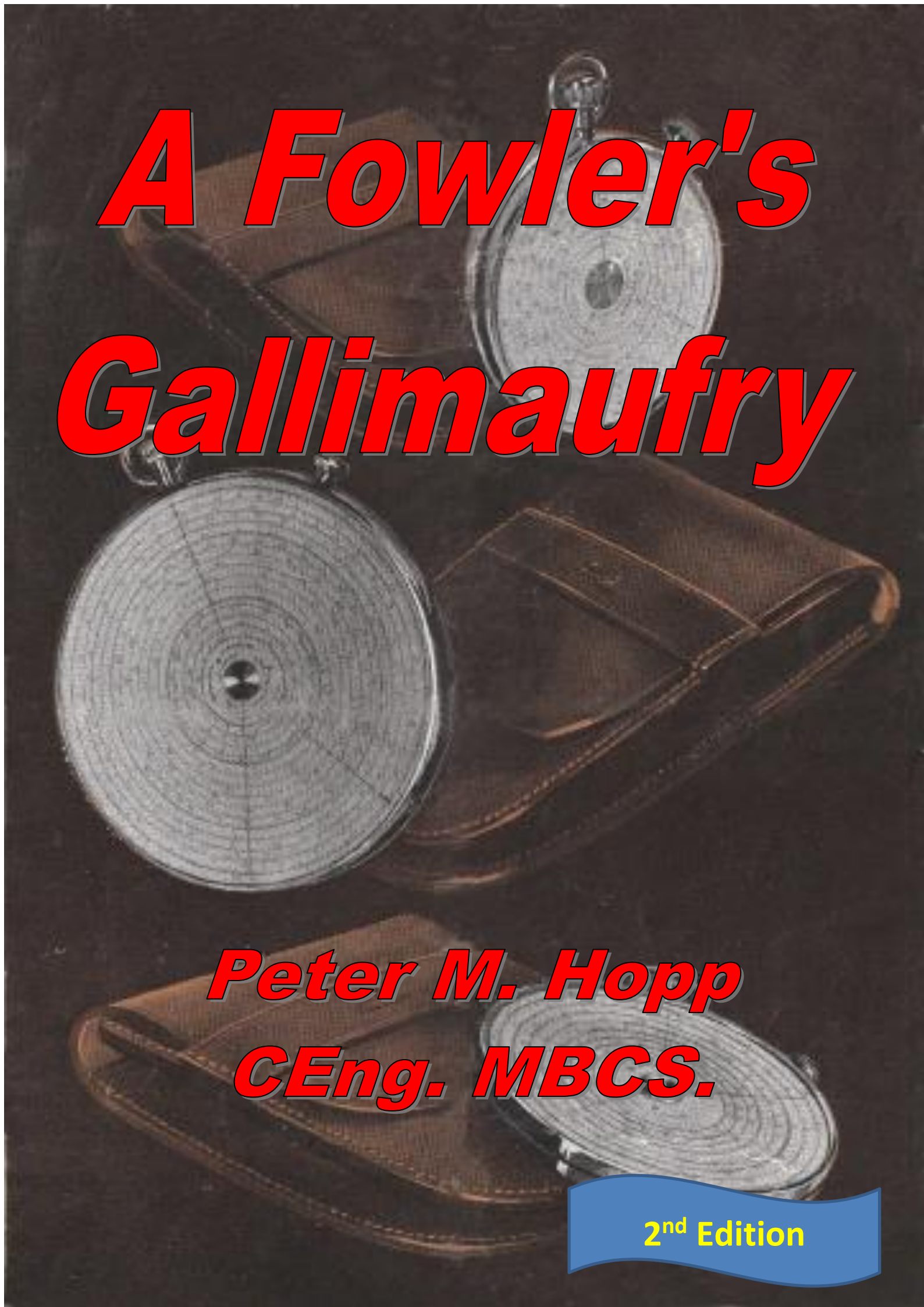

A Fowler's
Gallimaufry
Peter M. Hopp
CEng. MBCS.
2nd Edition

A Fowler's Gallimaufry

Peter M. Hopp, CEng MBCS

Version2

Table of Contents

Acknowledgements

The Cover illustration is taken from the inside page of a Fowler four-page A5 advertising pamphlet labelled "List 50" which could imply a date of 1950, with a photograph of a Fowler's Long Scale Calculator on its cover. It advertises that *"7 different types are available for all principal Trades and Industries. Each Calculator is supplied in handsome reinforced case with Instructions. Price on application."* Elsewhere it describes The MAGNUM Model with a Diam. of Dial 4½" and a hand added price of 63/-; The UNIVERSAL Model, Diam. of Dial 3⅜" and hand added price of 42/6; and finally VEST POCKET Model, Diam. of Dial 2⅝" and the same added price of 42/6. It is one of the few pieces of Fowler advertising I have been able to find. It fascinates me that there are often hand added changes in ink, Fowler must have had many more than immediately needed documents printed which then required modification – a sign of a thrifty company?

Within the pages of the book are numerous images of Fowler calculators for which I must thank the slide rule collecting fraternity for the generosity and help in supplying information to add to the completeness – such as it is – of the information presented. A resource such as eBay must also be added as an acknowledgement. Nowhere else is it possible to find such an abundant variety of calculators to study! The internet generally makes our author's jobs infinitely easier than ever it was.

I must also thank Alistair Pearson for allowing me to include considerable additional information relating to textile gauge points and also relevant information on the work and costing of cloth making that he has researched and generated – thank you Alistair!

Preface

Fowler's calculators and their antecedents, those from the Scientific Publishing (SP) stable, have been written about exhaustively by many authors within the slide rule collecting community, but to my mind never conclusively. This book attempts to achieve that! It is probably a forlorn hope, but I would rather travel in hope and nearly achieve my goal than not to travel at all!

I have written several times on these subjects, the "Fowler's Calculators – A Catalogue Raisonné" by Blankenhorn and de Cesaris in the JOS of Fall 2002 has achieved a degree of acceptance by being quoted as a knowledgeable source by several eBay sellers. Most recently the SP and Fowler chapters in my "Pocket-Watch Slide Rules", Astragal Press 2011 have added to those models recorded. However, since that date several other articles have added yet further information and data. I beg the reader's indulgence for obvious repetition, but the information now will at least be all in one place as this monograph will attempt to bring it all together!

Why Gallimaufry? Well we have had several articles using the definitive article, and we have had a Catalogue Raisonné, so I needed to find another and different collective noun to describe a marque, and I like Gallimaufry, it has a "ring" to it – so there you are!

This also seems the appropriate place to ask that if you the reader come across, or have in your collection any Fowler's Calculator that does not feature here, please let me have a picture and any other information about it that you may have – thank you in advance!

Introduction

My fascination for these quite delightful devices goes back very many years. My attempts at describing and classifying them are almost as long. My first attempt at describing the genre goes back to 1998 when, with the assistance of the late John Knott, I produced the first attempt at a "complete catalogue" of types[1]. Jenny Wetton of the Museum of Science and Industry in Manchester had published an article in the Bulletin of the SIS in 1997[2] which was a pretty short part of a series on instrument manufacturers in Manchester, and repeated much of what John, who had had preceded me and her with a short two-page article on the company itself [3], had previously said. These are the first two articles I have been able to find within the slide rule community.

Anything that purports to describe the Fowler's calculator genre in any conclusive and complete way must start by describing the Scientific Publishing range as well, for these are the true forefathers of the Fowler's range, so we will start with the SP calculators.

The de Cesaris and Blankenhorn 'Catalogue Raisonné' (from now on called C-R) developed a numbering system that seems to have found favour with some parts of the slide rule collecting fraternity. Unfortunately I have not found a sensible way of incorporating the multitude of variants that are part of both SP and Fowler's manufacture; however I have included the short form reference from C-R in my later classification. How to include all variants remains a problem. For example we have 10 variants of SP Mechanical Engineer (which did not feature in the C-R) and 14 of Fowler's Short Scale Textile (which featured in the C-R as 2MT1 with variants, which were not obvious, from 'a' to 'f'; and were not illustrated). Other models have many variants which similarly were not included.

Version1: 12.11.2019
Version2*: Includes the following:****25.01.2021***

- *Throughout, corrected spelling and grammar errors in Version 1*
- *New Type A1 calculator*
- *New Single sided Fowler Calculator (page31)*
- *Short Scale Textile: further variants identified and included:*
    - *New Type 0 this and the following new Type1a, 4a and 5a were found after examining further examples.*
    - *New Type 1a*
    - *New Type 3a – as T3 but labelled in English*
    - *New Type 4a – different rear scales inc 2.952.d*
    - *New Type 5a - different rear scales inc 2.952.d*
    - *Variations to later types as well*
- *New unique Ribble Motor Services Calculator, see page 93*
- *New Appendix B on Serial numbers*
- *Fowlers Type B and Fowlers Pick Finding variant – additional gauge point and Textile calculation information added courtesy of Alistair Pearson*
- *New Appendix C on Fowler Documents*

[1] ***Fowler Pocket-watch Type Calculators***, Peter M. Hopp. Journal of the Oughtred Society, Volume 7 No 2, Fall 1998
[2] ***Scientific Instrument Making in Manchester 1870 – 1940, III: Flatters and Garnet Limited, and Fowler & Company,*** Jenny Wetton, Bulletin of the SIS No 53, 1996, p15.
[3] ***Fowler & Company 1898 – 1988***, John V. Knott, Journal Of the Oughtred Society Vol 4 No 2, October 1995 p16.

A Fowler's Gallimaufry

'Scientific Publishing' Pocket-Watch Calculator

Introduction

John Knott [4] and Jenny Wetton [5] have previously covered the history of Fowler, both articles give the Scientific Publishing Company (SPC) as the root from which Fowler & Co. grew. The range of 'Fowler's calculators has also been previously covered[6], and pocket-watch type calculators carrying the SPC name are mentioned. In this document we attempt to define the chronology, and show how the range started with one pocket-watch calculator, 'The Mechanical Engineer', and then expanded via a small range of SPC calculators to the extensive range of calculators that were later available under the 'Fowler' brand name. It is very unlikely that SPC initially manufactured calculators, but we do know from later information that when they became Fowler they did assemble them.

History

William Henry Fowler set up the Scientific Publishing Company in 1898, his son Harold Fowler became involved in 1905. SPC were best known for the publication of a range of technical pocketbooks for architects and the engineering disciplines. William Henry was also the editor of a weekly news magazine, 'The Mechanical Engineer' which was published from 1898, initially at 6d. per week, and later (by 1909) had reduced to 3d. per week. The availability of a pocket watch calculator from SPC was advertised during 1898 [7]. The various Fowler's Pocket Books advertise many different Fowler watch type calculators over the years. A chronological list of addresses for the Scientific Publishing Company is as follows:

1898: Corporation St. Manchester, England
1901 - c1915: 53 New Bailey Street, Manchester,
1908: Workshop in the Family home, Sale Lodge, Sale, Cheshire.
Pre 1914: Oakleigh, the Avenue, Sale, Cheshire.
c1915: Fowlers & Co. 53 New Bailey Street, Manchester.

