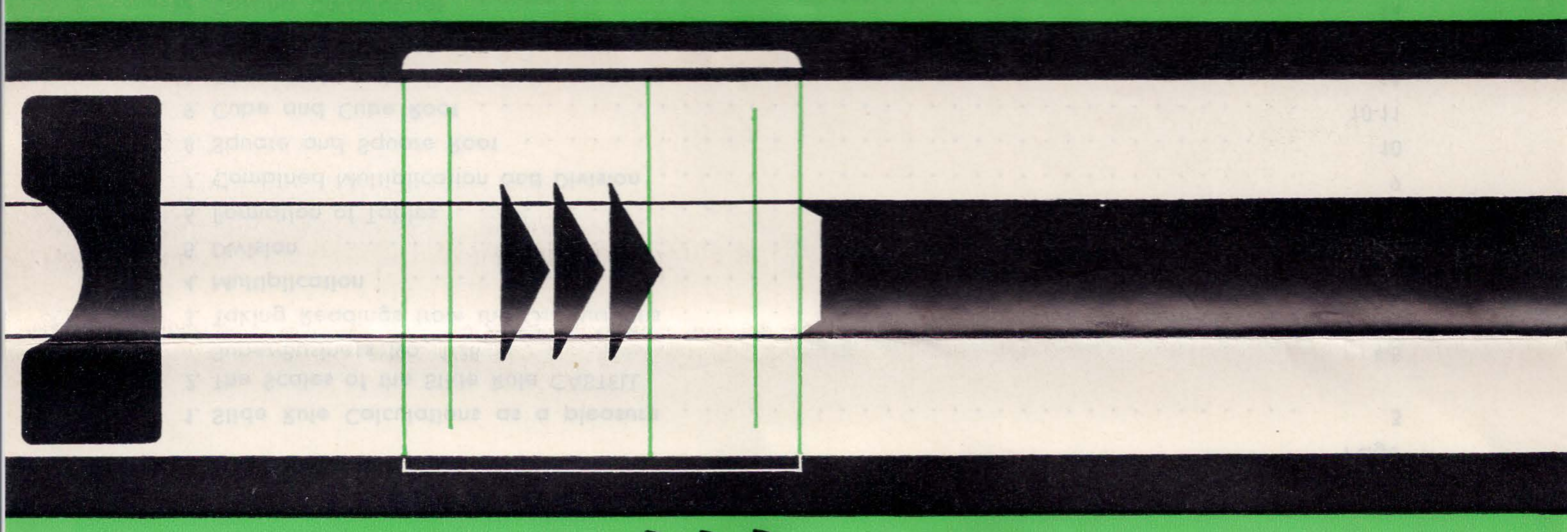
A.W. FABER-CASTELL · STEIN BEI NÜRNBERG, GERMANY

1172 ● Printed in Germany 1/28 e

INSTRUCTIONS

Precision Slide Rule

Super-Business
No. 1/28



Contents

1. Slide Rule calculations as a pleasure

When you use the slide rule you are not so much "calculating" as just "reading", for all you have to do is to make the setting and read off the result. The rule does the calculating for you.

For carrying out slide rule calculations you require little prior mathematical knowledge. A few basic Instructions for Use are sufficient and these can be rapidly mastered. From then on it is just a matter of practice and habit.

The "CASTELL-SUPER-BUSINESS No. 1/28" was developed from our welltried "CASTELL-BUSINESS No. 1/22", designed for those concerned with costing, sales, interest, insurances etc., in connection with commercial buying and trading. We will start with a few indispensable explanations before we go on to the actual use of the slide rule:

On what system are slide rule calculations based?

If two ordinary rulers are laid side by side (see diagram) we obtain an **addition** (3·5 + 4·5 = 8) when proceeding from left to right or a **subtraction** (8 — 4·5 = 3·5) when proceeding from right to left.

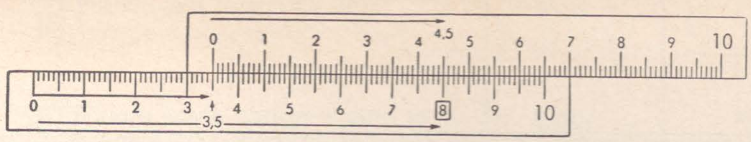


Fig. 1

If two scales of a slide rule are now placed next to each other in the same manner, we obtain a **multiplication** (3·5 × 4·5 = 15·75) towards the right or a **division** (15·75 ÷ 4·5 = 3·5) towards the left (see Figs. 1 and 2).

