Another Forgotten Helical Scale Slide Rule: The Fischer Cylindrical Calculator

The compact pairing of helical scales with a tubular or cylindrical body created some endearing high-precision slide rules.

Introduction

Reading Peter Hopp's insightful article about Prof. R.H. Smith's Calculator in last year's *Gazette* [1] reminded me of another unsung and equally rare slide rule with helical scales: the **Fischer Cylindrical Calculator**.

The most written about slide rule with helical scales is the ubiquitous W.F. Stanley-made desktop Fuller with its quirky brass mounting spigot. However, the most well-known slide rules with helical scales are the much-loved and tactile Otis Kings. The commonest models are the **K** and the **L** but there were others[1]. Although named after their inventor, "Otis King" was only ever the brand name and not the maker. Shortly after its launch in 1921, production was outsourced to UK manufacturer *Carbic Limited*. What is even less well known is that in the late 1950s Carbic started making another slide rule with helical scales [2]. Although again tubular, the newest offering looked nothing like any Otis King or even the comparable Prof. R.H. Smith Calculator.

Figure 1: A Fuller on its spigot

Persistence

R.H. Smith Calculators seldom come up for sale on eBay. Slide Rule Searches[2] of eBay auctions from 1999 confirm this is equally true for Fischer Cylindrical Calculators. However, at least one did briefly appear in 2014. I happened to spot it but I was put off by the shipping restriction: "*collection only from Perth, Scotland*"! Not expecting much, I asked the seller if given its small footprint they would consider shipping to The Netherlands. I got a friendly reply explaining the listed shipping restriction was a mistake and he would ship anywhere. The eBay listing accordingly changed and I resigned myself to the expected flood of sky-high bids. But then the posting disappeared! As the seller was initially so friendly and helpful, I got back in touch and asked why the change of mind. Unexpectedly he had to make an extended trip abroad before the posted closing date of the auction. So to avoid upsetting buyers he felt obligated to withdraw the item for reposting at a later date. But ironically his last-minute travel plans had just been cancelled. He was now staying in Perth and would I like to make him a private offer. I may have used up all my "collecting luck" for the year in that one deal as an unbelievably rare Fischer Cylindrical Calculator was soon, for a modest fee, on its way to The Netherlands.

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[1] See Paul Tarantolo's Collection: https://osgalleries.org/collectors/tarantolo/tarantolothumbnails.cgi .
[2] Rod Lovett's eBay search engine: https://sliderules.lovett.com/srsearch.html .

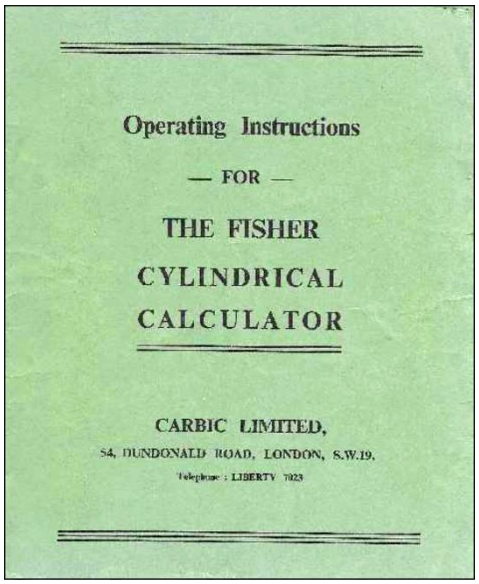
Figure 2: Plastic, paper and metal 29 x Ø 2.5 cm long-scale Fischer Cylindrical Calculator with helical scales and its dark mottled green cardboard tubular case and cap