Pocket Watch type calculators

Calculators which are known to have been made or sold under the name of the Scientific Publishing Company are fairly rare and to date only include the following types:

- The Mechanical Engineer (single scale)
- The Mechanical Engineer (only one version carrying the SPC name) in various sizes
- The Mechanical Engineer, desk version (No known examples, but advertised by Halden in 1902)
- Fowler's Patent Pocket Calculator
- Type T textile calculator
- Type O Calculator – a later version of the Fowler's patent calculator

We can now look at these in greater detail to establish their chronology and to get a better understanding of which models were available under the SPC label and when.

Version2

[4] 'Fowler and Company, 1898 – 1938'; J.V. Knott in *Journal of The Oughtred Society*, Vol. 4 No 2, Fall 1995, p16-17.

[5] 'Scientific Instrument Making in Manchester, 1870 – 1940', iii- Flatters and Garner & Fowler and Company; Jenny Wetton in *Bulletin of the Scientific Instrument Society*, No 53, (1997), pp 15-18.

[6] 'Fowler's Pocket Watch Type Calculators'; Peter Hopp in *Journal of The Oughtred Society*, Vol. 7 No 2, Fall 1998, pp 43 - 49.

[7] Wetton (above) states 'In 1898, the '*Mechanical Engineer'* carried an article on a circular calculator, under the same name, which had been developed by the proprietors'. She goes on to say 'Records do not show who designed this instrument or where it was made; it was sold via the Scientific Publishing Co.'. See Appendix A.

Figure 1.1: 1.1a, 1.1b, 1.1c, and 1.1d 'Mechanical Engineer' calculators various

The 'Mechanical Engineer' (ME) Calculator

There has been some speculation as to who made the 'ME' calculator. A previous article [8], identified the apparent anomaly of a 'Swiss' marking on some examples, though the majority of known examples show no obvious maker's name. However we have now found enough examples which do carry a 'maker's name' i.e. Scientific Publishing or 'The Mechanical Engineer' so that we can now be certain that SPC were the retailer if not the actual maker. Four examples are shown in Figure 1.1; this appears to cover all known major variants with multi scales. Here we have an example with no maker's name and no model name (1.1a), a second example marked 'The Mechanical Engineer' but no makers name (1.1b), a third marked 'Scientific Publishing Company, Manchester' (1.1c), and finally one marked 'The Mechanical Engineer Price 6d. weekly' (1.1d). While many SPC adverts state that the calculator was available in two sizes, we now know that they actually came in three sizes, the scale diameters of 1¾", 2" and 2½" being obvious from Figure 1.1. The chronology of the models is more difficult to ascertain, and there are more and different variants as will be demonstrated later.

Subsequently we have also found what appears to be a 'single scale' Mechanical Engineer pocket calculator, a device that only carries the second scale of the 'normal' ME, i.e. the 'calculating scale' of the ME. Why SPC should decide to make such a simple calculator, and when, is not known, but we can try some theories and see how they work out.

Image Courtesy of the Conrad Schure Collection

Figure 1.2: Single scale ME

The device has 2" (51 mm) diameter scales in a 2½" (62 mm) diameter single sided case

[8] 'The Mechanical Engineer'; Bob De Cesaris in *Journal of The Oughtred Society*, Vol. 7 No 1, Spring 1998, pp 23 - 24.

and carries all the other characteristics of an ME, including the furniture etc., and it also carries the clearest Scientific Publishing Co., Manchester; labeling. As with the ME, the crown turns the scale and the side knob the pointer.

Note also that a 1902 Halden catalog advertises a desk version of a Mechanical Engineer. There is neither description nor illustration, but it is priced the same as an F-C Calculigraphe with a nickel case. This is a curious device as it has not been seen advertised anywhere else, and no examples are known.

With this [9] and other evidence ([4] and [5]) we can now be sure that the ME was sold by the SPC, and is in all probability the earliest design made and sold by them starting from 1898. Exactly what 'made' entailed is still open to debate. We know from contemporary photographs (c1908) in the Bolton Museum that Fowler assembled pocket-watch calculators (see the later Fowler sections). From this we can assume that either he had the components made to his designs, or that he bought off-the-shelf (pocket-watch?) components from any of a variety of sources; and hence some could have been 'Swiss'. Note that the calculator in Figure 1.1d has 'Swiss' stamped into the axle, (see also Figure 1.16) and Figure 1.3 is marked 'Swiss Make' on the dial. We do not know what this link was.

Figure 1.3: ME marked "Swiss Make" on the dial

Figure 1.1 appears to cover all known variants of the multi-scale ME, and Figure 1.2 is yet another in their range of calculators, the single scale calculator.

Dyson Textile Calculator.

Figure 1.4: Dyson Textile calculator

The Dyson Textile calculator very much appears to have been made by SP, though there is nothing stated on the device to confirm this. It has most of the "family features" of the ME and so it is being included here. Whether it is a variant of the ME, or whether it is another type of SP calculator remains unknown. Observing the internal mechanism of the Dyson and comparing it with the ME might confirm or otherwise this supposition.

It is included in the story at this point as the calculator follows the ME pattern by being in a pocket-watch case, and not the later 'Fowler' patent patterns.

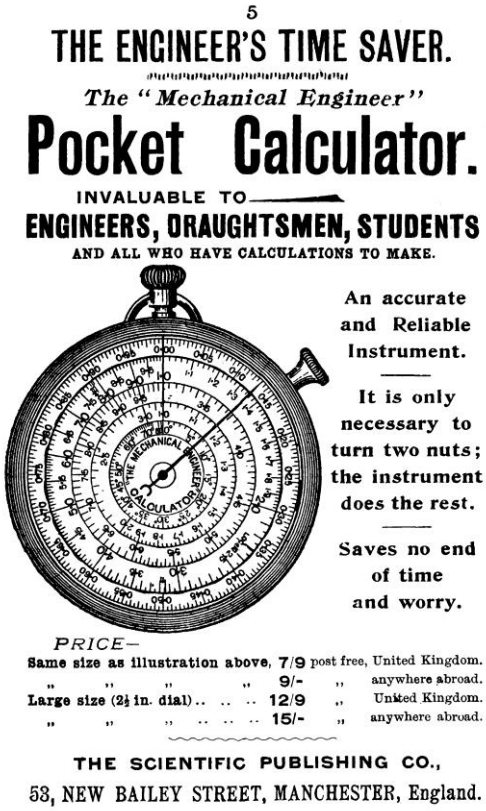
The scales on the Dyson are as follows:

Centered on the index of the complete outer scale 'Subtract 20, 10, 1 10, 20, 30, Add'. The complete outer scale is a logarithmic single cycle scale in 10's decimally

[9] 'Scientific Instrument Making in Manchester, 1870 – 1940', iii- Flatters and Garner & Fowler and Company; Jenny Wetton in *Bulletin of the Scientific Instrument Society*, No 53, (1997), pp 15-18.

divided, followed inwards by a scale in Shillings and old pence from 1/- to 20/- divided logarithmically and Centered on 8/4d (why?) with finally another single cycle log scale from 1 to 10 in quarters.

ME Chronology


5

THE ENGINEER'S TIME SAVER.

The "Mechanical Engineer"

Pocket Calculator.

INVALUABLE TO

ENGINEERS, DRAUGHTSMEN, STUDENTS

AND ALL WHO HAVE CALCULATIONS TO MAKE.

An accurate and Reliable Instrument.

It is only necessary to turn two nuts; the instrument does the rest.

Saves no end of time and worry.

PRICE—

Same size as illustration above, 7/9 post free, United Kingdom.
" " " " 9/- " anywhere abroad.
Large size (2½ in. dial) .. .. .. 12/9 " United Kingdom.
" " " .. .. .. 15/- " anywhere abroad.

THE SCIENTIFIC PUBLISHING CO.,
53, NEW BAILEY STREET, MANCHESTER, England.

Figure 1.5: 1901 SP advert


218

The "Mechanical Engineer"

Pocket Calculator.

Invaluable to ENGINEERS, DRAUGHTSMEN and all who have Calculations to Make.

PRICE:
7/9 Post Free UNITED KINGDOM;
9/- Post Free Anywhere Abroad.

The Mechanical Engineer Pocket Calculator (actual size).

SEND FOR DESCRIPTIVE CIRCULAR—FREE.

The Scientific Publishing Company,
53, New Bailey Street, MANCHESTER, England.

Figure 1.6: 1909 SP advert

SPC made three sizes of ME. If we take the SPC adverts at face value, i.e. that there were two sizes of calculator available at any one time, but with the caveat that this might have been any two sizes at one time, then we can possibly estimate a chronology. The 1901 edition of 'Fowler's Mechanical Engineers Pocket Book' carries an advert (Figure 1.5) which shows a calculator marked 'The Mechanical Engineer' and gives prices for the 1¾" and 2½" scale diameter sizes available. Pickworth [5] shows the same advert and an 'early' (undated) edition of 'Watch Calculator' [4] shows the same two sizes with the same markings. A 'later' edition of [4] (also undated) shows a small (1¾") calculator marked as described earlier, and a larger (2") calculator marked 'Scientific Publishing Co, Manchester'. The 1909 edition of 'Fowler's Mechanical Engineers Pocket Book' carries an advert (Figure 1.6) which shows only one size of calculator, the 2" version, marked SPC, Manchester, and priced the same as the smaller version in the 1901 advert. The 1908 issue of 'Calvert's Mechanics' Almanac' (typeset in 1907) also carries the same advert, hence we can estimate 1907 as a possible earliest date for the advent of the SCP marked 2" models.

The 'no name' version of the 1¾" ME remains an enigma. Were they intended to be sold by independent retailers in parallel with the marked versions, or were they the earliest (or latest) version available? We do not know. Hopefully future evidence will answer the question.