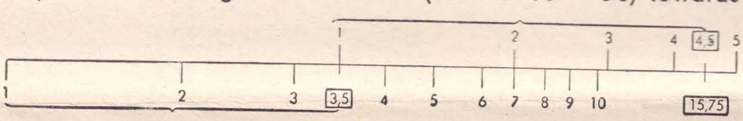


Fig. 2

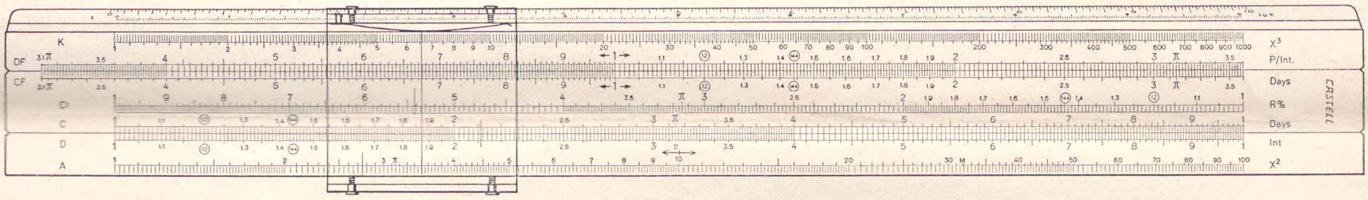
Conclusion.

If **two lengths of a slide rule are added together,** this results in a **multiplication,** while if **one length is subtracted from the other,** this results in a **division.**

2. The Scales of the Slide Rule CASTELL Super-Business No. 1/28

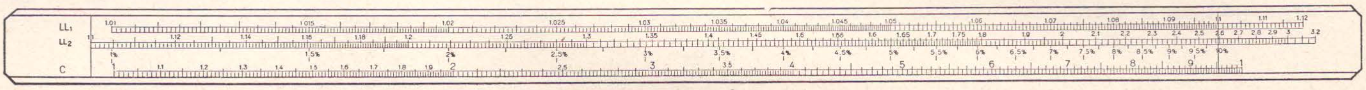
Front of Slide Rule 1/28

Fig. 3



Back of the Slide

Fig. 4



International terms for scales	Explanation	Colour	Identification Symbol
Main Scales:			
On upper body of rule, adjacent to the slide: **DF**	Basic Scale displaced by 360 (number of interest-days in the year) running from 3·1 via 1 to 3·6*	Black	P/Int. (principal/interest)
On slide, upper edge: **CF**	ditto	Red	Days
On slide, along centre: **CI**	Reciprocal Basic Scale, running from 10 to 1**	Green	R⁰/₀ (percentage rate)
On slide, lower edge: **C** (with additional scale C on the reverse of the slide)	Basic Scale from 1 to 10	Red	Days
On lower body of rule, adjacent to the slide: **D**	Basic Scale from 1 to 10	Black	Int. (interest)
Additional Scales:			
Lower body of rule: **A**	Square Scale corresponding to D and C	Black	x^2
Upper body of rule: **K**	Cube Scale corresponding to D and C	Black	x^3
Upper bevel edge of body: **L**	Logarithmic scale for D (C)	Black	log x
On reverse of slide: **LL_1**	Exponential scales	Black	$e^{0{\cdot}01\,x}$
On reverse of slide: **LL_2**	from 1·01 to 3·2	Black	$e^{0{\cdot}1\,x}$
Vertical lower edge of body:	Table for conversion of s & d into £	Black	sh/d and £

* **Displaced** = The scale does not start with 1, like the Basic Scales (C, D), but with 360. This saves a setting operation when multiplying or dividing by 360.

** **Reciprocal** = Runs in the opposite direction to the Basic Scales (C, D) and must therefore be read from right to left.

3. Taking Readings from the Graduations

This can most readily be learnt by means of the Basic Scales C and D. The main or centre hair line on the cursor should be utilised when effecting calculations on the main scales. Not every graduation mark or division has a number. Only the import ones have guide numbers which assist in the further reading of the intermediate graduations.

The slide rule does not show the order of magnitude to which a number belongs. For example, "6" may denote either 0·6, 6, 60, 600 or 6000.

It is therefore advisable to disregard the decimal point when setting the slide rule and taking readings and to determine it afterwards by a rough calculation.

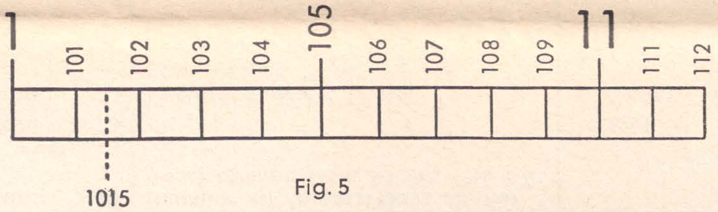
The simplest setting and reading method is as follows: —

For 3·65 = 3—6—5 (three - six - five); or
for 560 = 5—6 (five - six).

Scales of Slide Rule 1/28.

The individual graduated zones, totalling 3, are not evenly sub-divided, as they narrow towards the right. This can be seen most clearly from the two scales C and D. We distinguish between the following three zones:
From 1 to 2; from 2 to 4; from 4 to 10.

