

This circular slide rules made by IWA and distributed as promotional item could have been listed equally well in the previous money section. But the four brand names are German margarine brands as well as the text on the reverse side point to the target group, food shopping house wifes. The VAT rate of 11% in an example on the reverse side dates the slide rule to 1968 to 1977. The female role model in West-Germany after WWII and up in the 1970s was still largely being a house wife and mother, with the husband earning the family income. Part of this marriage and family model was her control of the 'Haushaltsgeld', the family budget for the day to day living expenses. KK

UNIQUE Caterers & Confectioners

With this *Caterers and Confectioners Rule* and its copyrighted design it is possible to calculate from the cost of the raw materials (10/- to £50) and the chosen number of portions (10–1000) the unit selling price at which any dish needs to be sold to give the sought after profit margin (0-80%). The bottom scale gives the same result but for sale of the items per dozen.

Unusually the majority of the scales are calibrated for pre-decimal British £sd – a non-decimal currency that does not directly lend itself to a logarithmic scale. The rule was made from 1946 up to decimalization in the 1970s. DR

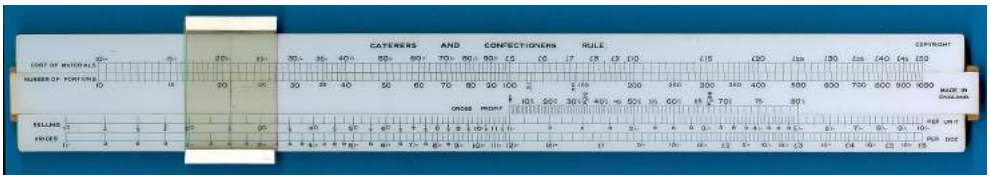

Figure 11: UNIQUE Caterers & Confectioners slide rule

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UNIQUE Wilkinson Sugar

In 1953 UNIQUE made the *Wilkinson Sugar* special slide rule (figure 12). But apart from being a Manchester-based sugar merchant, little is known about W. Wilkinson.

The copyrighted design makes it possible for a given currency conversion rate to convert American based prices of sugar (or the price of any commodity within the same range) in cents per pound (lb) into pre-decimal British shillings and pence per hundredweight (cwt) or viceversa. Uniquely a slide rule specifically designed for the Anglo-American commodities market with two currency-based scales. The C and D scales can also be used for regular multiplication/division calculations.

DR

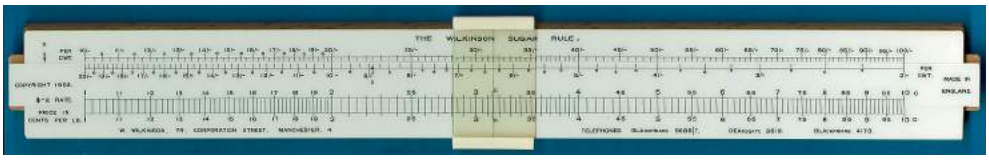

Figure 12: UNIQUE Wilkinson Sugar slide rule

Blundell Harling Beer & Lager Calculator

As denoted by its 'P' model number (P5154), it was a Blundell Harling special commission for the UK based *Courage & Co. Ltd* brewery, which was founded in 1787 by John Courage. The brand flourished and can still be bought today but the company is now owned by *Wells & Young's Brewing Company.*

The front of the chart is for calculating for a given profit margin per barrel: (i) the retail price per pint or (ii) the wholesale price per barrel.

The reverse is for calculating the resale price for bottled beers/lagers for a given profit margin. Unlike most profit margin calculators it integrates the Value Added Tax (VAT). Blundell Harling sold the same design to several other breweries.

DR

Building construction and home improvement

Home, sweet home — a never ending story, from its construction through renovations, extensions, modifications, modernization. A wide field for craftsmen, (ambitious) do-it-yourselvers, and sometimes even real professionals.

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Figure 13: Blundell Harling Beer & Lager Calculator

UNIQUE Concrete Volume Computer

This 6 inch pocket slide rule (figure 14) determines the amount of concrete, i.e. its volume for a conventionally shaped cavity, for instance pouring pouring a concrete wall. With just four scales it is deceptively simple to use – hence no need for a cursor. After setting the three dimensions (l×w×h) of the cavity, the volume in cubic meters can be found on the bottom scale. Unusually the top 3 scales are calibrated for both imperial and metric units of measure. This shows

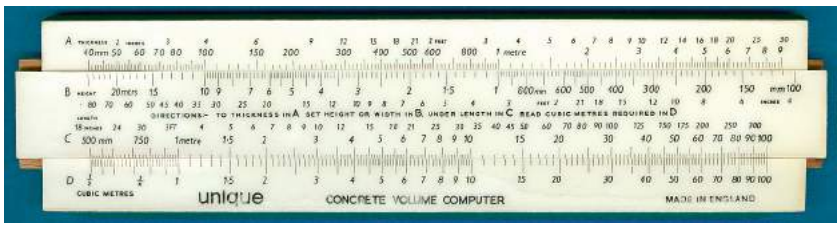

Figure 14: UNIQUE Concrete Volume Computer

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it is a later model, after 1955, as earlier UNIQUE made separate imperial and metric versions of this model. As a popular specialist model (most makers had similar models) it often doubled-up as a promotional item with the name of a company printed on the back – in this case: *Pioneer Concrete (U.K.) Ltd.*

DR

Concrete Calculator — give-away for *Readymix Corp.*

A cheap slide rule for the same application as above from the US. Very simple construction of folded plastic with an insert, 16.3× 3 cm. Here a promotional item from the *Readymix Corporation*, but many companies issued the same model with their branding on the back side next to the short instructions. The actual maker is unknown.

KK

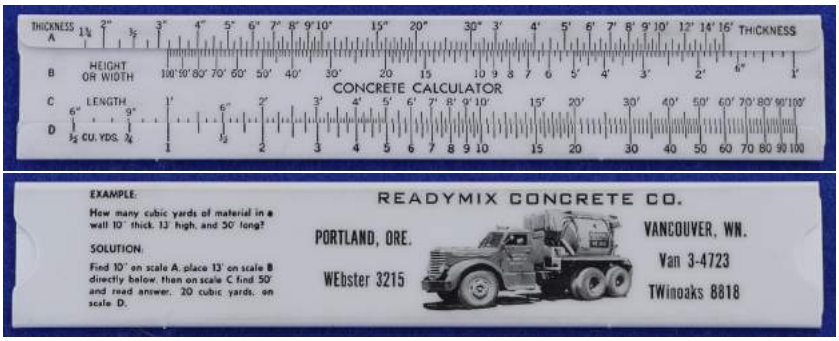

Figure 15: Concrete Calculator (Readymix Corp.), front and reverse side

SR&SE Pipkorn Brick & Tile Computing slide rule

SR&SE (*Slide Rule and Scale Engineering Co.*) is a little-known American maker founded by George Lockhart in 1930. The company may have later morphed into *Acu-Rule Mfg. Co.* Lockhart specialised in easy-to-use slide rules for industrial use. But apart from being builders merchants, little is known about the company the brick and tile slide rule was made for: *W. H. Pipkorn.*

The 12 inch wood/printed coated with clear lacquer slide rule (figure 16) built 1946–1950 needed no cursor. Tables on the back give details of various types and sizes of masonry units. Depending on the type of brick, tile or masonry chosen, the clever but simple copyrighted design from 1940 gives the

total number of units needed to build a wall of given imperial dimensions (l×h in feet). Any factor for wastage has to be added to the result. DR

Figure 16: SR&SE Pipkorn Brick & Tile Computing Slide Rule

Lawrence 10-D Lumber Calculator

Lawrence, the American maker of this rule (figure 17), is mostly known for its ultra cheap 25¢ basic slide rules.

But in the same 10 inch imperial series they also made unusual models such as the 10-D and 10-D0 Lumber Calculator. The 10-D is the more basic version. Built 1946–1947 with no cursor they were made from wood with painted scales.