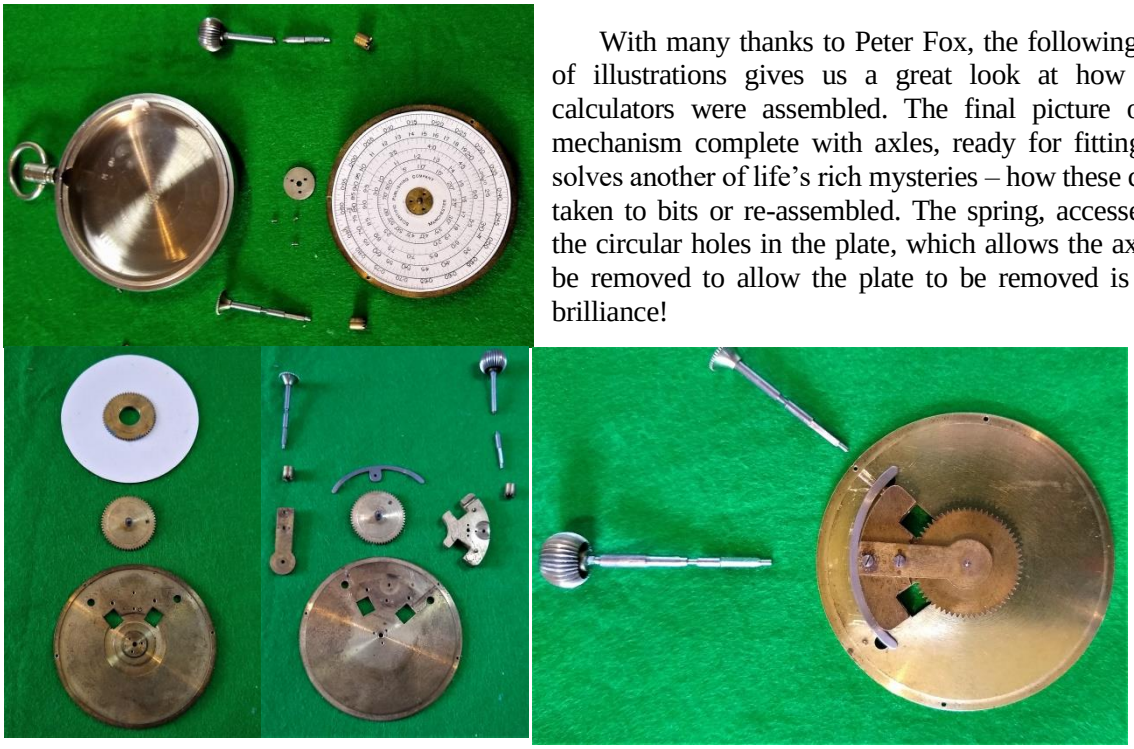
From the evidence above it is possible to estimate a chronology for the ME:

- No name (Fig 1.1a) 1¾" diam.	1898 - 1900 (assuming that they were the earliest model)
- 'Mech Eng' (Fig 1.1b) 1¾" diam.	1900 - 1907 (Pickworth etc. adverts all show calculators marked ME)
- 'Mech Eng 6d.' (Fig 1.1d) 2½" diam.	1900 - 1907 (or possibly earlier)
- SPC (Fig 1.1c) 2" diam.	1907 - 1910

Note that the 'No Name' versions may have been produced throughout their history for other retailers to sell; they are not uncommon. By not carrying any marking they have caused confusion as to what the device is, and others (see 'Davis' in the listing of all variants later in this section) have engraved the back of the calculator, or named them in some other way.

Note that a more complete expose of the many variants of Mechanical Engineer types is included later as a separate section.

The Workings of an ME calculator



With many thanks to Peter Fox, the following suite of illustrations gives us a great look at how these calculators were assembled. The final picture of the mechanism complete with axles, ready for fitting also solves another of life's rich mysteries – how these can be taken to bits or re-assembled. The spring, accessed via the circular holes in the plate, which allows the axles to be removed to allow the plate to be removed is sheer brilliance!

Figure 1.7: The Workings of an ME calculator

Other SPC Pocket Watch calculators

Having established that SPC started with the Mechanical Engineer as their first design, and that at least one model was produced with SPC as the 'makers name', what calculators followed the ME and when? The intermediate chronology is not obvious; however we can also be fairly definite about the calculator which superseded the ME. This has to be Fowler's Patent Pocket Calculator, patented in 1910. This also became the Type 'O' later, still under the SPC name.

There can be little argument that any calculator with the very obvious centre button on the obverse must be the model that followed on from the ME and started the Fowler calculator dynasty. Initially it was thought that only the Patent Pocket Calculator, and a Textile Calculator with the back-button existed, but subsequently a Fowler Type E1 with the single back button has been found.

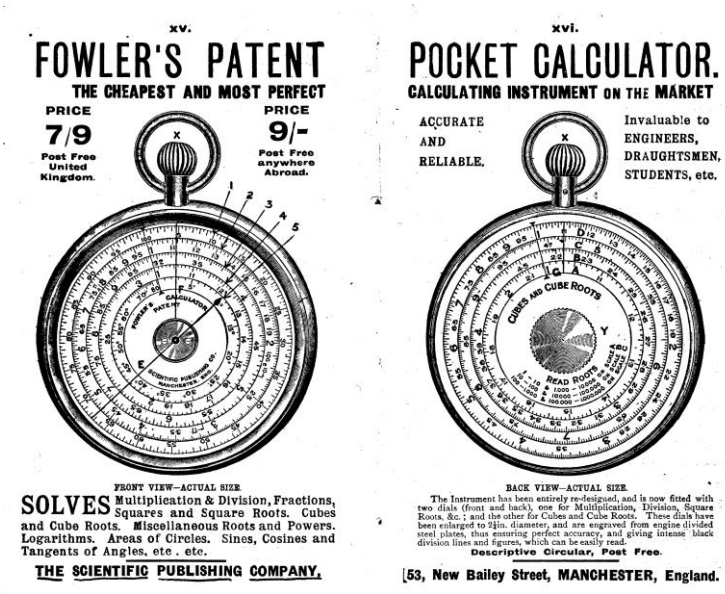


Figure 1.8: 1913 SP advert for the 1910 Patent Calculator

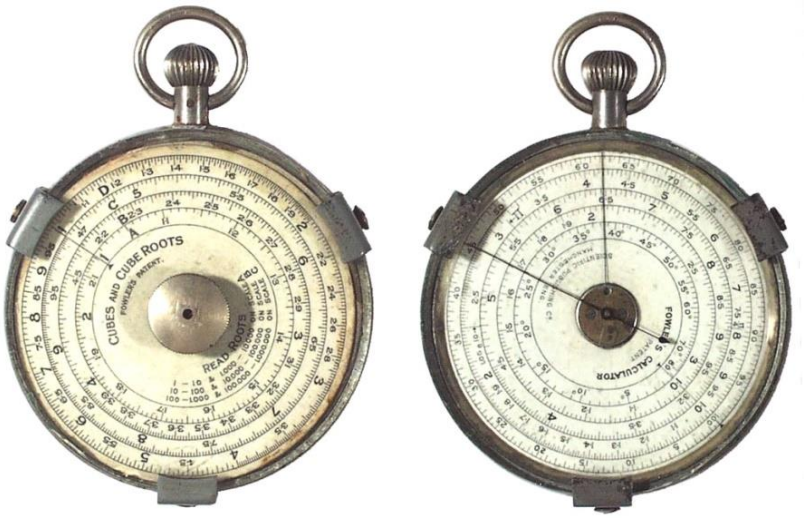


Figure 1.9: Fowler's Patent Calculator by SPC

Fowler's Patent Pocket Calculator. *2AG1*

The 1910 date of Patent 5,528 granted to W.H. Fowler gives a very strong indication that this was the next chronological design following the ME, which in all probability it superseded. The patent covers the very characteristic and unique calculator with centre button on the obverse driving the pointer, and the scale driven from the single crown. It was advertised in the 1913 Fowler's *Electrical Engineers Pocket Handbook*, see Figure 1.8.

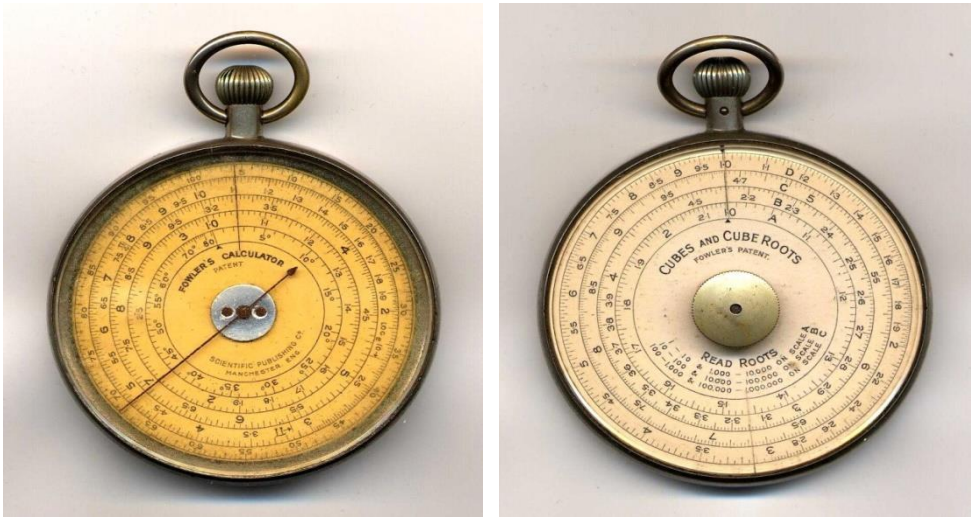


Figure 1.10: Fowlers Patent Calculator by SPC

Figure 1.9 shows an example of Fowler's Patent Calculator marked Scientific Publishing Ltd. It is not clear whether this particular example with its three clips is a home-made addition to stop the glasses falling out of the cast case, or whether these were part of the original fit. I believe that they are a home-made cure for a problem. A second example shown in Figure 1.10 does not have the clips. All three clips on the example are very similar leading to the suggestion that they might have been available as a DIY, or a "fix" by a previous owner as a cure for the problem.

We also have an example of an early type of Textile calculator and its later evolution under the SPC name; we do not think that any other models also existed during this time.