Rafael Fischer

This unique-looking long-scale calculator with helical scales was invented by Israelis **Rafael Fischer**. He was granted international patent **GB778556** for his design in 1957. This patent was preceded by national Israeli patent **8666** (now lapsed) from 1955. However, it proved difficult to uncover much about the inventor's life. When applying for his calculator patents he was living in Kiryat Motzkin, a suburb of Haifa in Israel. At this time Fischer was working in the Engineering Department of the Haifa Postal Service. This probably explains why his earlier Israeli patent, 6036 (also now lapsed), was for: "*improvements in automatic telephone installations*" [3].
Although outwardly the Fischer Cylindrical Calculator and the Otis King models look noticeably different, at least patent application wise Fischer's design is strikingly similar to Otis King's patent GB183723 from 1922. Perhaps the timing helped as when Fischer applied for his international patent in 1957, the earlier Otis King patent would have elapsed after 20 years in 1942. Also by asking Carbic Limited to make his calculator, strongly suggests Rafael Fischer at least knew about the tabular Otis King models. Sadly my Fischer Cylindrical Calculator came without any instructions and before a long-lost copy surfaced in 2023, I struggled with Fischer's patent claim that, in contrast to other helical calculators, his design resulted in a: "… *simple pocket instrument that is easy to manipulate*". I found it anything but intuitive to use and any owner would have needed unnaturally deep pockets to carry it around!

Fischer or Fisher Cylindrical Calculator?

When cased, all known examples came in an unmarked dark mottled green cardboard tube as shown in Figure 2. The branding on the calculator was always limited to the maker's name and address on one end and the international patent number on the other end. The address, *54 Dundonald Road, London S.W. 19,* helps with the dating as Carbic moved to these premises after 1951. In both patent applications the device is described as a: "*logarithmic calculator similar in principle to a slide rule*". Therefore, until the recent discovery of a Carbic Ltd. produced set of instructions, it has always been known as the Fischer Cylindrical Calculator. Instead for the instructions and the accompanying sales leaflet Carbic surprisingly


Operating Instructions

— FOR —

THE FISHER

CYLINDRICAL

CALCULATOR

CARBIC LIMITED,

54, DUNDONALD ROAD, LONDON, S.W.19.

Telephone : LIBERTY 7023

Figure 3: Operating Instructions for the "Fisher" Calculator

chose the "anglicised" model name of: **Fisher Cylindrical Calculator** [4]. Collectors may recall seeing the name *Fisher* on a linear slide rule. Makers such as Blundell Harling, IWA and Pickett & Eckel all produced a specialist slide rule to size correctly *Fisher Control Valves*. But this Fisher refers to William Fisher who, in 1880, founded a company that started making control valves. Such expensive and sensitive Fisher-type control vales have always been needed to monitor and precisely control the measured flow of a fluid such as gas, steam, water or a chemical compound to a point of delivery. Given that the early Fisher Control Valve slide rules probably came out before Carbic started making the Fischer Cylindrical Calculator, it is surprising the company chose the same model name as an existing specialist linear slide rule.

How it worked

The Fischer Cylindrical Calculator was robustly made. The scales were printed on paper and sealed helically around a rigid brass and grey plastic tube with sturdy knurled black metal handgrip on one end. A primary full-length plastic sleeve and a shorter 14.5 cm wide secondary plastic cursor sleeve slide snugly over and around the scales. The sleeves are transparent and each has four positioning arrows for calculating. On the primary sleeve the arrows are **red** and called R-1, R0, R1 and R2 by Carbic. The open end of the primary sleeve is banded with two red rings but is capped off with a red plastic endcap on the other end. The endcap has a needed hole in the centre to allow air to escape when sliding the extended sleeve back along the stock to the closed position. On the secondary cursor sleeve the arrows are **black** and called B-1, B0, B1 and B2 by Carbic. Both open ends of the cursor sleeve are banded with two black rings [4].

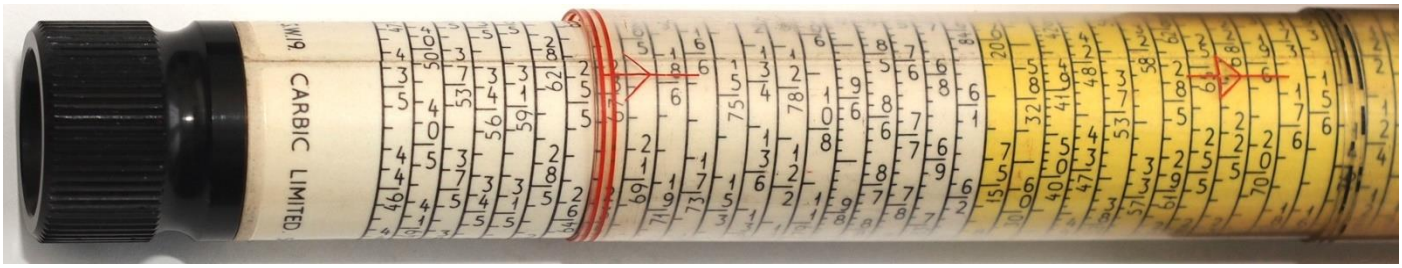
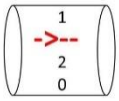