The slide rule was specifically made for the US and Canadian markets as 'board feet' is a unit of measure particular to these countries. One board foot being equal to a one-foot length of a board, one foot wide and one inch thick. So for a given timber construction, aligning the imperial dimensions (t×w×l scales) gives volume of timber needed in board feet lengths. US and Canadian lumber merchants quote prices in type of wood per board foot. DR

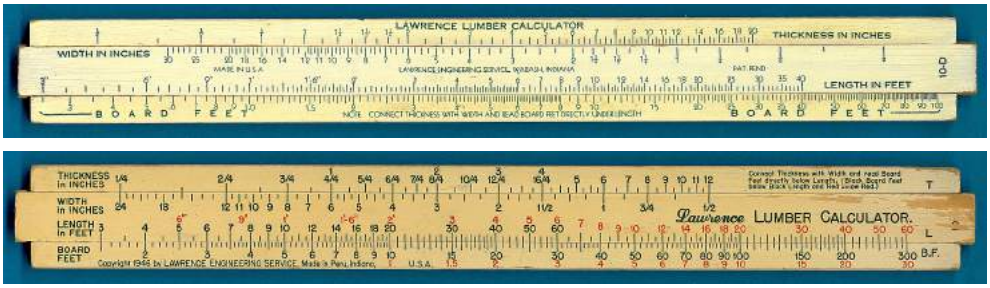

Figure 17: Lawrence 10-D and 10-D0 Lumber Calculators

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BRL P1960/B Paint Calculator

As denoted by its 'P' model number, the BRL P1960/B Paint Calculator (figure 18) was a BRL special commission for the Hull-based *Sissons Brothers & Co. Ltd*, made 1963–1964. Founded in 1803, the company was a well-known British paint maker throughout most of the 20th century. It was taken over in 1970.

Using the L (3–30 feet) and H (25–3 feet) scales, the area to be painted in square yards is calculated. With the result and the spreading or coverage rate (i.e. thickness of paint application based on the viscosity of the household paint chosen), the cost per square yard or the cost per gallon of paint can be found using the other scales.

A table on the back of the stock lists typical spreading/coverage rates per gallon for different types of Sissons' household paint.

Unusually the top A1 and A2 scales are parts of a folded £sd scale (folded at 2/-). The C and D scales can also be used for regular multiplication/division calculations.

DR

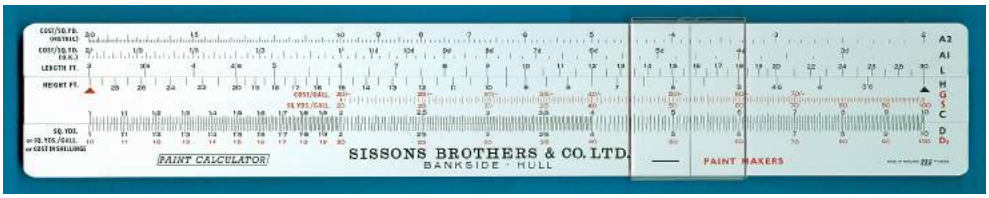

Figure 18: BRL P1960/B Paint Calculator

BRL P1553 Flooring Calculator

As denoted by its 'P' model number, the BRL P1553 Flooring Calculator (figure 19) was a 1961 BRL special commission for the London-based *Armstrong Cork Co. Ltd*. The UK subsidiary opened in 1925 but the American parent company was founded much earlier in 1883. By 1949 Armstrong was the largest manufacturer of linoleum in the world. The UK operation had its own factory for producing floor tiles.

Using the A and B scales the floor area can be calculated in square yards (1–100) using the D scale or in square feet (1–900) using the F scale. With the result, the corresponding cost per square yard or cost per square foot can be found using the P scale for any unit tile price between 3d and 20/-. Depending on the pattern (square or diagonal) the C scale gives the number of 12×12 inch tiles (extra adjustments needed for 9"×9" or 18"×18" sized tiles)

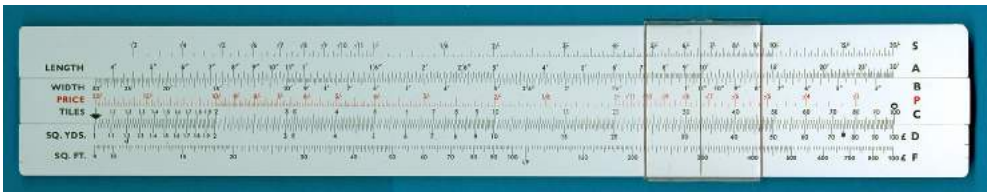

Figure 19: BRL P1553 Flooring Calculator

needed to cover the floor area. Besides using the C and D scales for regular multiplication/division calculations, these scales can also be used for financial aspects (e.g. price including VAT) and factoring in floor tiling related tiling aspects like wastage, cutting charges, etc.

DR

Heating

My home is my castle, but cold castles are not very habitable, and so it's not very surprising that there are a number of slide rules around the subject of the heating.

ARISTO 10157 — Ruhrkohle Wärmepreis

ARISTO's No. 10157 was designed in 1956 for *Ruhrkohlen-Beratung* to calculate the costs in Deutsche Mark (DM) for 100 kg of different fuels like coal or fuel oil or in DM/100 m^3 of gas. Besides different qualities of coal and coke also peat, wood browned briquette, electrical current, liquid gas and several quantities of liquid fuels can be chosen with the relevant range of their calorific value. In figure 20 nut coal with a calorific value of 7600 kcal/kg and costs of 7.45 DM / 100 kg gives a heat rate (*Wärmepreis*) of 9.80 DM / 1 Mio kcal.

Without changing the setting, on the other side of the disc (figure 21) one can read off the cost corrected by the efficiency of the boiler; in this case 14.00 DM / 1 Mio kcal. There are quite a lot of boiler types on the disc, representing typical boilers in the 1950s.

Of course, the scales also could be used for ordinary multiplication and division. There are brief instructions for use of the disc on a separate round cardboard. The disc and instructions were given to customers in a red cover.

WR

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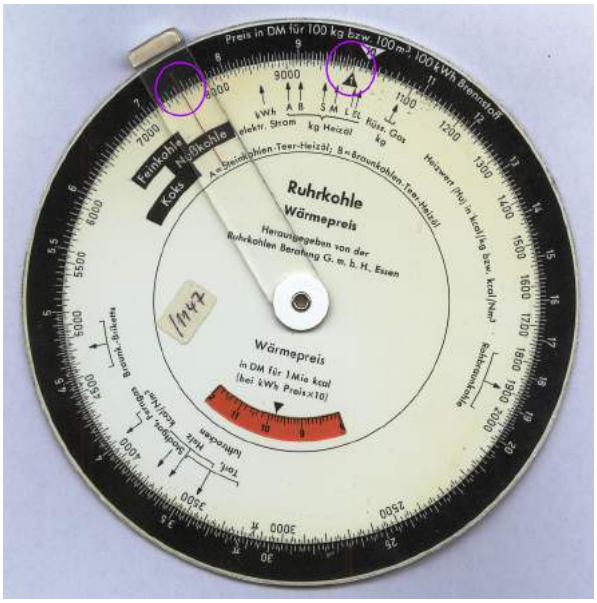

Figure 20: ARISTO 10157 Ruhrkohle Wärmepreis (top side)

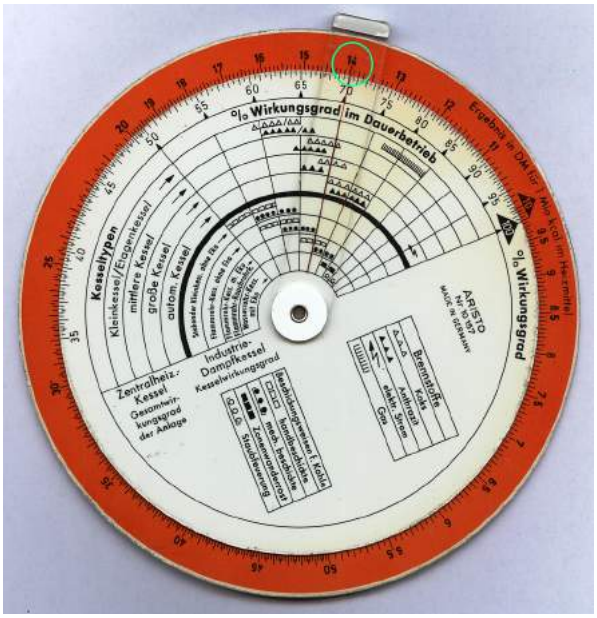

Figure 21: ARISTO 10157 Ruhrkohle Wärmepreis (bottom side)

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Gas or Oil, this is the question

For a long time, there was significant air pollution in Germany due to home heating primarily by coal, lignite and wood using separate furnances per room. In the 1960s and the following decades there was a move to central heating and alternative heating materials, oil and gas. It was also the time that hot water from the tap became ubiquous. So many local businesses of craftsmen were engaged in modernization of heating and hot water supply.