Scientific Publishing Type O calculator *2BG1*

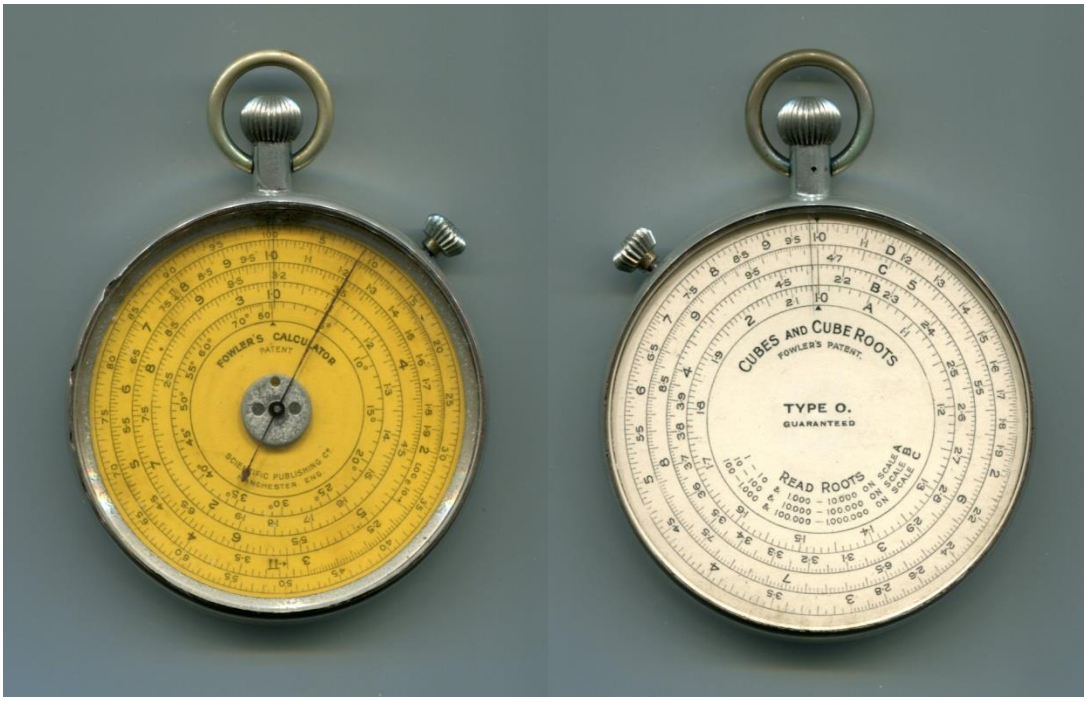


Figure 1.11: Scientific Publishing Type 'O' calculator (The Patent Pocket Calculator)

(The original illustration was taken from C-R; I had not seen another. Since then the above example appeared in the Tom Wyman collection; it is rare!)

A later version with two crowns instead of the Centre button is called a SP Type 'O', this being printed where the Centre button used to be. (See Figure 1.11.) This is the first evolution from the Patent Calculator. An example of the next evolution, another of what became the more usual two-crown device (known as the Type H) made by Fowler & Co. which is covered by patent 20,416 of 1912 by W.H. & H. Fowler, has a date of '11.11.1915' written inside it. It is accompanied by an SPC instruction manual which is for the earlier style of calculator with Centre button, but has a stuck-in overprint to the effect that the scales: *'... are rotated by a nut at the side instead of a button at the Centre, but this does not affect the instructions for making the calculations'*. This calculator, the Type H, was still being advertised in the 1925 Fowler's Mechanic's and Machinist's Pocket Book. This is further evidence that by 1915 SPC had definitely become Fowler & Co. and was producing pocket-watch calculators under that name rather than SPC, and we can now be sure that the SPC model of the Patent Calculator was made and sold from 1910 through to 1914 or 1915.

Later patents, 3,638/1914 and 15,990/1914, cover anti-backlash mechanisms and a calculator which does not use crowns at all but is rather more like Halden's Calculex utilizing thumb nuts on both sides, it was probably never manufactured. These patents were at the very end of the SPC period.

Scientific Publishing Textile calculator *2AT1*

This is a variant of the Patent Calculator complete with the Centre button, Scientific Publishing name, and tables on the rear that would soon turn into the slightly later Type T with its side key as shown below (Figure 1.13). The *"Instructions for Working Fowler's Patent Textile Calculator with Uniform List of Prices"* that accompanies such a calculator in the author's collection includes various printed notes relating to prices dated, July 1907, February 1909 and January 1911. This allows us to assume that they date from at least 1911 and as the Patent Pocket Calculator is advertised in the back of the instructions, we know they are contemporaneous.

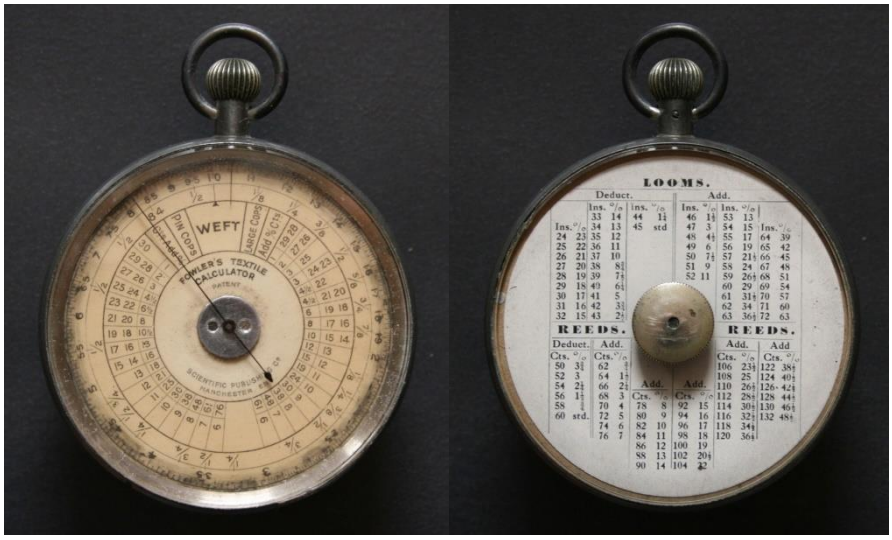


Figure 1.12: Scientific Publishing Textile Calculator

Type T Textile Calculator *2BT1*

The Type T Textile calculator is shown below (Figures 1.13 and 1.14). Apart from carrying the Scientific Publishing Co maker's name, it is very obviously from the same period characterized by the very thin pointer, the prominent axle, and the cast metal case with the two spokes carrying the mechanism. Note that the anti-backlash mechanism shown in Figures 1.14 and 1.15 is covered by patent 3,638/1914 from which we can more accurately deduce that the change from SPC to Fowler took place around the time of the patent grant (May 1914). This Type T textile calculator is thus from very late in the SPC period (c1913?). When they started making Type T Textile calculators is not known, however the general style would evolve for years to come as part of the 'Fowler' range, see the next chapter. I am not aware of a Type T calculator in the 'Fowler' range.

It is believed that with the single exception of the lone Fowler's E1 shown later, all back-button calculators produced carried the Scientific Publishing Co maker's name. It is also believed that each back-button design was replaced with a similar design but with the later side-winder, and now carried a Type number, but still with the SP maker's name:

Fowler Patent Calculator → Fowler's Calculator Type O
Fowler's Textile Calculator → Fowler's Textile Calculator Type T

The SP Fowler's Textile Type T was then replaced by a Fowler's Textile Type M with Fowler as the maker.