Figure 4: Enlarged half of the Fischer Cylindrical Calculator showing the T and S scales, both sleeves and some of the positioning arrows

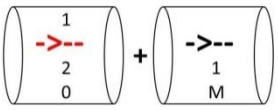
The calculator has four scales, all standard – an **A** scale (coloured yellow and called Q by Carbic), a **D** scale (called M by Carbic), an **S** scale (coloured yellow) and a **T** scale. With this complement of scales multiplications, divisions, squares and square roots are possible alongside calculations involving sines and tangents [4]. The calculator's higher precision comes from it being a long-scale type of slide rule. Long scales are scales where by folding or overlapping sections of the scale, its total length is longer than the physical length of the stock [5]. The effective helical scale length of the Fischer Cylindrical Calculator is 140 cm whereas the tubular stock length is just 29 cm. However, unlike the Otis King's, the Fischer Cylindrical Calculator does not have to be extended before it can be used.

Collectors familiar with similar tubular long-scale slide rules will recognise the way of calculating. For everyday calculations such as multiplications and divisions just the **D** scale is used. For example, to calculate **12 x 3** the following four steps are needed:

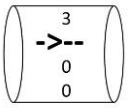
1. Move the **red** arrow R0 on the primary sleeve (second arrow from the left) to line up with **12** on the D scale (depicted as "120")



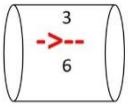
2. Keeping the primary sleeve in place, set the **black** arrow B0 on the cursor sleeve (second arrow from the left) to line up with **1** on the D scale



3. Holding the cursor sleeve in place, use the black handgrip to move the stock so **3** on the D scale (depicted as "300") is aligned with the **black** arrow B0 on the cursor sleeve



4. The answer **36** can now be found under the single **red** arrow still in the range of the D scale (n.b. only one of the four red arrows will ever be in the range of the D scale at the end of any calculation – in this example R0)



For chained calculations such as **12 x 3 x 4** the earlier listed step 4 obviously changes and two extra steps are needed:

4. Keeping the primary sleeve in place, reset the **black** arrow B0 on the cursor sleeve (second arrow from the left) to again line up with **1** on the D scale
5. Holding the cursor sleeve in place, use the black handgrip to move the stock so **4** on the D scale is aligned with the **black** arrow B0 on the cursor sleeve
6. The answer **144** can now be found under the single **red** arrow still in the range of the D scale (n.b. only one of the four red arrows will ever be in the range of the D scale at the end any calculation – in this example R1)

As is often the case when using such a tabular long-scale slide rule, the needed steps feel unintuitive and at first, excessively fiddly. But once the operations are mastered it is surprisingly quick and easy to use. The **A** scale only comes into play when calculating squares or square roots or calculations involving sines or tangents.
My Fischer Cylindrical Calculator came cased but even so both sets of the crucial black and red arrows are unhelpfully partially faded. I suspect this might have been a production fault (ink retention on the plastic) and be common to all Fischer Cylindrical Calculators.

Siblings

As they were both made by Carbic, the Fischer Cylindrical Calculator is inevitably paired with the Otis King models. However, although having the same maker and both being long-scale tubular types, they do not resemble each other in any way and their construction was radically different. Equally, unlike all Otis King's that can (just) be called pocket models, being 29 cm long the Fischer would not fit into any standard sized pocket. A much more deserving and the only true sibling, is the French-made **Lafay Hélice a Calcul**.