For consulting the customer to make a good selection oil or gas and for dimensioning the boiler and its fireing, manufacturers of these gave special

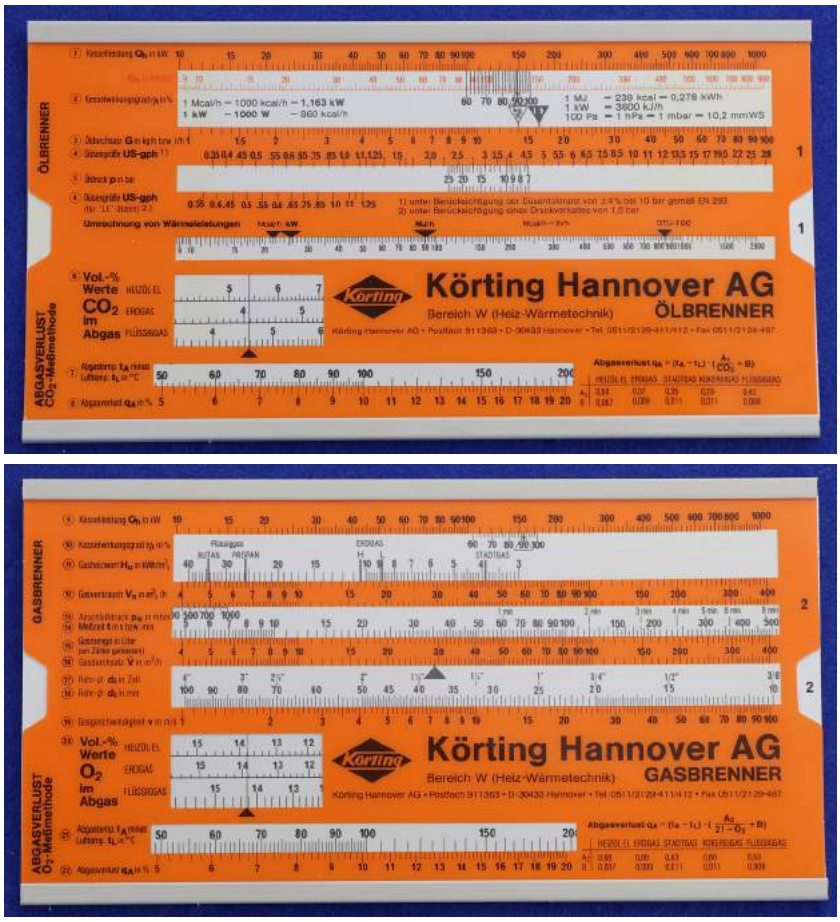

Figure 22: Calculation of oil and gas boiler heating

slide rules like the one in figure 22 to the craftsmen of the local heating and sanitary businesses, often small family businesses, where the head was both master craftsman, consultant and salesman.

I have at least three such special slide rules, made by IWA or (in this case) Greschner. They were not for the end user, but for the craftsmen who planned and built heating installations. Typical calculations are listed on the plastic sleeve for the slide rule as short user instructions, more detailled ones on a couple of separate instruction sheets. KK

Lawrence Tokheim 92 – 'K' Factor

Next to the ultra cheap basic slide rules *Lawrence Engineering Services* produced a series of specially commissioned innovative models such as the *Tokheim 92* in 1948. It was made for the *Tokheim Corporation*, Fort Wayne, Indiana. Today the company head office has moved to the UK and it is one of the largest global fuel retailers.

Key to the copyrighted design of this slide rule (figure 23) is the 'K' Factor. This is a normalised indicator of how fast a householder uses/needs heating oil expressed as gallons per degree day. An analogy would be car fuel economy when expressed as miles per gallon. In the 'K' Factor formula a 'degree day' is a unit of measure representing how hot or cold the average outside temperature was over a 24-hour period. This average is subtracted from the benchmark median of 65° F (the temperature whereby householders do not need to burn fuel to warm or cool their homes) to give the number of degree days for that day. By aligning the accumulated number of degrees days for a given period on the top scale against the gallons used on the middle scale, gives the 'K' Factor on the bottom scale. Then like the car fuel economy ratio, householders can now use the scales and their 'K' Factor to work out: (i) how many degree days can pass before they need to reorder more fuel oil or (ii) the gallons of fuel oil they have used since their last delivery. DR

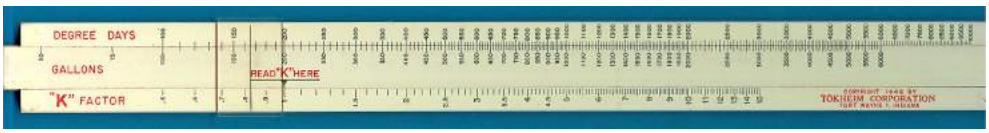

Figure 23: Lawrence Tokheim 92

Shell Heating Oil Re-Ordering Planner

When do I have to reorder heating oil? How long will the supply I have still be sufficient? To answer this question, Shell Oil had this large (∅ 26.3 cm) circular slide rule made. Concentric circles take are of various boiler capacities and mean oil consumption / year to find the right dates. Detailled instructions can be found on the reverse side. KK

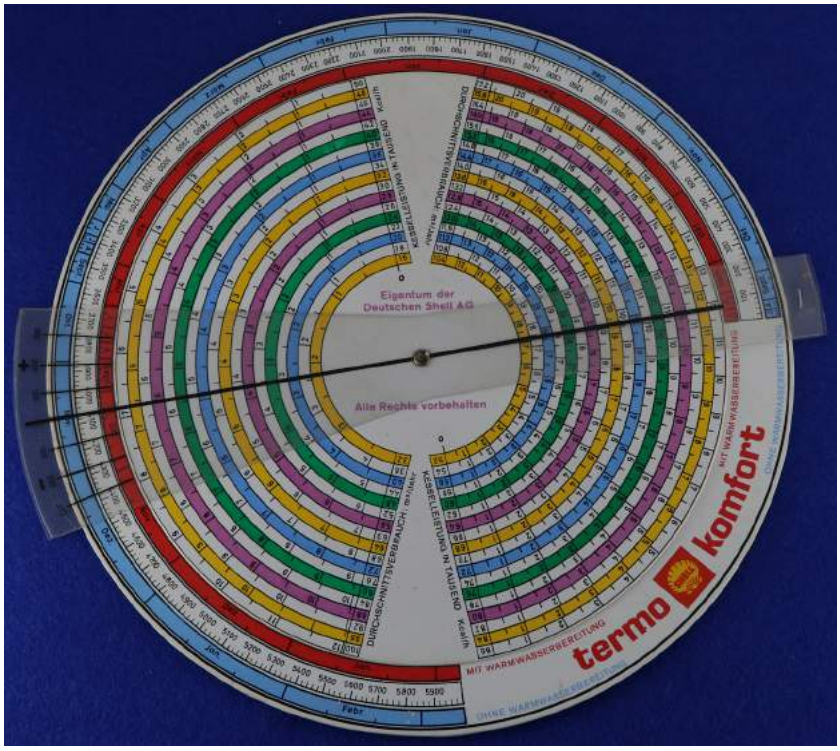

Figure 24: Shell Heating Oil Re-Ordering Planner

Space and Volume

What is so difficult in calculating a rectangular volume? It is a simple multiplication: length×width×height! Simple, if you are using metric units, but a nuissance if you have to do it in Imperial Units[2], i.e. inches, feets and yards. So it is no surprise to find three slide rules for space and volume computations here, all coming from the United Kingdom.