A Fowler's Gallimaufry

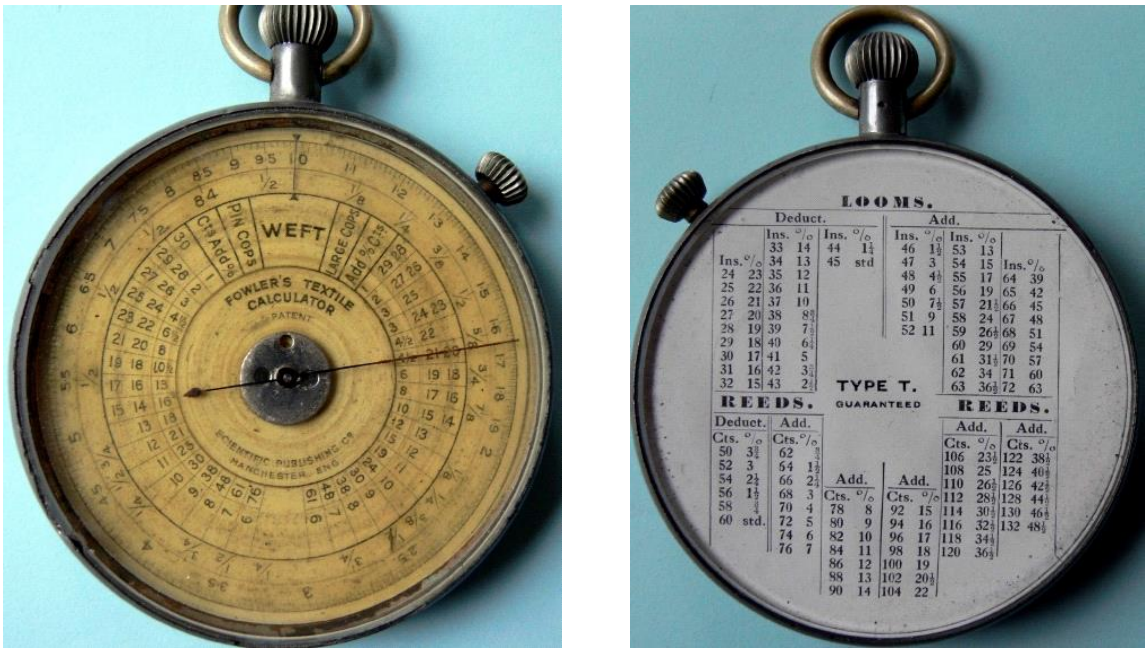


Figure 1.13: Scientific Publishing Type T Textile Calculator

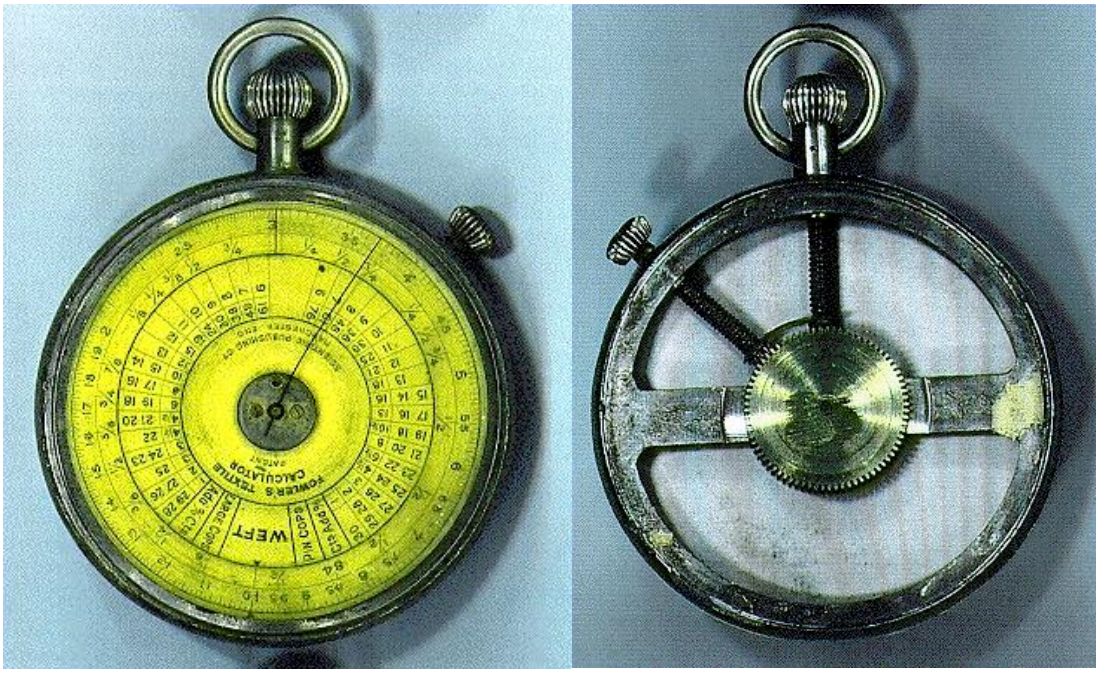


Figure 1.14: Type T Textile Calculator with yellow lens and showing mechanism

Fowler's Type M Textile Calculator *Not Mentioned*

This Fowler's calculator has been included in the Scientific Publishing section to give an indication of when Scientific Publishing ceased to exist as a 'maker'. An example of this calculator dated late 1914 is shown in Figure 1.15. The style of this device and the mechanism is extremely similar to the earlier Type T (Figure 1.13) and other SPC calculators. However, this Type M carries the Fowler & Co. name, and it is the first time we see the table of Weft, Looms and Reeds that would become ubiquitous across many Fowler Textile calculators. The pencil annotation on the back of the scale says 'Rep^{d}. 6/12/1914. HF'**.** Was this calculator repaired by Harold Fowler himself? Probably, but we will never know. However this is further evidence that no later than December 1914 and probably slightly earlier as this was a repair to a 'Fowler' calculator, SPC had become Fowler & Co., Manchester.

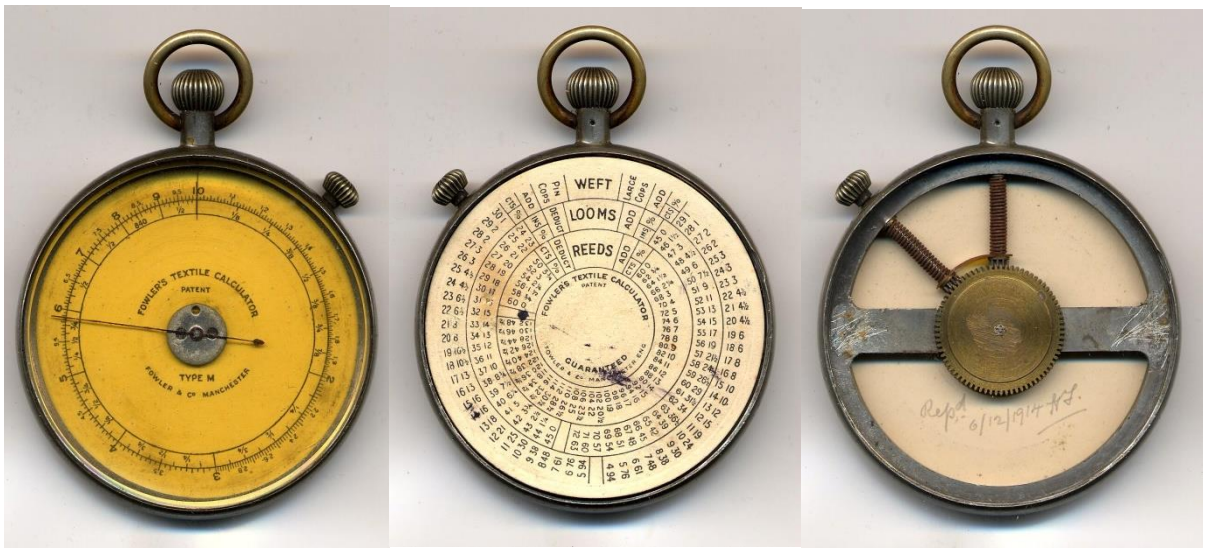


Figure 1.15, a, b, and c: Fowler & Co Type M Textile Calculator

This is certainly one of the first, if not the first calculator, to carry the Fowler label.

Summary

We can now conclude that the ME was the first pocket-watch calculator made (or at least assembled) by The Scientific Publishing Company, and that it was made from 1898 and continued to be made in various guises until 1910 when the patent for Fowler's Patent Calculator was taken out, and SPC started to manufacture the Fowler's Patent calculator instead. The Patent Pocket Calculator with the Centre button was made and sold under the SPC name from 1910 until about 1914, and then evolved to have two crowns (one crown and one side-winder) when it was sold under the Fowler name. Whether the two-crown version was made with the SPC name is not known. We can reliably speculate as to the chronology of the SPC Type T textile calculator and for how long it was made, however there is no hard evidence available to date it.

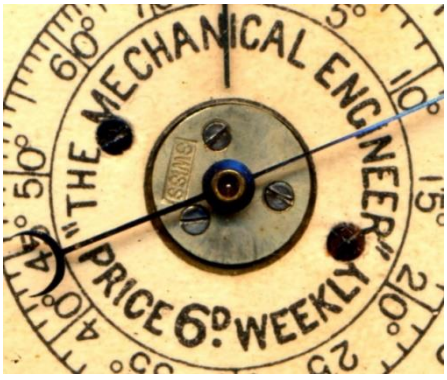


Figure 1.16: ME marked "Swiss" on the axle

Other calculators carrying the Scientific Publications Company name were available for a short time, from about 1907 to 1914. Only a very limited range of models carried this name, one version of the Mechanical Engineer, a Textile Calculator and the Type T Textile and Fowler's Patent Pocket calculator (later Fowler Type H) are the only ones known to date. However, by 1915 all pocket-watch calculators carried the Fowler & Co. name.

ME Variants[10]

Introduction

The Mechanical Engineer, Mech Eng or ME has been consistently and regularly written about for some considerable years. It is only after reviewing these articles that one realises that there are many more variants than is obvious from a casual look at the type. This article attempts to produce a definitive list.

The late Tom Wyman produced the first listing of the variants[11] which followed the listing in "Pocket Watch Slide Rules"[12]. It is neither complete nor definitive. Subsequent articles have looked at the unusual ones, but not the actual variants which are not obvious unless one has something to enable size comparisons, e.g. a coin. The "small" ME is a delightful fob-watch sized device and we have identified six variants, there are three variants of "medium" and three variants of the "large" device which is quite a weighty handful!

A simple visual presentation of the known variants under headings of "Small", "Medium" and "Large" follows. Please have a look at any examples in your collections and let me have any additions and / or corrections where I might have made wrong assumptions. They at least deserve accurate advertising on eBay.

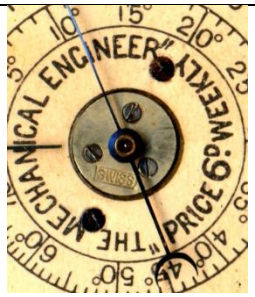
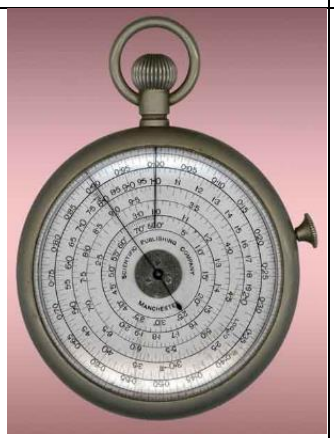
The Variants

	"Small"	**"Medium"**	**"Large"**
Size	Case 2″ Φ; Scale 1¾″ Φ	Case 2⅜″ Φ; Scale 2″ Φ	Case 3⅛″ Φ; Scale 2½″ Φ
Weight	75 gm	94 gm	215 gm
a) No Name			

[10] ME Variants, Peter M. Hopp CEng. MBCS Gazette 18, Autumn 2018, page 101

[11] **Pocket-Watch Calculators Produced by Scientific Publishing Company**. Tom Wyman, Journal of the Oughtred Society, V. 22 No 1 Spring 2013.

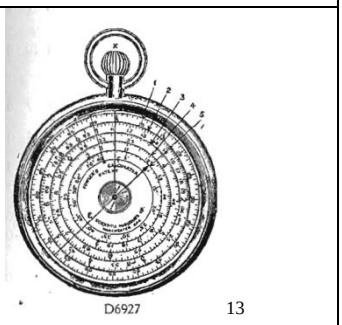
[12] **Pocket Watch Slide Rules**, Peter M. Hopp CEng. MBCS Astragal Press 2011. ISBN 978-1-931626-31-6

	"Small"	"Medium"	"Large"
b) ME scale			
c) Swiss Label		No examples of "Swiss Label" 'medium' are known. Below is a detail  from a Small example.	No examples of "Swiss Label" 'large' are known.
d) Swiss Axle		 This is a detail from a small calculator. No examples of "Swiss" 'medium' are known.	 From a 'large' calculator n.b. Price 6d weekly.
e) Sci Pub	No examples of "Scientific Publication" scale 'small' or 'large' are known.		 'Sci Pub' example with engraved name on back. **Photo courtesy Peter Fox**

A Fowler's Gallimaufry

	"Small"	"Medium"	"Large"
f) Green Scale	 **Photo courtesy David Riches**	No examples of "green scale" scale 'medium' are known.	No examples of "green scale" scale 'large' are known.
g) No Name Type 2		These comments relate to the "small" calculator shown left, of which only one example is known. No examples of 'medium' or 'large' calculators are known. The major difference between this and Type (a) is the different scale spacing resulting in no space between axle and first scale, or is the 'washer' larger?	No examples of 'medium' or 'large' No name Type 2 calculators are known.
h) John Davis	 	Only a 'small' and a 'large' example with the John Davis makers name on the back are known.	  **Photos courtesy Peter Fox**

As well as these fourteen variants listed above, there are three further "unknown" relations to the Mech. Eng. Genre. These are shown below.

	Prototype ME?	Single Scale ME	Desk ME
			 D6927 13 D6927 "Mechanical Engineer" Pocket Calculator (patent) with two dials. Solves multiplication, divisions, fractions, squares and square roots, cubes and cube roots, miscellaneous roots and powers, logarithms, areas of circles, sines, cosines, and tangent of angles ... nett £0 7 6 Halden 1902 and Thornton 1916 catalogue

The Prototype ME has featured in a previous Gazette article[14]. I shall not repeat any of it here.

The Single Scale ME is a fairly recent discovery and is illustrated in "Pocket-watch Slide Rules"[15] with no detailed comments. It is effectively just the outside scale of an ME in a "Small" case.