Section of graduated zone 1—2 (Scale C and D)

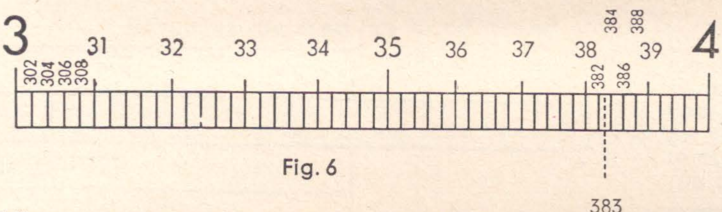


From guide-number 1 to guide-number 1·1
10 sub-sections of 10 intervals each (= 1/100 or 0·01 per graduation mark)

Fig. 5

Here an accurate reading to 3 places (e.g. 1-0-1) can be taken immediately. If the distance between 2 graduation marks is **halved**, an accurate 4-figure setting (e.g. 1-0-1-5) can be carried out. In such cases the final figure is always a 5.

Section of graduated zone 2—4

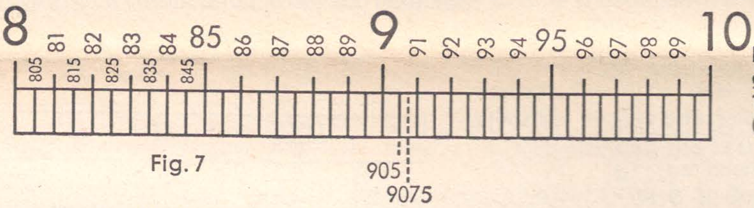


From guide-number 3 to guide-number 4
10 sub-sections of 5 intervals each (= 1/50 or 0·02 per graduation maik)

Fig. 6

Here an accurate 3-figure reading can be obtained (3-8-2). The last figure is always an even number (2, 4, 6, 8). If the intervals are halved the odd numbers 1, 3, 5, 7 and 9 can also be obtained (3-8-3).

Section of graduated zone 4—10



From guide-number 8 to guide-number 10
10 sub-sections of 2 intervals each (= 1/20 or 0·05 per graduation mark)

Fig. 7

Here an accurate reading to 3 places can be obtained if the last figure is a 5 (9-0-5). If the intervals are halved it is even possible to obtain an accurate reading to 4 places. Here again the last figure is always a 5 (9-0-7-5).

Other **intermediate values** have to be **estimated.**

Example: To set to 518, set to 5-1-7-5 by halving the distance between 515 and 520 and then move the cursor line slightly to the right.

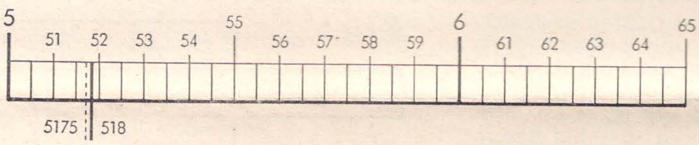


Fig. 8

First practise setting and reading until you are fairly confident.

Make use not only of the cursor line but also of the right-hand or left-hand 1 of the slide.

Note: Numerical values are always set and read with the use of the main line which extends across the whole of the cursor or by means of the initial 1 or final 100 (Scale A) or in the case of Scales CI, C and D, the final 1.

4. Multiplication

To multiply two numbers together, the method of adding together the sections of the slide rule to which they correspond is employed.

The most important scales for this purpose are C and D.

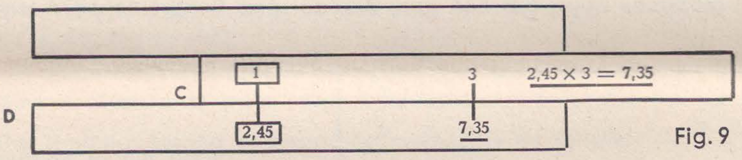


Fig. 9

Example: 2·45 × 3 = 7·35

Place the 1 at the beginning of the slide (**C** 1) above 2·45 on the lower scale of the rule (**D** 245); place the cursor line above the 3 on the lower scale of the slide (**C** 3) and read off the product (7·35) underneath the cursor line and on the lower scale of the rule. (**D** 735).

a×b

In certain calculations on the Basic Scales C and D it will be found that the second factor of a multiplication cannot be set within the range of adjacent markings on slide and rule.

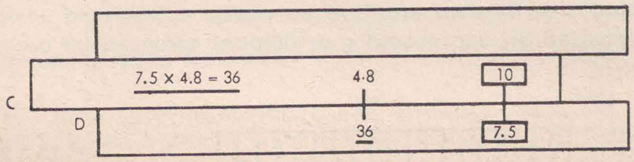


Fig. 10

Example: 7·5 × 4·8 = 36

In this case the slide is moved across to the left and **C** 10 placed above the first factor (7·5 on **D**). The cursor line is then placed above **C** 4·8 and the result (36) found underneath it, on **D**.

This operation is known as transposing the slide.

a×b

5. Division

Here the process used in multiplication must be reversed:

a number is divided by another number by subtracting the section corresponding to the denominator from that corresponding to the numerator.