UNIQUE Area Calculator

The UNIQUE *Area Calculator* is a pocket slide rule in typical UNIQUE technology, with a 5 inch scale length, made from 1946 to 1975 (figure 25). It is deceptively simple to use, hence no need for a cursor. However, this is deceiving. After setting the dimensions of any 2-dimensional shape or figure in feet and inches using the top two scales, the answer in square yards or square feet is given against one of the two arrows. All the scales are calibrated in imperial non-decimal units of measure. Also, unusually the bottom scales are two parts of a single folded scale, folded at 6 square feet. DR

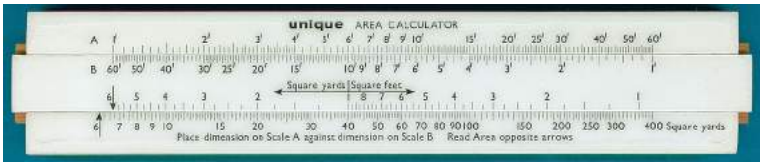

Figure 25: UNIQUE Area Calculator

BRL P1418 Room Volume Calculator

As denoted by its 'P' model number, it was a BRL special commission for the *Shell-Mex/BP (SMBP) Ltd* joint venture (*JV*). Set up in 1931, the JV was limited to the joint marketing and distribution operations in the British Isles.

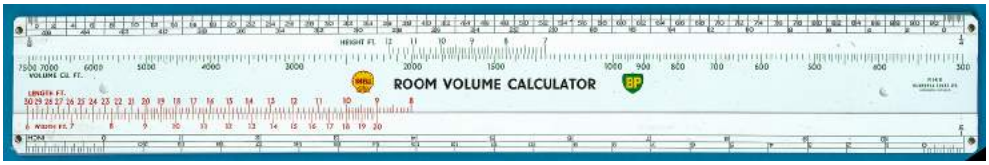

Figure 26: BRL P1418 Room Volume Calculator

So all the scales of the *Room Volume Calculator* (figure 26) are calibrated for imperial units. After aligning the length against width, the room volume in cubic feet can be found opposite the respective room height. Interestingly combined with a top inch scale divided into quarter and eighth of an inch sections and a bottom inverted inch scale divided into half-inch sections. One of series BRL made for the JV. All were most likely promotional 'giveaways'. DR

[2] The *Weights and Measures Act* of 1824 defines: 12 inches = 1 foot; 3 feet = 1 yard; 1760 yards = 1 statute mile

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Inglis Flash Square and Cubic Calculator

The *Inglis Flash Square and Cubic Calculator* shares its design principle with the Inglis Flash Bank Interest calculator on page 174. It was one of 12 similar Flash Reckoners and with it is possible to calculate the surface area of a flat surface such as a floor, sheet of glass, etc or the volume of a 3-dimensional object such as a room, a box, a trench, etc. The scales were printed on paper before being mounted on thin wooden strips/slides. The lefthand page is for calculating in feet and inches up to 20 square feet and 100 cubic feet. All results are in imperial units. The right-hand page is for calculating in yards,

Figure 27: Inglis Flash Square and Cubic

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feet or inches up to 100 square yards and 100.000 cubic yards. However, all results are shown in both imperial and metric units. DR

Calendar calculations

We often have to task to find a particular date or date range resulting from a start or end date and a number of days, or to find the number of days between two dates, e.g. for the calculation of interest. Addition and substraction are not difficult, but the different month lengths can make the calculation a nuissance. Furthermore, implicit inclusion (or exclusion) of the end day can easily lead to off-by-one errors, if the calculation is performed with insufficiant case. So slide rules for date arithmetic do make sense.

Finally, we have the issue of the leap year. Unfortunately, none of the slide rules in this section take this into account. You have to keep that in mind and mentally add the extra day separately.

UNIQUE Interval Calculator

The *UNIQUE Interval Calculator* (figure 28) is a typical UNIQUE slide rule with 10 inch scales, built in the 1950s.

It has two pairs of scales. The upper one consists of a scale with the months and all the days of the year and a scale with number of days. If both calendar dates fall in the same year, set the left-hand index to the first date. Move cursor over the second date to find the number of days. If the second date falls after the year end, use the right-hand index for the first date. However, if February 29th falls in the interval/year it is necessary to add one to the resulting number of days.

The C and D scales are for regular multiplication/division calculations. DR

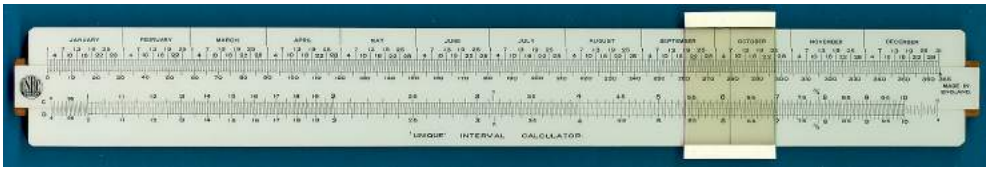

Figure 28: UNIQUE Interval Calculator

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Delivery period calculator

For goods the are standard delivery times, usually expressed in a number of weeks from the order date to an approximate delivery date. This little circular slide rule made by Greschner is a typical give-away that does the job: Set the date of the purchase order and read the dates of the delivery time frame n weeks later.

KK

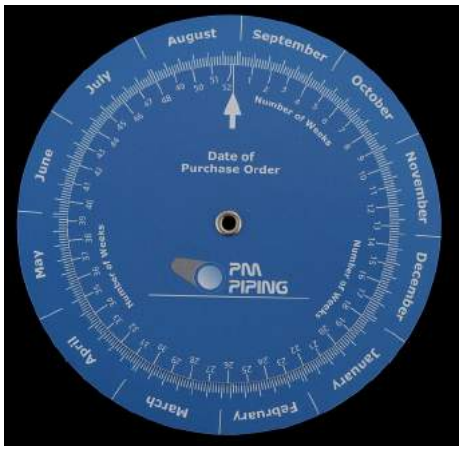

Figure 29: Delivery period calculator

Vifor Pregnancy Calculator

A particular kind of delivery is that of babies.

A small little calculating disc made by the Meierhofer Schilderfabrik AG, Mellingen (CH), out of anodized Aluminium for the physician to calculate dates in relation to pregnancy (∅ 75 mm, figure 30), was a promotional give-away of Vifor (International) Inc. in context with their medicament 'Venofer', an iron sucrose compound.

Instruction for use: Set right edge of slide on date of last monthly period (here 10th of May) and obtain date of birth at the left edge of slide (here 20th of February. Read at the date of examination the number of days, of weeks or of months of pregnancy.

Example: Date of examination = 20th of September, read 129 days, 19 weeks or 5 months of pregnancy. Additionally you can also read the weight and the lenght of the embryo.

It is quite remarkable that this data disc is still in production and has not be replaced by an app on the iPhone!

JP

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Figure 30: Vifor Pregnancy Calculator

VERLA / BIOMED Pregnancy Calculator

There are many pregnancy disks, even today, most of them promotional give-aways of the pharmaceutical industry. In contrast to the Vifor disk of the previous subsection, most of them are cheaply made from cardboard or thin stiff plastic sheets. This one is a bit special, as it also contains a calendar, which gives the day of the wekk for all the dates. But as 1992 was a leap year, the calendar function of the disk only works for 1992 and 1993. The reverse side lists some statistical mean values over time. KK

Figure 31: VERLA / BIOMED Pregnancy Calculator

Biomate Biorhythm Calculator

Calculating dates from other dates is one thing, but will it be a good day? The Biorhytm tries to answer that question.

The *Biorhytm Calculator* offered by *Biomate UK Ltd* is based on a 1976 patented design by Alan Geffin (GB1446576), and was manufactured in plastic in Japan. It is a circular construction with one date and three non-concentric temporal scales geared to rotate at different rates, and has an overall size of about ∅ 3½ inch.