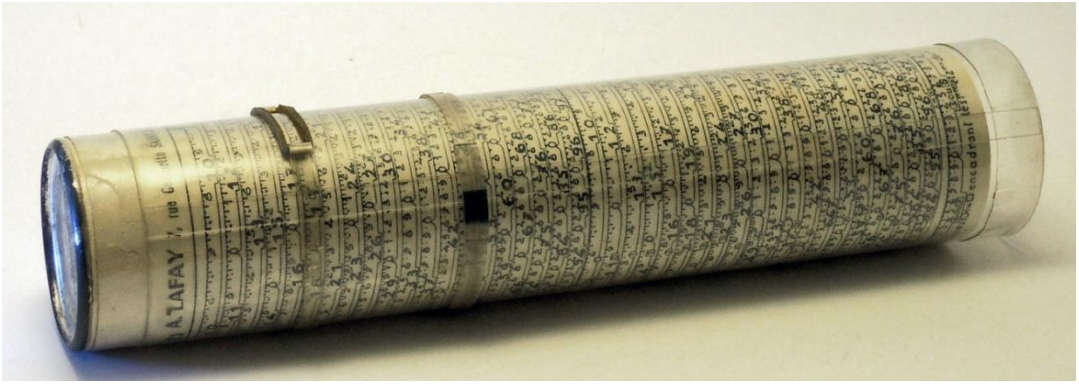
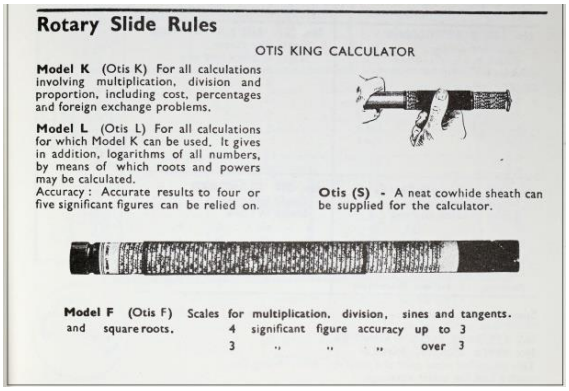


Figure 5: Cardboard and plastic 19 x Ø 4 cm long-scale Lafay's Hélice a Calcul model No. 2

Besides looking very much alike and both being long-scale types, calculations were also performed in a similar way. The respective inventors, Fischer and the Lafay, ironically also shared the same degree of only limited commercial success. Frenchman Jean-Antoine Lafay (1887-1964) invented the Hélice a Calcul and obtained an international patent for his design, FR695989, in 1930. His tubular long-scale slide rule was sold as three models[3]. Because he was a full-time Chemist, Lafay's calculator business was only ever a cottage industry. However, despite being inexpensive, the Hélice a Calcul models were not durable and like the Fischer Cylindrical Calculator not intuitive to use. So sales volumes from Lafay's home-based business were disappointingly low [6].

Conclusions

Some questions about the Fischer Cylindrical Calculator, like sales volumes, still remain unanswered. Moreover, what is the "correct" model name: (i) Fisher or (ii) Fischer? Although today politically incorrect, the most obvious explanation for the two spellings is that UK maker Carbic Ltd. singularly preferred the gentile spelling of Fisher to the German-Jewish spelling of Fischer. However, I favour honouring the inventor and keeping *Fischer Cylindrical Calculator* as the preferred model name. Carbic successfully marketed their Otis King series with sales flyers, folders and regular advertisement campaigns in national magazines. It is thought about 150,000 were sold [2]. Strangely Carbic chose not to co-market the Fischer Cylindrical Calculator alongside the Otis King's. This suggests that like the Lafay siblings, Carbic only ever made Fischer Cylindrical Calculators to order.


Rotary Slide Rules

OTIS KING CALCULATOR

Model K (Otis K) For all calculations involving multiplication, division and proportion, including cost, percentages and foreign exchange problems.

Model L (Otis L) For all calculations for which Model K can be used. It gives in addition, logarithms of all numbers, by means of which roots and powers may be calculated.
Accuracy: Accurate results to four or five significant figures can be relied on.

Otis (S) - A neat cowhide sheath can be supplied for the calculator.