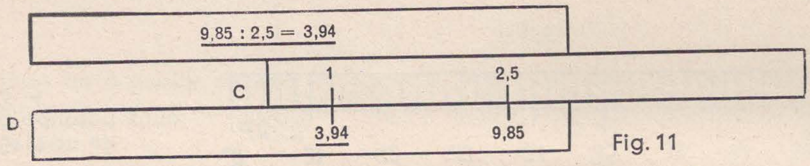


Fig. 11

Example: 9·85 ÷ 2·5 = 3·94

The cursor line is placed above the numerator 9-8-5 on Scale D, and the denominator 2·5 (on Scale C) is then placed underneath the cursor line.

Under C 1, at the beginning of the slide, the result 3-9-4 can now be found on Scale D.

$\frac{a}{b}$

Here, too, it may occur that, in setting, the slide has to be moved so far to the left that the result cannot be read under C 1; it is then found at the right-hand end, under C 10.

Example: 210 ÷ 28 = 7·5

Using the cursor line, place C 28 above D 210. C 1 projects as far to the left that a result cannot be obtained and one must now revert to C 10 at the other end of the slide beneath which the answer 7·5 is to be found.

$\frac{a}{b} \cdot \frac{c}{d} \cdot \frac{e}{f}$

6. Formation of Tables

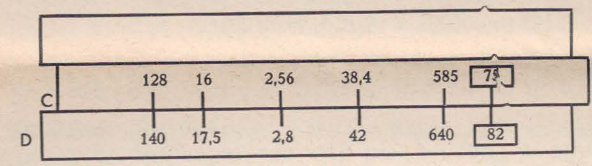


Fig. 12

Example: to convert yards into metres.

Take a known basic formula: 75 metres = 82 yards.

C 75 is placed above D 82. This produces a constant table, and the following readings can be taken: 42 yds = 38·4 m; 2·8 yds = 2·56 m; 640 yds = 585 m; 16 m = 17·5 yds.

For accurate readings use should always be made of the cursor line. It is thus placed above the known number of metres on C, the corresponding number of yards being found on D, under the cursor line, and vice versa.

Where a convenient equivalent (see table of constants on reverse of rule), is not known i.e. 75 lbs = 34 kilos but it can be established that 1 lb = 0·454 kilos, then C 1 or C 10 is placed above D 4-5-4, and this produces a table for the conversion of pounds into kilos, the pounds being shown on C and the kilos on D.

$\frac{a \times c \times e}{b \times d \times f}$

7. Combined Multiplication and Division

Example: $\frac{13{\cdot}8 \times 24{\cdot}5 \times 3{\cdot}75}{17{\cdot}6 \times 29{\cdot}6 \times 4{\cdot}96} = 0{\cdot}491$ Examples for practice: $\frac{38{\cdot}9 \times 1{\cdot}374 \times 16{\cdot}3}{141{\cdot}2 \times 2{\cdot}14} = 2{\cdot}883$; $\frac{1{\cdot}89 \times 7{\cdot}68 \times 8{\cdot}76}{0{\cdot}723 \times 4{\cdot}76} = 36{\cdot}95$

Always commence with the division and then carry out multiplication and division in alternation. The intermediate results need not be read off. First of all, therefore, D 1-3-8 and C 1-7-6 are brought into line with each other (division) by the aid of the cursor line. No reading is taken of the result under C 10 on D (approximately 0·8); the multiplication by 24·5 is next carried out by placing the cursor line on C 2-4-5. The result (about 1-9, on D) is, in its turn, immediately divided by 29·6, by keeping the cursor line in position and bringing C 2-9-6 underneath it. The multiplication of the result (0·65 under C 10 on D) by 3-7-5 and, finally, the division by 4·96 are carried out in the same manner. The result, 0·491, can then be found, under C 10 on D.

8. **Square and Square Root**

a^2

Numbers are **squared** by taking direct readings from the D scale to the A scale; for this purpose it is of advantage to use the central cursor line. The cursor line is placed over the value on D, and the square is found on A.

Example: Calculating the area of a square surface with a side of 47 cm.
$A = 47^2 = 2209$ cm². Place the cursor line over D 4·7 and find the result, 2209, below it, on Scale A.

Examples for practice: $1{\cdot}345^2 = 1{\cdot}81$; $4{\cdot}57^2 = 20{\cdot}9$; $0{\cdot}765^2 = 0{\cdot}585$; $67{\cdot}3^2 = 4530$; $9{\cdot}7^2 = 94{\cdot}1$; $10{\cdot}7^2 = 114{\cdot}5$.

Square roots are found by the converse process.

The cursor line is placed over the number on A of which the square root is to be found, and the root is read off on D. In this case it is **not** immaterial which zone of A is selected for the setting of the number of which the root is to be found:

The following "rule of thumb" should be applied:

Use the "left zone" (1-10) for all settings with an **odd** number of places in front of, or noughts after, the decimal point.

Use the "right zone" (10-100) for all settings with an even number of places in front of, or noughts after, the decimal point.