The Desk ME features in a 1902 Halden catalogue where it is advertised alongside a standard "Mechanical Engineer" in Nickel Case at 7/6d, ditto – large size for desk at 12/6d. There is no illustration; we can only assume it is a figment of someone's imagination.

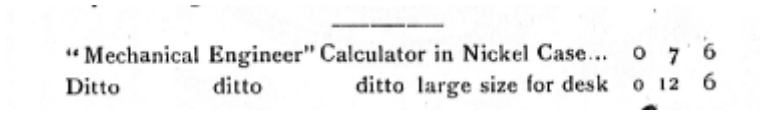

"Mechanical Engineer" Calculator in Nickel Case... 0 7 6
Ditto ditto ditto large size for desk 0 12 6

Figure 1.17: Cut from Halden 1902 catalogue

The Thornton 1916 catalogue shows an ME with only one winder (above). Again, either a figment of someone's imagination or else a plain and simple mistake – but to add confusion the catalogue does mention a two dial calculator which the ME most definitely is not!

[13] The actual illustration, complete with the numbers in an arc outside the case, has subsequently been identified as from the "FOWLER'S CALCULATOR, FRONT DIAL" illustration in the *"Instructions for Working Fowler's Patent Pocket Calculator",* and also thus explains the lack of side-winder as this would originally have had a back button. It does not really explain the "two dials" statement other than the standard cubes and cube roots rear dial.

[14] **"**A Quartet of Unusual Mech. Eng. Pocket-watch Slide Rules". **Peter M. Hopp. Gazette Issue 15, Autumn 2014. pp 139**

[15] **Pocket Watch Slide Rules** Ibid

Fowler's Pocket Watch Calculators

Introduction

Any description of the Fowler's product range must follow on seamlessly from the description of the Scientific Publishing range, it being self-evident that the same products (in some cases) were now sold as Fowler's calculators. An early attempt at a full classification of Fowler's calculators [16] has been subsequently updated [17] and now, starting from 1915, we can examine the prolific range of pocket-watch calculators that are known to have been sold.

The earliest designs use the cast sintered Aluminum alloy case, and of course there are also Fowler's versions of the Scientific Publishing cast case 'Calculator' with the Centre button.

Fowler's patents

Neither William Henry nor Harold Fowler were prolific patentees; however their five patents all reflect solutions to problems that would have had to been overcome during the manufacture of these devices.

***Fowler's* Pocket-Watch slide rule Patents**		
Date	**Patent No.**	**Patentee information**
1910	UK 5,528	William Henry Fowler of 53 New Bailey Street, Manchester, Engineer.
1913	UK 20,416	William Henry Fowler of Sale Lodge, Sale, Cheshire, Engineer, and Harold Fowler, of 'Alston' Old Hall Road, Sale, Cheshire, Engineer.
1914	UK 3,638	William Henry Fowler of 'Oakleigh' The Avenue, Ashton-on-Mersey, Cheshire, Engineer, and Harold Fowler, of 'Alston' Old Hall Road, Sale, Cheshire, Engineer
1914	UK 15,990	William Henry Fowler of 'Oakleigh' The Avenue, Ashton-on-Mersey, Cheshire, Engineer, and Harold Fowler, of 'Alston' Old Hall Road, Sale, Cheshire, Engineer.
1924	UK 215,648	William Henry Fowler of Station Works, Sale, Cheshire (British) and Harold Fowler, of Station Works, Sale, Cheshire (British).

William Henry Fowler's first patent, No. 5,528, applied for on 5th March 1910, and accepted very quickly thereafter on 23rd June 1910, is supposedly to simplify the construction of calculating instruments and to avoid *'derangement or fouling of the gearing or pointers'*.

[16] 'Fowler's Pocket Watch Type Calculators'; Peter Hopp in *Journal of The Oughtred Society*, Vol. 7 No 2, Fall 1998, pp 43 - 49

[17] 'The Fowler Calculators – A Catalogue Raisonné'; Rick Blankenhorn & Bob de Cesaris in *Journal of The Oughtred Society*, Vol. 11 No 2, Fall 2002, pp 3 - 12

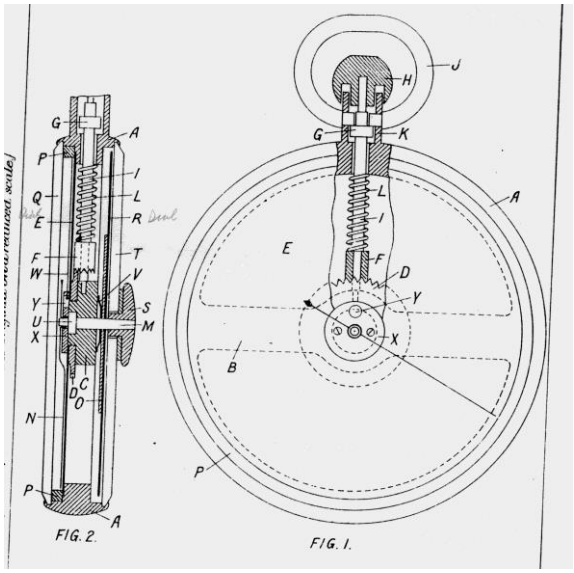


Figure 2.1.1: Fowlers Patent 5,528/ 1910

This is very obviously the patent for Fowler's Patent Pocket Calculator and the unique calculators with the single crown and a milled knob at the back of the calculator that was used on at least two designs of calculator illustrated in the earlier Scientific Publishing section, and the Fowler E1 in this section.

Patent No. 20,416 from William Henry Fowler and Harold Fowler was the first joint patent from father and son, both living in Sale, Manchester. The patent was applied for on 7th September 1912 and was awarded on 27th February 1913.

The patent covers a method of reducing the expense of the design and improvements to enable the radial shafts (which replaced the milled knob) to be better fitted and more reliably *'rendering the boss immovable, and at the same time secure extreme accuracy in the readings of the instrument'*. It is not easy to understand why they took out this patent; the Mechanical Engineer calculators would have used such a construction 15 years previously.

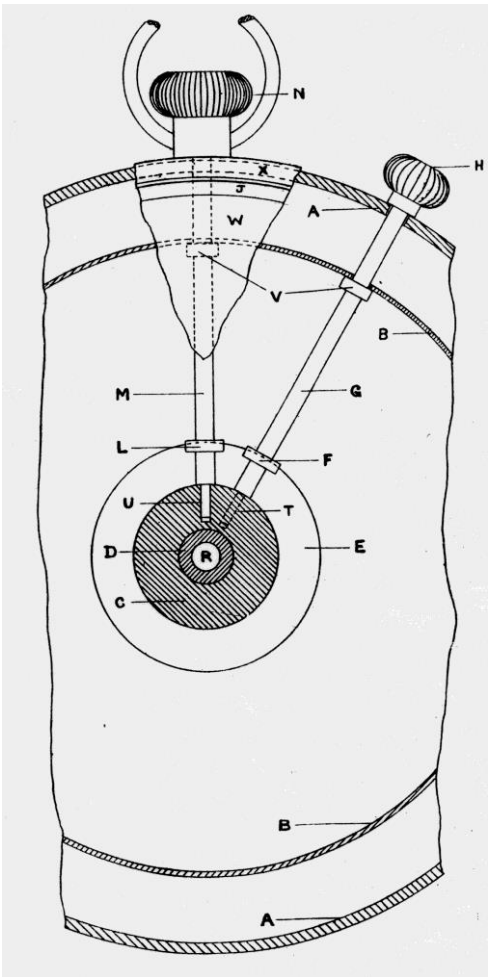


Figure 2.1.2: Fowler patent 20,416/1913

Patent No 3,638 applied for on 12th Feb 1914, and awarded 21st May 1914 is also in the joint names of Fowler father and son still living in Sale, and is the first of two patents awarded in 1914 for improvements to the design of the calculators.

The drawing on the next page shows 4 of the 5 anti-backlash designs that were suggested and obviously implemented as can be seen in the illustrations of the internals of the Fowler calculators in this and the last sections.

Albeit that they did succeed in avoiding the *'inexact movements'* that are mentioned in the object, there is nothing truly novel in the design and therefore rather difficult to understand why the patent was issued.

Patent No 15,990 applied for on 4th July and awarded 3rd December 1914, also in their joint names is the second patent of 1914 and applies to *'improvements in the method of operating circular calculators or watch forms of slide rule.'*

It is again difficult to understand the reasoning for the patent application, no types of slide rule to this design have been seen, and it appears as if the Fowlers were trying to revert to a type similar to that shown in their original patent with the milled knob at the back, though this design uses a form of ring to rotate the pointer.

A Fowler's Gallimaufry

The final patent in the joint names of Fowler senior and junior is No 215,648, applied for on September 6th 1923 under provisional patent No 22,418/23 and complete accepted on 15th May 1924.

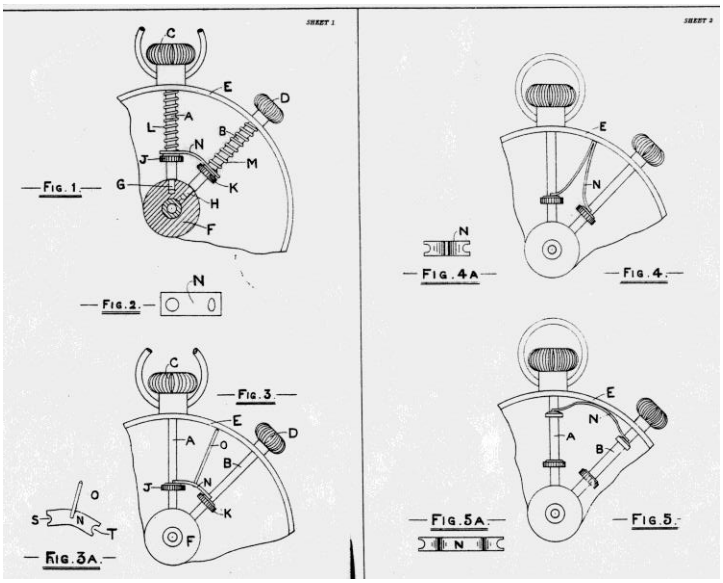


Figure 2.1.3: Fowler patent 3,638/1914

They have reverted back to radial shafts and this patent is intended to improve the independent operation of pointers and dials on the two sides of the instrument, and the design allows a definite and controllable amount of frictional resistance to the circular movement of the wheels rotating on a common axis.

Once again it is possible to recognize later designs of Fowler's calculator in this patent, those where the loop was attached to a separate point on the rim and two entirely independent knobs working on radial shafts. This was obviously the patent for the range of variants with a central loop and two side-winder designs, and gives us a date for the introduction of that style of case.

It is always interesting to be able to follow the application of such a patent in the designs that followed afterwards. This is definitely so here.