Model F (Otis F) Scales for multiplication, division, sines and tangents. and square roots. 4 significant figure accuracy up to 3
3 ,, ,, ,, over 3

Figure 6: Bottom half of a page out of a 1960's *Esmond Hellerman Ltd.* Catalogue

Only one *Modern Drawing Equipment* Catalogue listing from a UK 3rd party, *Esmond Hellerman Ltd.*, has ever surfaced giving the two Carbic made calculators dual billing [7]. Even here the Fischer Cylindrical Calculator is only listed as a pseudo Otis King model F. However, a 1964 *Price List* for a Hellerman Catalogue reveals a strong clue as to what may have been behind Carbic's questionable marketing policy. The *Price List* quotes a British pre-decimal trade price

[3] Rod Lovett's gallery of Long Scale Rules: https://osgalleries.org/longscale/listsearch.cgi?string1=lafay&string2=&string3=&string4= .

of **£1 11s 8d** (GBP 1.58) and a retail price of **£2 7s 6d** (GBP 2.38) for a "model F" Fischer Cylindrical Calculator. This compares with a British pre-decimal trade price of **£2 8s 9d** (GBP 2.44) and a retail price of **£3 5s 0d** (GBP 3.25) for an Otis King model K or L [8]. The respective unit production costs are sadly unknown but are thought to be comparable. If correct, the margins on the Otis King's would have been significantly higher, making it unattractive for Carbic to undercut their "in-house" Otis King series by unduly encouraging sales of the competitor Fischer Cylindrical Calculator.

The rarity of Fischer Cylindrical Calculator's alludes to relative few ever being made. This is regrettable because Rafael Fischer turned an innovative idea into a quality finished product that deserved more exposure and much more commercial success. So do look out for the Fischer Cylindrical Calculator with helical scales as it would certainly grace any slide rule collection.

Acknowledgements and Bibliography

Friend **Otto van Poelje** for taking excellent high-resolution images (© POELiteLab) of my difficult to photograph Fischer Cylindrical Calculator. I also needed some help from four other fellow collectors: **Willy Robbrecht**, **Alan Williams**, **David Riches** and **Nathan Zeldes**. Willy also has a Fischer Cylindrical Calculator but importantly his uniquely came with a sales flyer and a set of instructions. Alan, another Fischer Cylindrical Calculator owner, had a Hellerman Catalogue that unusually listed the Carbic-made Fischer Cylindrical Calculator alongside Otis King's. David also had a Hellerman Catalogue but with a Price List from the same era. Finally, apart from the information in the patent application, I had no luck researching Rafael Fischer's life. Nathan agreed to help and by searching on Rafael Fischer's Jewish name, he uncovered some limited biographical details. Nathan also explained the nature of the Israeli patents and provided the image of the sibling *Lafay Hélice a Calcul* slide rule.

[1] **Hopp, Peter M.**: T*he Forgotten Helical Scale Slide Rule - Prof R.H. Smith's Calculator*, UKSRC *Gazette*, Issue 23, Autumn 2023, Pg. 33-39.

[2] **Barnes, Colin & White, Tedford K.**: *Otis King Calculators – A History of Production 1920-1977*, ISBN 978-0-9560254-2-5, private 2012 publication now only available via peterhopp678@btinternet.com , Pg. 23-27 & Pg. 99.

[3] **Zeldes, Nathan**: private email correspondence October, 2023.

[4] **Carbic Limited**: *The FISHER CYLINDRICAL CALCULATOR*, 2-page sales flyer and 10-page operating instructions, 1950s.

[5] **Rance, David**: *A Homage to Long Scales or When Size Does make a Difference!*, UKSRC *Gazette*, Issue 22, Autumn 2022, Pg. 73-77.

[6] **Zeldes, Nathan**: *Jean-Antoine Lafay: the story of an indomitable innovator*, UKSRC *Gazette*, Issue 18, Autumn 2018, Pg. 39-48.

[7] **Esmond Hellerman Limited**: *Modern Drawing Equipment Catalogue*, 1960's, Pg. 53.

[8] **Esmond Hellerman Limited**: *Catalogue Price List*, 1964.