The original number can also be "placed" in either of the two "zones" (1-10 or 10-100) required by analysing it into separate "powers":

a^3; $\sqrt[3]{a}$

Examples: $\sqrt{1936} = \sqrt{100 \times 19{\cdot}36} = 10 \times \sqrt{19{\cdot}36} = 10 \times 4{\cdot}4 = 44$

$\sqrt{0{\cdot}543} = \sqrt{54{\cdot}3 \div 100} = \sqrt{54{\cdot}3} \div 10 = 7{\cdot}37 \div 10 = 0{\cdot}737$;

$\sqrt{0{\cdot}00378} = \sqrt{37{\cdot}8 \div 10000} = \sqrt{37{\cdot}8} \div 100 = 6{\cdot}15 \div 100 = 0{\cdot}0615$

Examples for practice: $\sqrt{10{\cdot}24} = 3{\cdot}2$; $\sqrt{62} = 7{\cdot}88$; $\sqrt{4{\cdot}56} = 2{\cdot}135$; $\sqrt{7{\cdot}68} = 2{\cdot}77$; $\sqrt{45{\cdot}3} = 6{\cdot}73$; $\sqrt{70{\cdot}8} = 8{\cdot}41$.

9. **Cube and Cube Root**

The Cube Scale K, provided on the upper part of the body of the slide rule, is based on the equation $\log x^3 = 3 \log x$; that is to say, it has 3 decades within the range of the decade of the basic scale. Numbers are cubed by direct readings from the D scale to the K scale.

Examples for practice: $1{\cdot}54^3 = 3{\cdot}65$; $2{\cdot}34^3 = 12{\cdot}8$; $4{\cdot}2^3 = 74{\cdot}1$; $6{\cdot}14^3 = 232$; $8{\cdot}82^3 = 686$; $0{\cdot}256^3 = 0{\cdot}0168$; $8{\cdot}98^3 = 724$.

Cube roots are extracted conversely by reading from the K scale to the D scale, using the cursor line, and noting that the left "decade" must be used for the setting of single-digit numbers, the middle for that of two-digit numbers and the right for that of three-digit numbers.

Examples for practice: $\sqrt[3]{4{\cdot}66} = 1{\cdot}67$; $\sqrt[3]{29{\cdot}5} = 3{\cdot}09$; $\sqrt[3]{192} = 5{\cdot}77$; $\sqrt[3]{6{\cdot}8} = 1{\cdot}895$; $\sqrt[3]{0{\cdot}645} = 0{\cdot}864$; $\sqrt[3]{1953} = 12{\cdot}5$.

Powers with the exponents $\frac{2}{3}$ and $\frac{3}{2}$ can be calculated by using the **Cubic Graduation K in conjunction** with the **Square Graduation A** and with the aid of the cursor line.

Example: $7{\cdot}5^{\frac{3}{2}} = 20{\cdot}54$. Place the cursor line over 7·5 on A and find the result (20·54) on K, underneath the cursor line.

Example: $132^{\frac{2}{3}} = 25{\cdot}9$. Place the cursor line above 132 on K and find the result (25·9) on A, underneath the cursor line.

Examples for practice: $0{\cdot}033^{\frac{3}{2}} = 0{\cdot}006$; $22{\cdot}7^{\frac{3}{2}} = 108{\cdot}2$; $0{\cdot}33^{\frac{3}{2}} = 0{\cdot}1893$; $5{\cdot}2^{\frac{2}{3}} = 3$; $64^{\frac{2}{3}} = 16$; $14^{\frac{2}{3}} = 5{\cdot}8$.

10. **Common Logarithms**

Readings of the common logarithms are taken by proceeding from the Basic Scale D (or from Scale C, in the case of a zero setting) to the logarithmic scale L, which is provided on the upper bevelled edge of the slide rule, adjacent to the inch scale, once again employing the central cursor line.

Example: $\log 52 = 1{\cdot}716$
$\log x = 2{\cdot}574$; $x = 375$

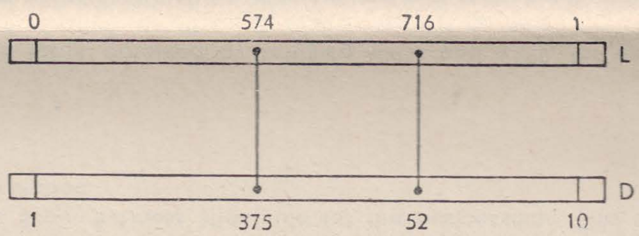


Fig. 13

Preliminary remarks on the ensuing types of commercial calculation:

The following sections — calculation of percentages, percentage deductions, percentage additions, currency conversions, etc. — show the advantages of the CASTELL Super Business slide rule for the businessman. This slide rule is shown to be far superior to many other aids to calculation.

11. **Percentage Calculations**

These calculations are based on the formation of a table, obtained by bringing 100% and £ 820, for example, into line with each other.

Example: To find 34·4% of £ 820.

Place D 8-2 and C 10 opposite each other, move the cursor to C 3-4-4, and find the result (2-8-2, i.e. £ 282), underneath it, on D.

Percentage Deductions and Additions.