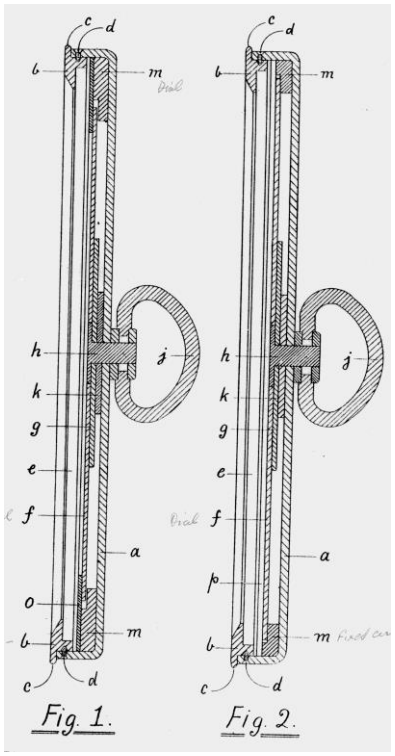


Figure 2.1.4: Fowler patent 15,990/1914

Fowler design evolution is difficult to establish. The earliest designs used a cast sintered aluminum alloy case which is actually very brittle and must have been extremely difficult to disassemble in the event of requiring repair. However we know that this did happen as we have dated examples which have been repaired.

A Fowler's logo which was used for a short time, (c1948?) is an intertwined 'FC', one assumes standing for 'Fowler's Calculators'.

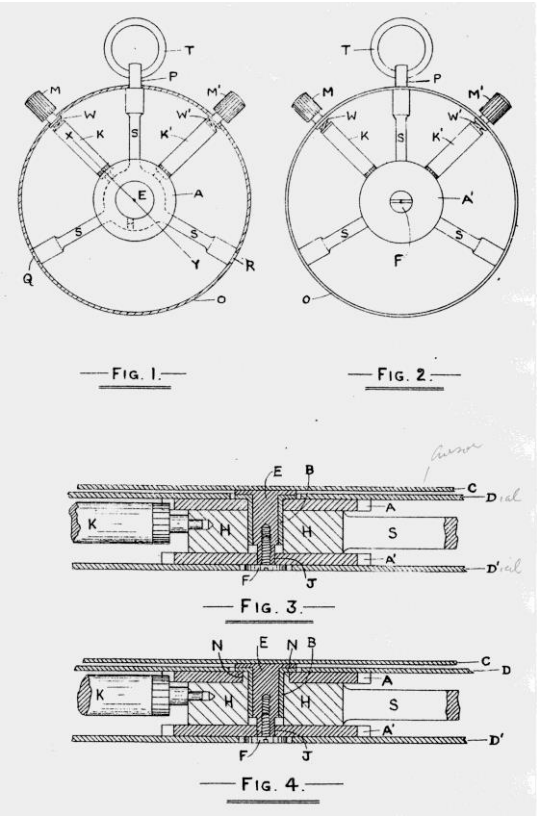


Figure 2.1.5: Fowler patent 215,648/1924

Fowler's design changes

The earliest Fowler calculators (and indeed all of the Scientific Publishing Calculators apart from the Mechanical Engineer in its various forms which comes in a proper pocket-watch case) were assembled in a case that was made in a type of sintered (heat treated) cast aluminum alloy. This is very distinctive, and must have been economic and good to work with, but repairing such devices would have created real problems.

Figure 2.2.1: Fowler Calculator FC Logo

Later calculators came in a variety of pressed steel case designs which are very easy to dismantle and to repair the mechanisms or replace glasses as necessary.

Finally Fowler reverted back to another form of cast alloy case. This had a more 'chromed' appearance (though the early calculators can be highly polished) and appears to have been manufactured in about 1948 (from various dated instruction leaflets) and was definitely in place from 1950 onwards.

Figure 2.2.2: Construction of early calculators

Fowler sold at least one special tool for unscrewing the axles of the majority of their designs. This spanner is illustrated in Figure 2.2.4. It has a pair of lugs at the broad end which would fit into the two holes in most axles, and likewise the thin end has a pair of similar lugs but perpendicular to the body of the 'spanner'. I have never seen such a spanner, nor seen any advert that offered it. Whether this is a 'home-made' device is not known.

For the non-purist, a pair of needle nosed pliers can be pressed into service if required.

Figure 2.2.3: Cast and pressed steel cases (knurled)

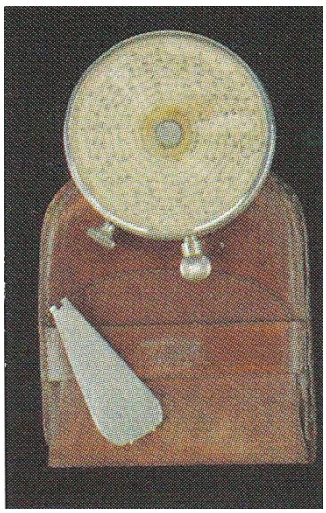


Figure 2.2.4: Fowler spanner

Serial Numbering

Scientific Publishing Calculators do not carry any Serial Numbering. However, Serial numbers are found on many Fowler calculators, on the case, the back, and very often on the axle. We have so far been unable to discover any complete logic to this numbering. See Appendix B.

Calculator Types

The following list of Fowler's calculators with a picture wherever possible, and short description of some of the features is mainly alphabetical.

A Fowler's Electrical Engineer's Pocket Book from 1946 quotes: 'These Calculators are made in three sizes, the smallest approximately 2½ ins. (63.5 mm) in diameter for carrying in the waistcoat pocket, and fitted with either one or two dials; the medium size, of which the "Universal" and "12/10" are examples (see separate advertisements), with single dials approx. 3 ins. (76 mm) in diameter; and the "Magnum," the largest instrument made, having a single dial approx. 4½ ins. (114 mm) in diameter.'

A similar description appeared in all the Fowler's Pocket Books (Mechanics' and Machinists', Electrical Engineer's, and Mechanical Engineer's are the usual three titles that are quoted; later there was an Architects' Builders' and Contractors' and special books such as the Stationary Engine book) right through to the latest editions, with minor changes in size and detail.

Each Type listed in the following section also has included its "Catalogue Raisonné" (C-R) identity in recognition of the merit of this earliest attempt at providing a comprehensive listing. Subsequent variations have not been listed according to C-R sub-sections. I have attempted to give a possible time-line which is at variance with some of the previously identified sun-sections. It must also be said that I do not understand the subtleties of some of the differences listed in the C-R sub-sections, e.g. those for the Short Scale and Long Scale Textile calculators, and similarly, there are no variants listed for Type RX, Long Scale and others which we know have many variants.

Fowler's Calculator *2AG1/2MG1*

Figure 2.3.1: Very early Fowler's Calculator

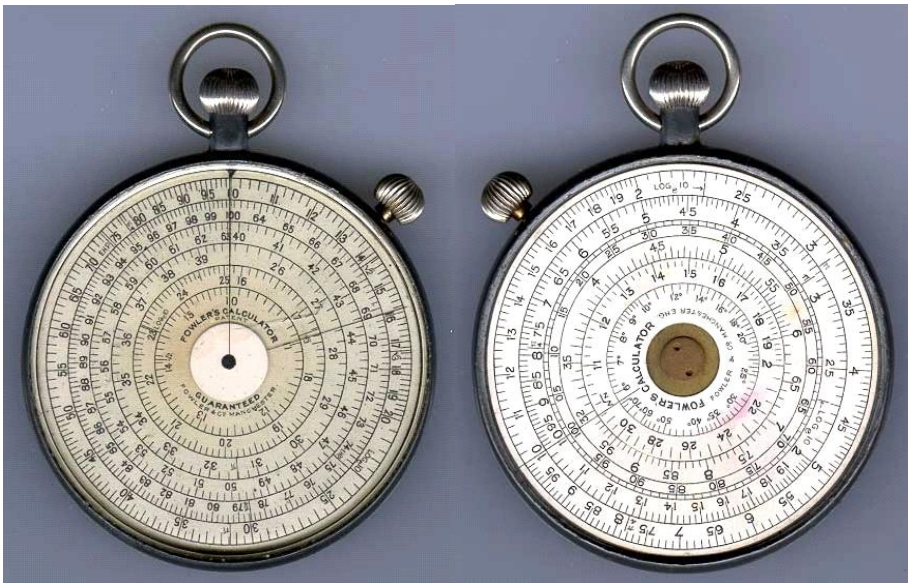


Figure 2.3.2: Fowler Calculator

'Fowler's Calculator' is a generic name covering several versions, see Fig 2.3.1 and 2.3.2. However some versions carried this as the type name. The first one (Figure 2.3.1) is the earliest type complete with back button, and is also sometimes referred to as "Cubes and Cube Roots" calculator for obvious reasons. The second one (Figure 2.3.2) shows all the characteristics of an early Fowler made calculator. It has a cast case, the 'bulls-eye' Centre and the ovoid shape of the early furniture. The scales are: C,A and then four scales whose function is not obvious, while on the verso, we have

C,CI and then 4 trig scales (sin & tan). The scales are, in fact, those of a Type RX, even though this is nowhere stated. It is most probably the Type RX predecessor. See Fig 2.25.3, which shows an even earlier version of RX with fine pointer.

Figure 2.3.3: Fowlers Calculator (Later version) Type R

This example (Figure 2.3.3) has the later axle and furniture, but otherwise is not very different to the earliest version. It appears to have a five-digit serial number which is unreadable.