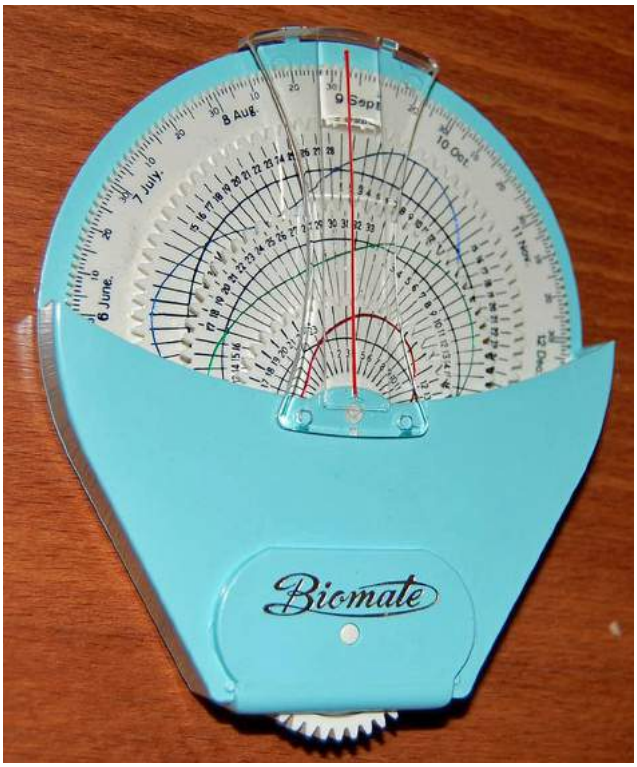

Figure 32: Biomate Biorhythm Calculator

The device shows an individual's biorhythm or life cycles for any day of the year once set to the user's date-of-birth (for ages 1 to 80 + any corrections for leap years). The late 19th century biorhythm theory, developed by German physician Wilhelm Fliess (1858–1928) defines three temporal rhythms: (i) the **physical** (red 23-day cycle), (ii) the **intellectual** (green 33-day cycle) and (iii) the **emotional** (blue 28-day cycle).

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Supposedly hitting the peak (or avoiding the trough) of a rhythm increases the chance of success or avoiding failure. For example, best days for a marriage proposal, reduced chance of an accident days, sex of a baby by day of conception, best ideas days, best days to gamble, etc. The theory lacks any proven scientific basis! DR

Cars

Parking Disk with Fuel Consumption Calculator

Disc Parking is a system of allowing time-restricted free parking through display of a parking disc showing the time at which the vehicle was parked. The time allowed is given on the sign declaring the parking zone. Traffic wardens check that the actual times lies in the period from the arrival time displayed to arrival time plus time limit and fine the car owner if that was exceeded. The system is more common on the European continent than on the British isles.

Figure 33: Parking Disk, reverse side with fuel consumption calculator

The most common form of a parking disk is a cardboard sleeve (15×10.8 cm) with a cut-out window for the arrival time on a cardboard disk inside, as shown in figure 33.

The reverse side of a parking disc originally is in its legal definition not specified, so it became popular to place advertisements on it. Later a combination of a car consumption calculator ('Benzin-Rechner') in form of a circular slide rule and advertisements became common, at least in Germany. The km since the last refuelling and the refuelled quantity are adjusted on the lower part of the disc. Now the average consumption can be read on the top of the disc. As it is a German parking disc, the fuel consumption is indicated in litres/100 km. As an extra the fuel costs/100 km also can be calculated. PH

Shell Fuel Consumption Calculator

This little Dutch give-away (figure 34) consists of folded paper in plastic sleeve. A very inexpensive special purpose slide rule, yet effective, and space saving too; just 18.9×4.7 cm and very thin. Note that the consumption is indicated as km/litre, an inverse to the German convention above. KK

Figure 34: Dutch Shell Fuel Consumption Calculator

Paravit Driver's Aid

This tool was used by driving schools to instruct the learner how to calculate the stopping distance and the overtaking way length. The knowledge of these theoretical calculations where requested at the examination!

It is a circular slide chart, made in the 1940s to the end of the 1950s by Paravid publishers of Zürich. The construction consists of three cardboard disks (∅ 10 cm) printed in black and red with a few cut-out windows. The illustrations on the disks show somewhat stylished VW Beetles as cars, the most widely used car of the time.

The front side gives the distance to stop the vehicle, depending on road conditions and under the premises of good brakes and good tyres.

Instruction for use: Choose road conditions (good, medium, bad). Set white triangle to speed (10 km/h on photo, with good road conditions). Read distances for reaction way (2.77 m), breaking way (0.5 m) and total breaking distance (3.27 m).

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The back side is used to calculate the overtaking way length. The example shows: Overtaking with 90 km/h a car riding at 30 km/h needs a distance of 150 m. JP

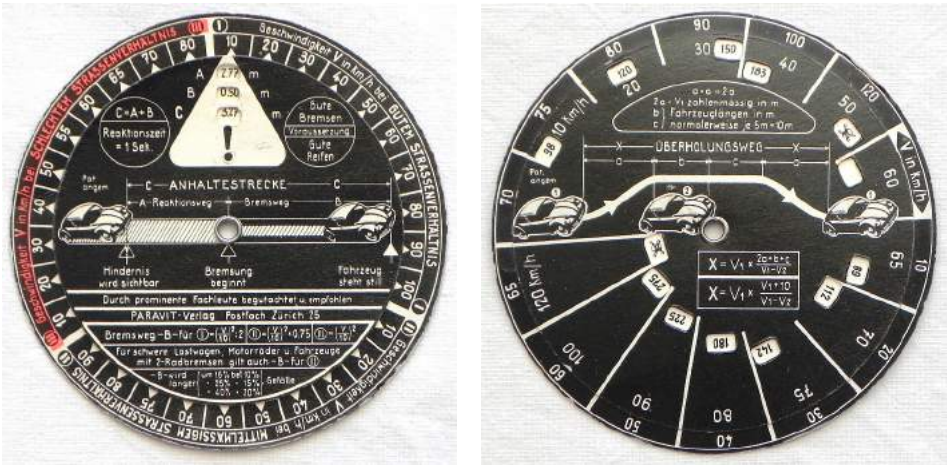

Figure 35: Paravit Driver's Aid

GDR Slide Chart for Breaking Distances

Even in East-Germany half a century back, in the GDR, there were themes that warranted to make and distribute an educational slide chart. Traffic safety was such a theme, in particular the braking distance of a car under various road conditions (dry / wet / iced road). A simple table would have equally worked, and it is barely hidden in the very simple construction shown in figure 36. The slide chart (16.2×5.2 cm) made of thin plastic sheet ("Plaste" in DDR-speak) was issued by a state/party committee "for order and safety" of the town of Chemnitz, which had been renamed Karl-Marx-Stadt in the GDR. KK

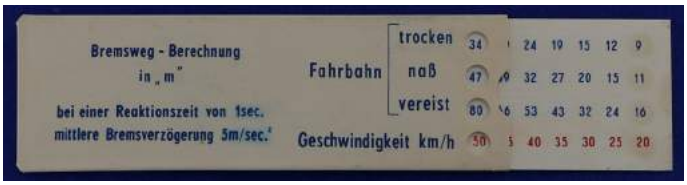

Figure 36: GDR slide chart for breaking distances of cars

Daimler-Benz Truck / Utility Vehicle Performance Calculator

Next to its famous premium cars Mercedes-Benz builts trucks and a large variety of utility vehicles. There are of course standard truck models, but there is also a significant number of special purpose vehicles, where Mercedes-Benz just provides a skeleton and the rest is built by a speciality vehicle manufacturer. In any case, there is a selection of key components like an engine, a gearbox or a particular transmission. These determine the performance of the final vehicle.