Example: Certain customers receive a 25% discount on the gross price. What is the nett amount which they have to pay? Place CF 1 (middle ←1→ on CF = upper red scale on slide) under DF 75 (100%—25%); the gross and the nett prices are then obtained on CF and on DF respectively. The actual values in each case are found with the aid of the cursor line.

Gross price on CF:	2·58	4·35	6·45	9·00	11·25
Nett price on DF:	1·94	3·26	4·85	6·75	8·45

In the case of the gross prices between 3·6 and 4·2, which cannot be set on CF, the cursor line is set on Scale C and the reading taken underneath it, on **D**.

Example: A price list has to be amended, as all prices have been increased by $6\frac{3}{4}$%. £ 100 now becomes 106·75. CF 1 is thus placed against DF 106·75. CF then shows the old and DF the new prices.

Old price on CF (or C):	3·00	3·36	4·74	7·50	8·20
New, increased price on DF (or D):	3·20	3·59	5·06	8·01	8·75

Example: In converting purchase prices into selling prices, an addition of 43% has to be allowed for expenses and profit. Place CF 1 against 143 (100% + 43%) on DF, and find the corresponding values with the aid of the cursor line:

Purchase price on CF (or C):	Francs	1·16	1·75	2·40	3·25	7·45	87·00
Selling price on DF (or D):	Francs	1·66	2·50	3·43	4·65	10·65	124·40

And now to something rather more difficult:

Example: A merchant grants a discount of 27% on certain articles. What percentage must he add to his first costs? Place CF 1 (100%) under 73 on DF (100%—27%). Under DF 1 we can now find 1-3-7 (100% + 37%) on the CF scale. A 27% discount thus corresponds to a 37% addition.

This has also provided us with a further table: on DF we find the values reduced by 27% and on CF the values increased by 37%.

First costs on DF (or D) of	Francs	2·08	2·97	4·25	7·90	8·43
Required selling prices on CF (or C) of	Francs	2·85	4·07	5·82	10·82	11·55

Example: We have a basic price of $ 66·50. Various percentage additions and deductions have to be determined. $ 66·50 is 100%. CF 1 is thus placed under DF 665. An addition of 3% thus results in $ 68·50, and the use of the cursor line results in a reading of 6-8-5 on DF, above CF 103.

$10\frac{1}{2}$% addition results in $ 73·50, for the reading above CF 110·5, is DF 7-3-5.
$7\frac{1}{2}$% deduction results in $ 61·50, for the reading above CF 92·5 (100%—7·5%) is DF 6-1-5.
15% deduction results in $ 56·50, for the reading above CF 85 (100%—15%) is DF 5-6-5

12. **Costing Calculations**

Explanations make the setting-exercises appear more difficult than they really are. The "reading layout", as explained on Page 5 etc. should be kept in mind at all times. Here CF 1 and DF 1 are in the centre of their respective scales, with the **percentage deductions** to the **left** and the **percentage additions** to the **right.**

(1) In a costing operation, a purchase price of DM 4·45 is to be increased by 7½% delivery costs, 17% overheads or general expenses and a 28% profit margin.
Bring CF 1 (100%) against DF 1075, for as a result of the first addition DM 100 becomes DM 107·50. The cursor line is then placed above CF 117, so that 17% is thus added, and CF 1 is now brought beneath the cursor line. The 28% is then added by placing the cursor line over CF 128. The required sequence of figures — 161 — will be found above it, on DF. This is the **costing factor** by which the basic price has to be multiplied.
If CF 1 is now placed under the cursor line, i.e. if CF 1 and the costing factor (161) are brought into line, a table is formed; on CF (or C) we have the purchase prices and on DF (or D) the selling prices.
Readings can thus be taken as follows: DM 4·45 becomes DM 7·16; DM 6·13 becomes DM 9·87; DM 12·68 becomes DM 20·41.

(2) In a costing operation 7½% has to be deducted and 14% then added, after which 2½% and 13% are to be deducted in succession. Find the costing factor!
We thus have to proceed as follows: as 7½% is to be deducted, CF 1 is moved to the left by 7·5 (starting from DF 1). We now add 14% by moving the cursor line to the right until it is above CF 114. CF 1 is again brought underneath the cursor line. The cursor line is then moved to the left by 2·5 (for "—2½%"), starting from CF 1; CF 1 again comes under the cursor line. Finally, we move by 13% to the left (for "—13%"), starting from CF 1. The costing factor (0·894) will be found above it, on DF.
By multiplying the initial figure by 0·894 we save all the time-consuming intermediate calculations.

(3) On a list price of DM 13·75 a dealer is to be granted a price reduction of 6½%, a rebate of 23% and a discount of 2%
CF 1 (in the centre of the upper red scale of the slide) is placed against DF 935 (100%—6½%). The cursor line is then placed on CF 77 (100%—23%), CF 1 once again being brought under the cursor line, and the latter is then moved to CF 98 (100%—2%). The **costing factor** (0·706) is found on DF.
If CF 1 is placed under the cursor line we have a further table and can make the following readings:
The amount payable in place of DM 13·75 is DM 9·71; DM 11·70 becomes 8·26; DM 7·45 becomes 5·26.

13. **Calculation of Simple Interest**

Rule to be noted: Place the cursor line over the **principal** on the DF (or P/Int.) Scale, then bring the **percentage** on the CI (or R%) scale beneath it; move the cursor line into position above the number of **days** on the CF or C (or Days) Scale; the **interest** will then be found above it on the DF (or D) Scale or below it on the P/Int. or Int. Scale.

Example: To find the interest on £ 8,000 at 5% for 160 days.
Place CI-5 under DF-8, then move the cursor to C 1-6 and find the result (1-7-7-7, i.e. £ 177·70) underneath it, on D.

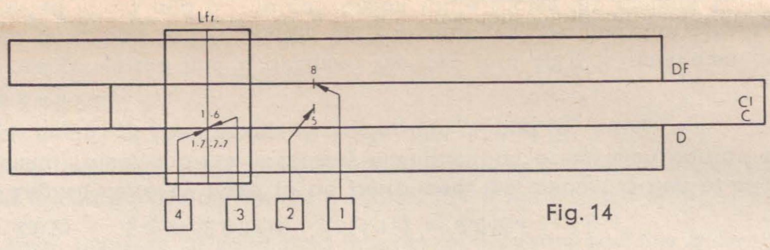


Fig. 14

Examples for practice:

Principal:	£ 4650	£ 6400	£ 489
Rate of interest:	4½%	4%	3¾%
Days:	284	183	220
Interest:	£ 165·1	£ 130·15	£ 11·20

If the interest is based on a year of 365 days (instead of 360, as in the present examples), we set the small cursor line (situated slightly to the left of the main line), against the interest rate.

Examples:

Principal:	£ 250	£ 1130	£ 855
Rate of interest:	3%	3½%	2¾%
Days:	146	67	41
Interest (1 yr = 365 days):	£ 3·00	£ 7·26	£ 2·64
Interest (1 yr = 360 days):	£ 3·04	£ 7·37	£ 2·68

14. **Currency Conversions**

Calculations based on rates of exchange are carried out by means of Scales C and CI. Only the main cursor line is used for the required settings.

Example: Rate of Exchange: U.S. \$ 1 = DM 4
Converse Rate: DM 1 = U.S. \$ 0·25
Place the main line above C 4 and find the result (2-5, i.e. U.S. \$ 0·25) above it, on CI.

Examples for practice:
Rate: £ 1 — DM 11·20 Converse Rate: DM 1 = £ 0·0893
Rate: 100 Dutch guilder = DM 110·40
Converse Rate: DM 100 = 90·5 Dutch guilder

Conversion Table for English Currency.

On the lower edge of the CASTELL Super-Business slide rule a conversion scale for English currency is provided, with the decimal equivalents in £ shown opposite the s d amounts.

Examples: 4/— = £ 0·2; 5 d = £ 0·0208; 11/1 d = £ 0·554

If calculations involving English currency have to be performed, the amount is first of all converted, by means of this special scale, into a decimal value, and the necessary multiplication or division carried out, the decimal result then being converted back, by means of the conversion scale, into s and d.

Example: To find 37% of £ 4-3-9d.

First of all the s and d are converted into a decimal. We find that 3/9 d is equivalent to £ 0·1875. Our total is thus £ 4·1875. By the procedure described in the section on "Percentages" we find that 37% is equal to £ 1·55. The decimal value £ 0·55 is now converted into s and d. The conversion table shows the amount 11/— above £ 0·55. Consequently, 37% of £ 4-3-0 d is £ 1-11-0 d.

15. **Calculation of Compound Interest**

The back of the slide carries the "log-log" scales, LL_1 (**along the top**), and LL_2 (**along the centre**) — these, together with the Basic Scale C (along the bottom) and a series of percentage marks which appear directly underneath the LL_2 scale, enable compound interest calculations to be carried out. They provide the so-called **"capital-growth" or "accrued-interest" factors,** with which the calculation is continued on the main graduations.

(a) to find capital-growth factor for 5% in 10 years
Turn the slide over and insert it so that LL_1 slides adjacent to DF and C (on the back of the slide) moves against D.
(1) Place the cursor line above the 5% mark (which lies underneath the LL_2 scale).
(2) The "capital-growth factor" (1·63) will be found above it, likewise under the cursor line on LL_2.

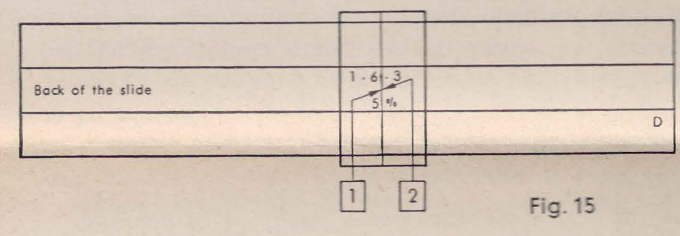


Fig. 15

Examples: Int: 3% period: 10 yrs. Factor: 1·344
Int: 2% period: 10 yrs. Factor: 1·219
Int: 3·5% period: 10 yrs. Factor: 1·411

Where the period is 10 years, a practised user can take an immediate reading of the factor from the back of the slide without first having to turn the slide over and re-insert it.