The 'Fahrleistungsrechner für Nutzfahrzeuge' (performance calculator for utility vehicles) allows to make good choices, as it allows to calculate for instance the rotational speed of the driving axle from the engine's rotational speed. And thus the achievable speed of the vehicle with a particular transmission and gearbox combination. So anybody configuring a truck or utility

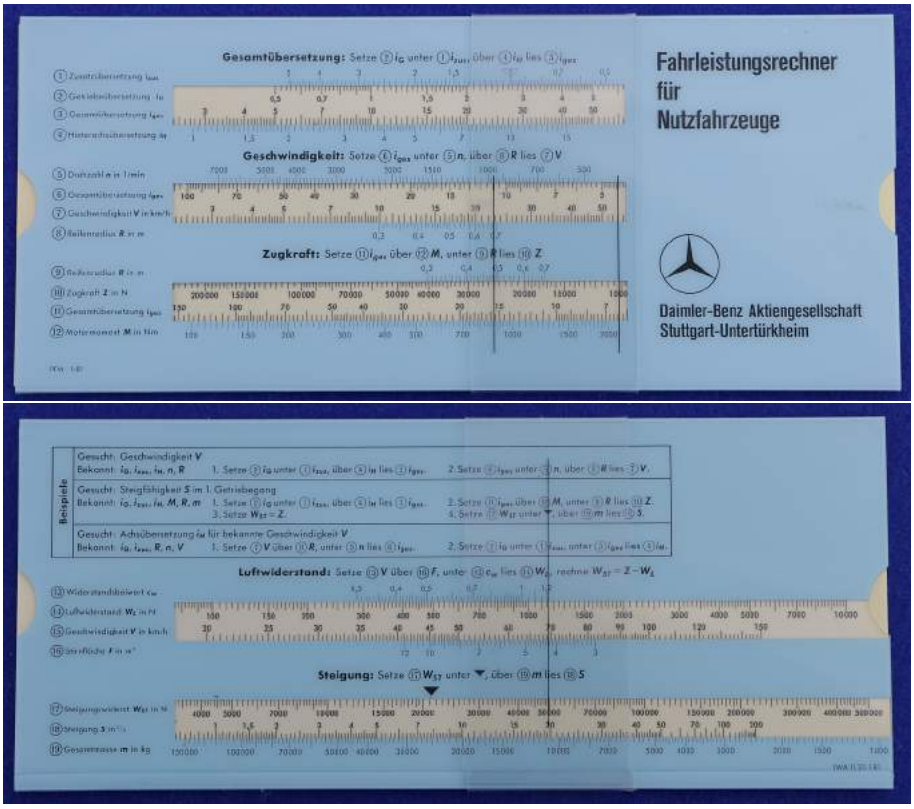

Figure 37: Daimler-Benz Performance Calculator for Utility Vehicles and Trucks

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vehicle can take the specification of key parts and check they would act together for a number of performance values.

KK

Speed

Lines Bros C276 Speed Computer

Scalextric is the trade name for a racing game based on 1:32 scaled model cars. It was invented by Fred Francis in 1956. A slot in connected sections of black plastic track guides and powers the model cars around a circuit.

The speed computer made of ∅ 5½ inch cardboard disks calculates the scaled up speed (60–240 MPH or 97–386 KPH) of a model car based on its clocked time (in seconds) to cover a given length (in metres) of track – usually whole laps of the circuit. It was made in the 1960s by *Lines Brothers Ltd.*

The heyday of the original game was the 1960s/70s, appealing to both adults and children. Since then it has evolved – e.g. 4-lane sets, sets where the cars can cross lanes, etc. *Scalextric* is still being sold by UK toy company *Hornby.*

DR

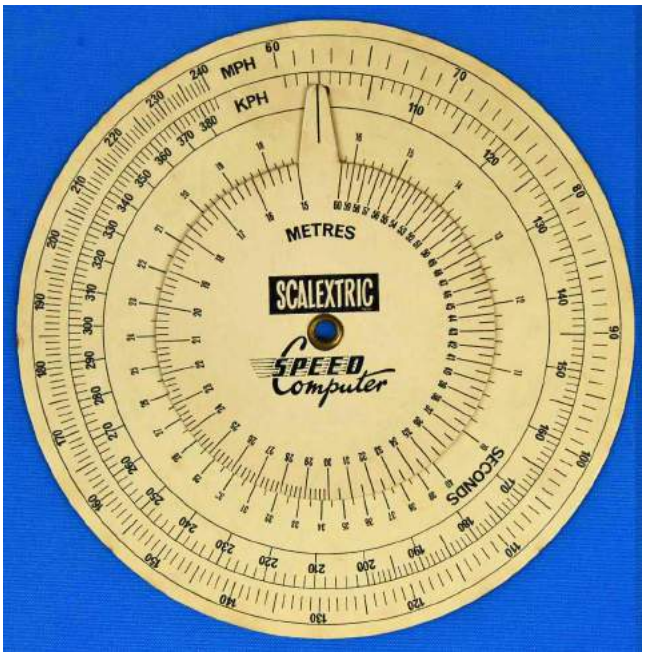

Figure 38: Lines Bros C276 Speed Computer for *Scalextric* race circuits

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Slide Rule for Railway Modelling

Railway modelling is an interesting hobby for many people. Driving these small scaled trains at home is fun for these people. But how fast must a model train run to have the same speed as a real train in the real world in relation to the surrounding houses and cars? There are some established international modelling scale standards in which model trains are build.

This slide rule (figure 39) made by Heinzl in Reutlingen in the 1960s works with these standards: 0 (1:45), H0 (1:87), and TT (1:120). As the slide rule was made for the German market it uses metric units. If the user knows of a certain speed a real train has when e.g. driving through Bonn, he now can easily calculate how fast his model train must run at home to give the impression of reality. If the user has a scale H0 train at home, a real speed of 120 km/h as shown in the picture below correlates with 2.6 s/m for his model train. So it will be easy to measure with a stop watch how long his train needs to run 1 m. He only has to adjust speed that it takes the train 2.6 seconds to run 1 m. The reverse side of the slide rule helps to transform distances between reality and model train scales.

PH

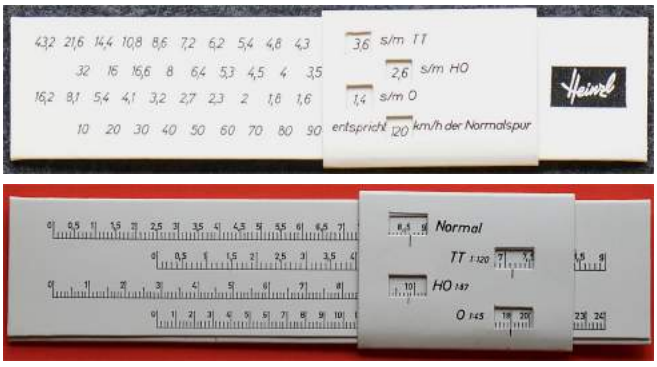

Figure 39: Slide Rule for Railway Modelling

A Slide Rule for Motor Cycle and Automobile Racing Fans

After model cars and model trains, now a slide rule for the real thing...

On the back of this cheap cardboard slide rule (figure 40) there are three famous motor racing courses depicted, both for cars and motor cycle races: Isle of Man, Nürburgring and Monza. Contrary to today's courses, which are

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usually about 5 km long, especially the Isle of Man (60.5 km) and the old Nürburgring ('Nordschleife', 22.8 km) are exceptionable long circuits.

This slide rule, presented by the British monthly journal *MOTOR CYCLIST ILLUSTRATED* in 1966, allows on the front side to find the average speed for the known length of the course and the recorded lap time. If for example at the Nürburgring (length of one lap = 14.17 Miles) one has recorded a lap time of 12½ min, the average speed is given at 73 miles per hour (red arrow on the top picture of figure 40). On the reverse side there is also a M.C.I. METRIC CONVERTER for converting kilometers into miles and vice versa and for liters into gallons. However, this converter is limited to a few round numbers. WR

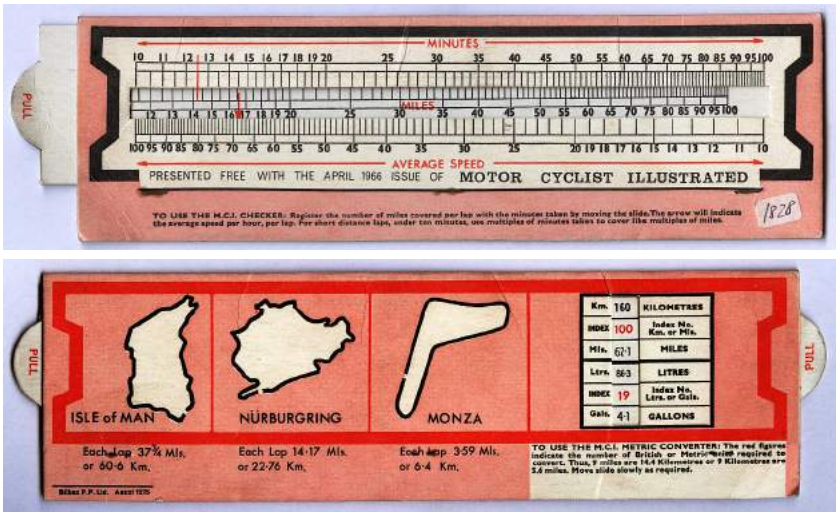

Figure 40

Time–Speed–Distance on the road, the ARISTO 670 and 60134

From models to race courses to the road...