Example: To what sum will £ 415 grow at 4% compound interest in 10 years?

On the back of the slide we find 1·4802 (LL_2) above 4%. This is the capital-growth factor by which £ 415 has to be multiplied. The multiplication is carried out on the main scales, the result being £ 614·3.

Example: £ 3150 has been invested at compound interest for 10 years and has grown to £ 4550. What was the interest rate?

We must first of all find the capital-growth factor. We thus perform the division 4550 ÷ 3150 = 1·445 on the front of the slide. On the back of the slide we find an interest rate of 3¾% opposite this value.

In these examples the number of years was 10 throughout, but the compound interest scale also enables the **capital-growth factor for any other period of years to be determined. Now, however, the slide must always be removed, turned over and re-inserted.**

Example: for growth of capital in a period of less than 10 years:

Find capital-growth factor for 3% in 8 years. Place the 3% mark (found below the LL_2 Scale) above D 10 (D 1), move the cursor into position above D 8 and find the factor (1·2667) on the LL_2 scale.

This also provides the table for the capital-growth factors for 3%. For 5 years it is 1·159, whilst for 7 and 6 years it is 1·23 and 1·194 respectively.

In the case of a lower rate of interest (usually under 3%) and a smaller number of years (up to 4), the capital-growth factor is read on the LL_1 scale.

Example: Find capital-growth factor for 2½% in 3 years.

Place the 2½% mark above the left-hand "1" of Scale D, move the cursor into position on D 3 and find the factor (1·077) on the LL_1 Scale.

In the case of longer period than 10 years, either the left-hand or the right-hand "1" can be used.

Example: for growth of capital in a period of over 10 years:

Find the capital-growth factor for 3·5% in 13 years. Place the 3·5% mark under C 1, move the cursor line into position above D 1·3 and find the capital-growth factor (1·564) above it, on LL_2.

Rule for taking readings of capital-growth factors:

When the percentage-rate is set above the **right-hand "1"** of Scale D:

Always take the reading from the central scale (LL_2).

When the percentage-rate is set above the **left-hand "1"** of Scale D:

Reading to be taken from upper scale (LL_1) in the case of a short period of years;

Reading to be taken from centre scale (LL_2) in the case of a period of over 10 years (in which case the left-hand 1 is regarded as 10).

After a certain amount of practice the user knows immediately above which "1" on the D scale the percentage-rate is to be placed.

If, however, the capital-growth factors for various different periods with one and the same interest rate are required, it may be that certain values will lie outside the "reading range".

Example: To find the capital-growth factor at 3% in 2, 3 and 5 years.

Using the cursor line, place 3% above the left-hand "1" on Scale D. You will then find above 2 (2 years) on the D scale the factor 1·0609 on LL_1; for 3 years the factor 1·0928 on LL_1. No reading can be taken of the capital-growth factor for 5 years.

This necessitates the process known as "transposing the slide". Place the cursor line above the right-hand red vertical mark of the slide and move the latter to the right until the left-hand red mark appears beneath the cursor line. Readings can now be taken of all capital-growth factors for periods of over 3 years (that for 5 years being 1·159). The "reading rule" already mentioned now applies: After "setting" above right-hand 1, always "read" on LL_2.

The exponent of the capital-growth factor (the number of years for investment at compound interest) will, in most cases, be a small number but the slide rule also provides a reading of the capital-growth factor in the unusual cases in which the exponent is a fairly high number.

Example: Find capital-growth factor for 4¼% in 30 years.

The power is sub-divided into 15 + 15, a reading taken of the capital-growth factor for 15 years and this factor multiplied by itself. For this purpose, the slide — which has been turned over — is pulled out to the left to the distance necessary to ensure that the 4¼% mark of the LL_2 scale is above D 1. If the cursor is then moved to D 15 we then obtain for the power q^{15} the value 1·867, on the exponential scale LL_2 and underneath the cursor line. This value is then set on Scale D, by means of C 1, and the same value traced on Scale C, after which D provides the reading (3·486) of the capital-growth factor for 30 years at 4¼%.

16. **Care of the Slide Rule**

CASTELL Precision Slide Rules are the result of many years experience, a culmination of the skilled workmanship of men with long training; the rules are unsurpassed for precision and should be handled with care.

Slide Rules of Specialised Wood Construction are impervious to climate; they should nevertheless be protected from any considerable temperature fluctuations and from humidity. The resilient base gives the Slide Rule great elasticity, making it easier to move the slide and adjust its mobility. There are metal inserts ensuring exceptional stability in the basic structure of the Slide Rule and preventing deformation by climatic influences.

To preserve the legibility of the graduations, the facial scales and the cursor should be protected from dust and scratches, and cleaned at frequent intervals with the special CASTELL cleaning agent No. 211 (liquid) or No. 212 (in paste form).