This combined key ring & travel calculator for motorists is part of the ARISTO 6xx circular series (figure 41). It is a ∅ 5 cm plastic circular dual slide rule. A version in black and white plastic was also made. But the 670 is one of the exceptions of a series that almost entirely consists of various Aviat flight computers. The metal key ring is part of a stitched black leather pouch for the slide rule.

The front side is for calculating conventional speed-time-distances in kilometres per hour. The reverse side is for calculating fuel economy in Litres per 100 kilometres. The 671 is a sibling model but is instead calibrated for imperial units of measure (miles and gallons). DR

In 1967 ARISTO made a special version, the ARISTO 60134 for 'Hamburger Flugzeugbau', which built the Transall military cargo plane. Today this company is part of Airbus. The 60134 is in English, but with metric units (km, litres, hours). In figure 42 you also see the leather pouch missing from the picture of the Aristo 670. KK

Figure 41: Aristo 670

Figure 42: Aristo 60134

Pilot's Computer

Figure 43: Pilot's toy

What the Aristo 670 is for the car driver, is this little slide rule for the key ring for pilots. It has the same size of ∅ 5 cm, but is single-sided. The back side lists the sponsors' web sites, air control organizations and weather service in central Europe. Further details unknown. KK

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Blundell Harling Portland Speed-Time-Distance Calculator

Blundell Harling designed this simple small plastic slide rule for sailors. Distances are given in nautical miles and the speed in knots. Instructions for use are given on the reverse side.

The photograph of the front side (figure 44, top) shows as an example: Sailing at a speed of 13 knots for 3½ hours would result in a distance travelled of nearly 46 miles. The upper scales allow time periods of a quarter minute up to two hours, while the lower scales run from 1 hour to 4 days.

For sailors it is important to know the departure (or difference) in miles between two meridians at different degrees of latitude. At 52 degrees (figure 44, photo in the middle) the distance between two meridians is only 4 miles compared to 6.5 miles at 0 degree latitude, i.e. in equatorial waters, see blue markings in the last photo of figure 44. WR

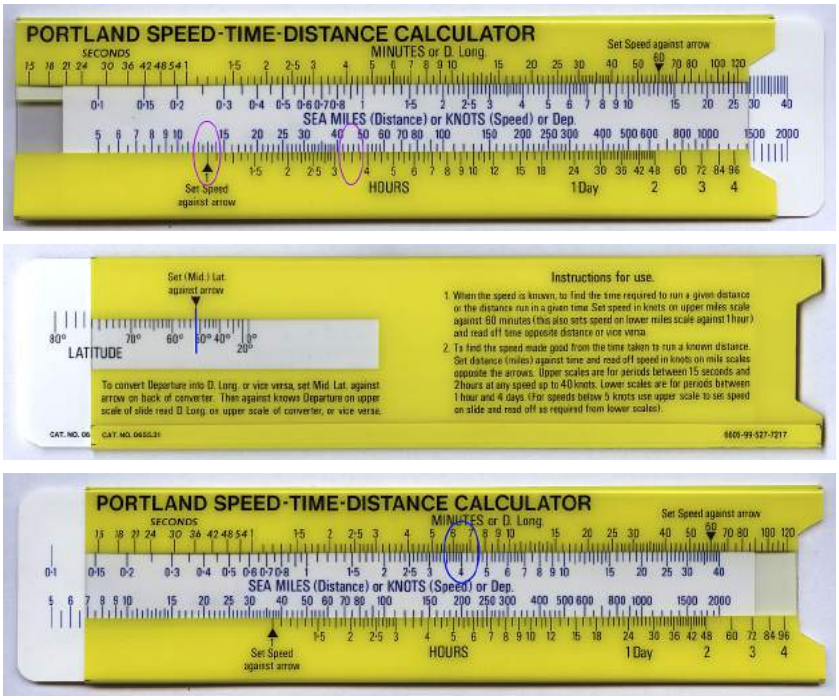

Figure 44: Blundell Harling Portland Speed-Time-Distance Calculator

Photography

Kolumbus Exposure Indicator

In the 1950s photography became very popular as easy to use and budget-priced cameras became available. Film material however was expensive and most cameras where not equipped with an photometer to ensure a correct exposure of the film. The solution to this problem was the manual exposure disc, for instance the *Kolumbus Exposure Indicator* (figure 45) offered by Heering Verlag, Seebrück am Chiemsee in Bavaria, in the 1950s. It is a circular slide chart, ∅ 85 mm, made of aluminum.

Instruction for use: First, the film speed must be set in the little round window (upper left). Choose the appropriate month and the time of the day, follow the corresponding line to the right and turn the dentated rotating disc clockwise to the 'nose'. Accordingly choose the weather and proceed as above. Equally choose the object of your photo and proceed as above. Read the possible combinations of exposure time and lens aperture and select the adequate solution. *Good luck for taking your photo!*

This item is identical in construction with the corresponding Agfa model!

JP

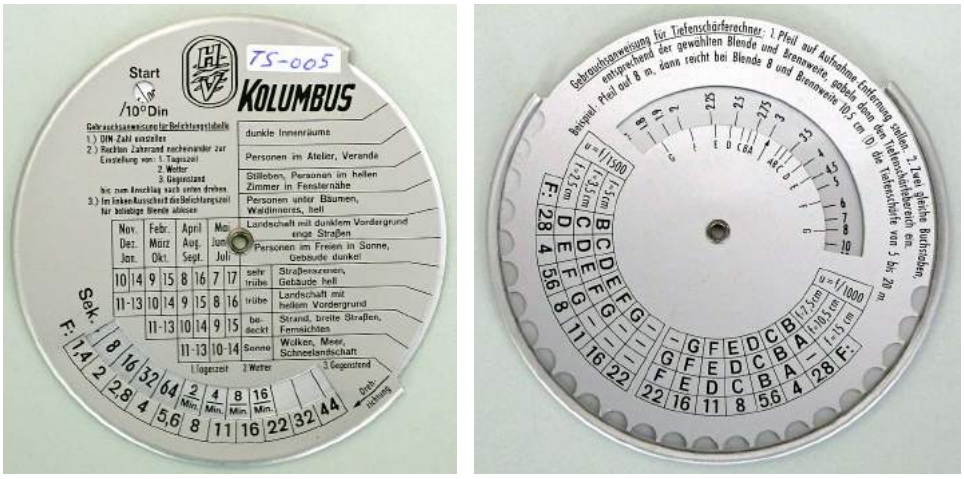

Figure 45: Kolumbus Exposure Indicator

Gossen *Sixtino* light meter

The Gossen Sixtino from the 1960s is a Selenium light meter combined with a circular slide rule for calculating how to set values for shutter speed and aperture for a proper exposure of a photograph.

After having set film speed in DIN or ASA the light reflected by the object to be photographed is measured. Then the setting ring is turned until the yellow follow pointer stands exactly over the white indicator needle. Now the measured light value can be read as well as appropriate f-number and shutter speed combinations for a proper exposure.

A slide rule is the perfect calculating device for photographers because the relation between exposure value (EV), aperture (f) and shutter speed (t) is a logarithmic one to the base of 2: $2^{EV} = \frac{f^2}{t}$. PH

Figure 46: Gossen *Sixtino* light meter

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Miscellaneous

Knitting Calculator ('Strickrechner') TRICAL

An outstanding tool for the housewife and the knitting slide rule collector! Also a real 'Windows calculator'! It is made from plastic material, one base plate with measuring window, two rotating discs with three logarithmic scales (figure 47). Its size is 136×200 mm.

Instructions of use: First of all a square gauge piece of about 10×10 cm has to be knitted. The window of the Knitting Calculator is now laid over the gauge piece. Please count in the window the number of meshes in the width and the number of rows in height of your sample.

How to do the calculations: Turn the cm-disk so that the 'arrow 5 cm' points to the number of rows counted on the gauge piece (20 on the picture). Turn now with your right thumb the disk with the numbers of meshes until the

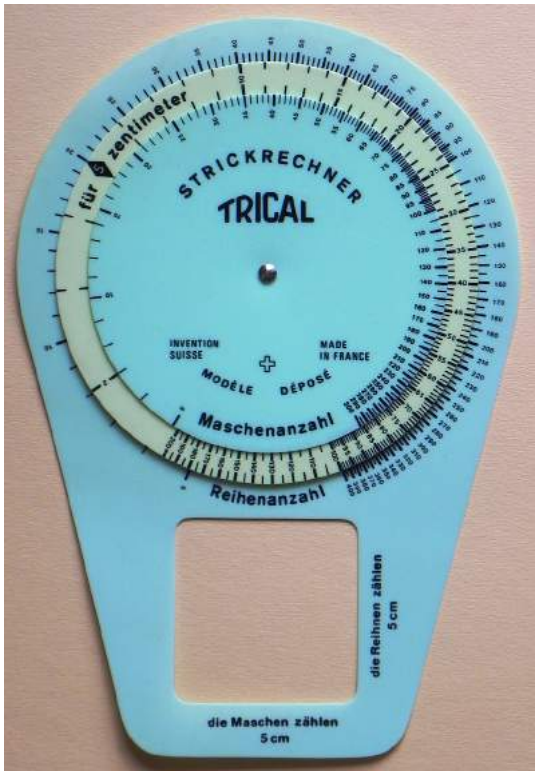

Figure 47: Knitting Calculator TRICAL

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counted number of meshes aligns with the 'arrow 5 cm' (Approx. 17 on the picture). Now you can use the so adjusted TRICAL as an table where you can read:

- On the outer disc the number of rows for a given measure in cm.
- On the inner disc the number of meshes for a given measure in cm.

Example: 40 cm corresponds to 160 rows and 140 meshes. JP

The all-in-one slide rule for everyday calculations

After having seen so many slide rules in the previous sections of this article, we might come to the conclusion that we should live and travel with a whole bag of them. The late Dieter von Jezierski, marketing manager at Faber-Castell for slide rules, came up with a different idea. He designed a low cost combined slide rule / chart (size 150×70 mm) combining a basic slide rule with scales for four applications we have seen on the previous pages in a technology not seen for Faber rules before.[3] And he did so in 1976, the time that Faber-Castell stopped its slide rule production. The UT1 (Universal-Tabellenschieber) 20/70 is the last Faber-Castell slide rule! KK

The upper part on the front side of the Faber-Castell 20/70 (figure 48) is a normal slide rule with scales CF/CF; CI; C/D.

For commercial calculations one could use the 'Rabatt-Aufschlag-MWST-Skala' (Discount - Surcharge - Value added tax/VAT- scales) below that. If in figure 48 the price (Preis) is 36 with a discount of 10% the reduced price would be 32.4 (blue marking) or with no reduction but including VAT (MWST) (at 19%) (=1.19) = 42.84 (green). The VAT (MWST) alone would be 6.84 (violet).

The top scale on the back (figure 49) is for calculating fuel economy in Litre/100 km.

In some companies employees can within certain limits choose the start and end times of their working day. For this purpose the 'Gleitzeit-Skala' (Flexible Time-Scale) could be used. For example, in figure 49 the working day (Arbeitszeit) of 8 hours is set against 60 min for breaks (Pausen). With this setting and a desired starting time (Kommt) of 7:30 am, the employee can mleave (Geht) at 16:30 hrs (4:30 pm).

Finally on this side we have a 'Normalgewichts-Tabelle' (Normal Weight Table). It gives the normal (standard) weight of women and men as a function of

[3] It looks to me that he subcontracted it to IWA. KK

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Figure 48: Faber-Castell 20/70 front side

Figure 49: Faber-Castell 20/70 reverse side

their height and age. An average man aged 50 and 172.5 cm tall should weigh 76 kg. This results in a BMI of 25.5 which according to WHO recommendations, is already slightly overweight.

Faber-Castell supplied an instruction sheet and a black cover with the slide rule.

WR

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What is this slide rule for?

For the final item of this collection, I have to tell a story. In the early 1980s I was a computer scientist who already had some experience, and I worked at a new research institute associated with the Technical University of Karlsruhe, but legally and organizationally apart. That institute was set up to cooperate with industry to bring newly developped technology into the field, resp. develop practical tools and methods from principal research results in the academic world. A bridge function, which was practically and legally not possible or rather difficult under the rules for a state university.

I headed a small group of researchers and programmers and did with them contract research for IBM. It was a confidential project exploring some new software technology for reliable reusable system components. Seen from today and considering various aspects, we were about two to five years 'ahead of the crowd' with our stuff. And we made good money from the project.

As the institute was about two years old, we were also still in the starting phase. I was formally a group leader, but effectively also served as department head, as this position was only to be established and be filled later, when we had further grown. The professor was one of the directors of the institute, together with some other professors also from the faculty of computer science of the university, but he usually was at the university or yet another lab.

It was summer, vacation period. The boss was far away, as most other leading figures. I was at the helm. Then I got a surprise visit. Actually, it was a visit for my boss. A leading research manager from Japan. Something had gone wrong with planning for this visit, but there he was and I had to step in. I had no experience with such visits on this level, no instructions, next to no preparation.

So I boldly acted as the boss that I wasn't. Certainly I irritated a couple of collegues on that day, acting so also in other departments, but my task was to extend the networking of our already known and respected institute furter, also internationally. I managed.

As traditional Japanese visitor our guest brought a little personal present. It was a triangular ruler made of black anodized aluminum (figure 50), 26 cm long, 24 mm wide. One side just carried a centimeter scale, the second a thermometer in the form of a strip of liquid crystals, and the third a slide rule. For a long time I had the ruler on my desk as a ruler, thermometer and paper weight, but not as a slide rule. Later, and most time of the roughly 35 years since that visit, the thing sat in a drawer.

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Figure 50: slide rule side

This slide rule is not like any other I know. It has scales on the body, three decades on the top (1–1000), and three on the bottom (10–10000). The slide does not have any scale, but carries a number of gauge marks in Japanese, only very few in roman letters (figure 51). I do not know what the slide rule is for, what the gauge marks are, never tried to find out. With my knowledge about slide rules today I guess that these are unit conversion factors of some kind. I didn't bother to find out anything about these gauge marks until now – I simply accepted the whole thing as a technical beauty, not as a tool to use.

But now the time has come. What are these gauge marks? What is the purpose of the slide rule – except being beautiful and a nice gift? After 35 years, I still haven't the faintest idea. Any help?

KK

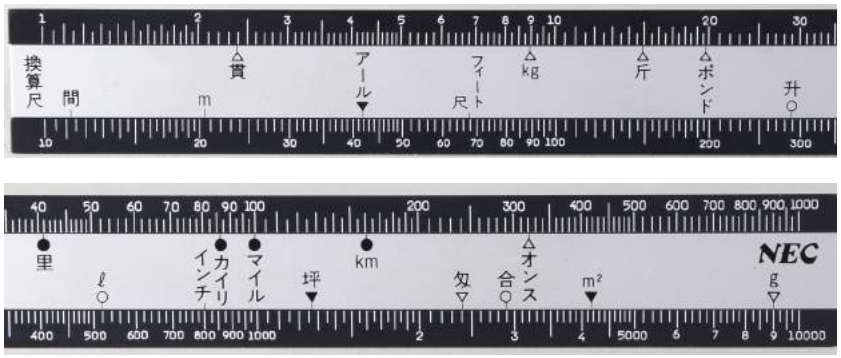

Figure 51: What are these gauge marks?

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