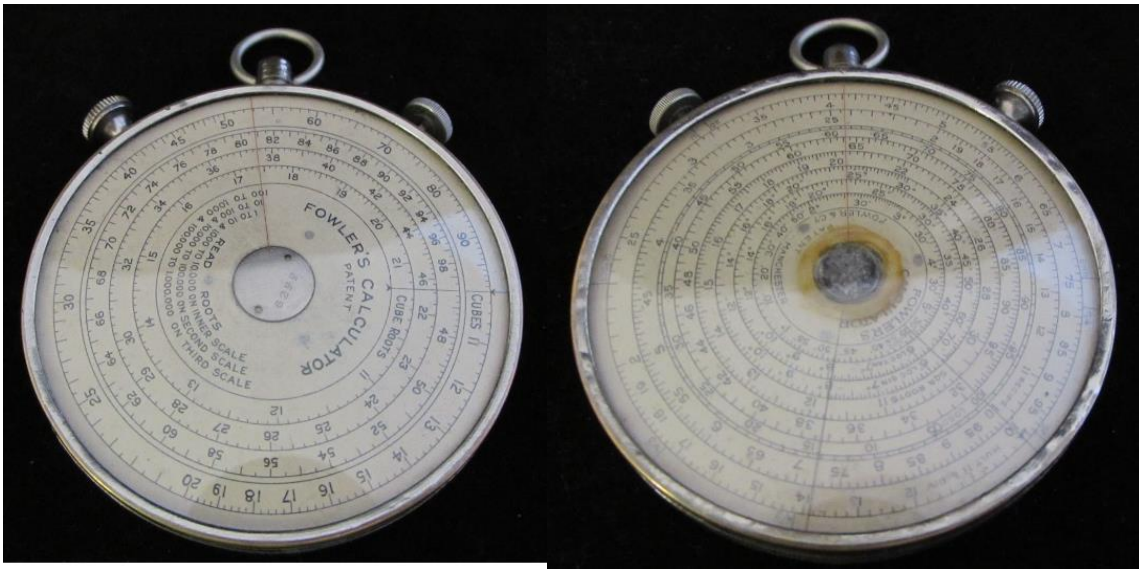


Figure 2.3.4: Fowler's Calculator (Later)

Fowler's Calculator Serial Number 8299 from the 1920's is shown in Fig 2.3.4. There appears to have been some sort of repair on the obverse scale axle – hence the discolouration. Again, the scales remain unchanged as an unmarked Type R, the case type and furniture is different.

Figure 2.3.5: Single sided Fowler Calculator

The single sided Fowlers Calculator illustrated in Fig 2.3.5 carrying serial number 10870 stamped into the back of the device was sold on eBay during August 2020 and is a fairly unusual device. Its condition was nothing special showing signs of rust and general wear and tear. It would appear to be contemporaneous with the double sided device whose rear scale is illustrated above in Fig 2.3.3 and it carries the same furniture as that device.

Why Fowler should chose to sell a single sided device which would have required a change to the manufacture is not known, and I have not knowingly seen one advertised by the company.

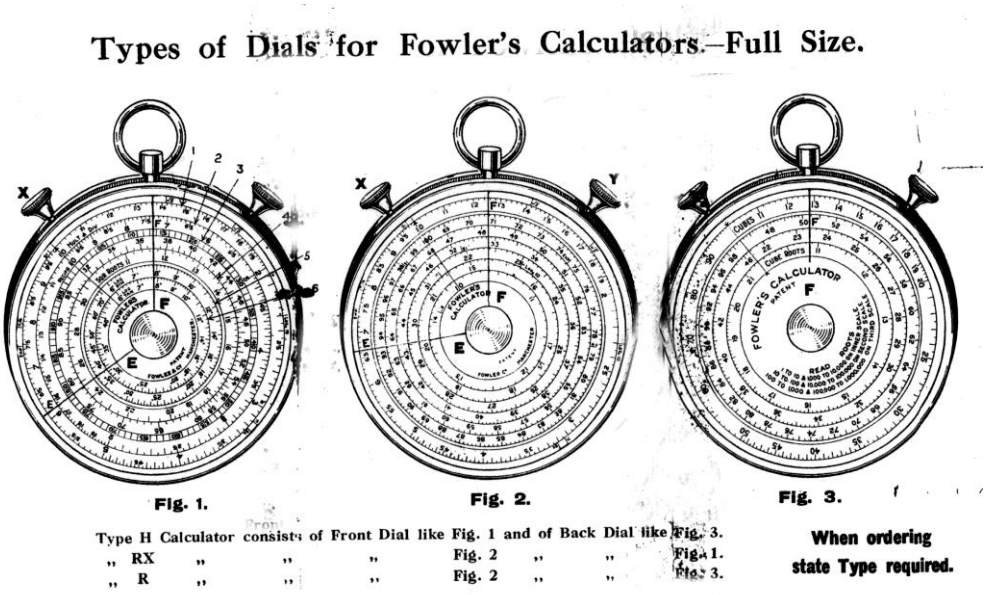


Figure 2.3.5: Type H, RX and R Fowler Calculators

Some of the confusion regarding certain Fowler Calculators may be clarified by reference to the diagram above (Fig. 2.3.5) taken from an undated 'Fowler's Calculators' advertising leaflet from sometime in the mid 1920's as it uses centre loop calculators for its illustrations. It also contains the description of these types as follows:

> The following three types of Fowler's Calculators are formed by a combination of two of the three dials shown full size on page 3. [reproduced as Fig 2.3.5 above]
>
> **Type H Calculator** (Front Dial as Fig. 1, Back Dial as Fig. 3).- The Front Dial comprises six scales : (1) Multiplication and division : (2) Reciprocals : (3) Logarithms : (4) Square Roots (it extends over two circles and can be used like the long scale on Type RX : (5) Logarithmic Sines of angles : (6) Logarithmic Tangents of angles. The Back Dial is a scale of Cubes and Cube Roots. This type is generally preferred by students.
>
> **Type RX Calculator** (Front Dial as Fig. 2, Back Dial as Fig. 1).- The Front Dial comprises an outer scale complete in a single circle, which can be used for Multiplication and Division in the same way as in Type H. The six remaining circles constitute another similar scale 30 in. long. The six circle scale is used in the same way as the single outer scale, though the outer scale is convenient for finding the precise circle on which to read the result. The Back Dial is the same as the front of Type H. This is a very useful combination for Engineers and Draughtsmen, as it gives Squares, Roots, Sines, Tangents, Logs and Reciprocals from the Back Dial, while multiplication and division can be done on the Front Dial with the long or short scale, according to degree of accuracy required.
>
> **Type R Calculator** (Front Dial as Fig. 2, Back Dial as Fig. 3) - The difference between this type of Calculator and Type RX is that the Back Dial gives Cubes and Cube Roots as in Type H, and is preferred by those who desire a long scale for accurate multiplication and division (as in Type RX) combined with a dial giving direct readings of Cubes and Cube Roots.

While the Type H and Type RX are very well known with many examples shown against their descriptions, we have only recently found a Type R calculator.

Note that FJ, Camm's 'Newness Slide Rule Manual' [6] carried a description and instructions for use of the Fowler Calculator (and was illustrated with diagrams of a Calculator – Fig 1 in Figure 2.3.5) from the first edition of 1944 right through to the final 7th edition of 1963, as well as later impressions.

Type A *2CG3*

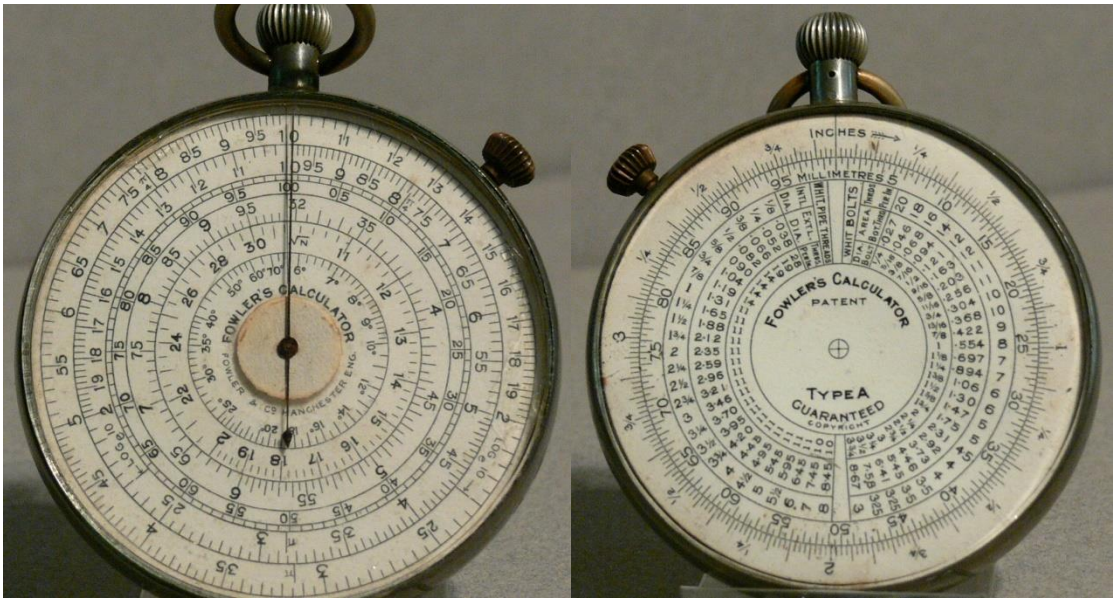


Figure 2.4.1: Fowler's Type A calculator

This illustration (Figure 2.4.1) shows a fairly early calculator with sintered case, 'bulls-eye' marking and a fine pointer with early furniture. It is a 2½" (63.5 mm) diameter double-sided calculator with Type H front dial (6 circles): 'Short Scale', Reciprocal Scale, Logarithm Scale, Square Root Scale (2 circles), Sine Scale (5° 45' - 90°), Type SR1 Conversion Scale back dial (5 circles): Inches, Millimeters, Whit[worth] Pipe Threads (3 half-circles), Whit[worth] Bolts (3 half-circles)

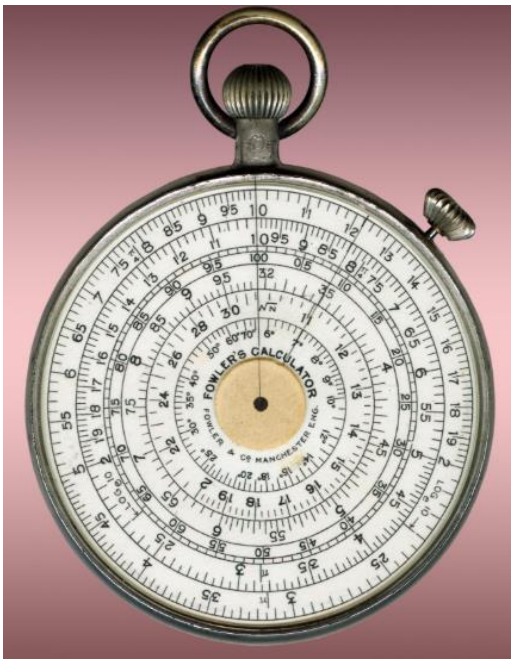


Figure 2.4.2: Later Type A calculator

Another example is known with Serial Number 2803 in the side of the sintered case, and the more usual bulls-eye pointer (and the same back) is shown left, Fig 2.4.2. Another is numbered 1616 inside the case (below)

Figure 2.4.3: With No 1616 and date May 1916

The later example of Artillery Calculator also has a "Conversion Scale" on the rear of the calculator. There is a statement in the C-R that a version of the Type A (a Type A1?) with C-R identity 2CG4 exists with a Type R Front Scale and the Conversion Scales on the Rear. Note: this information is repeated in the Artillery Calculator listing.

A Fowler's Gallimaufry

Type A1 *Not included*

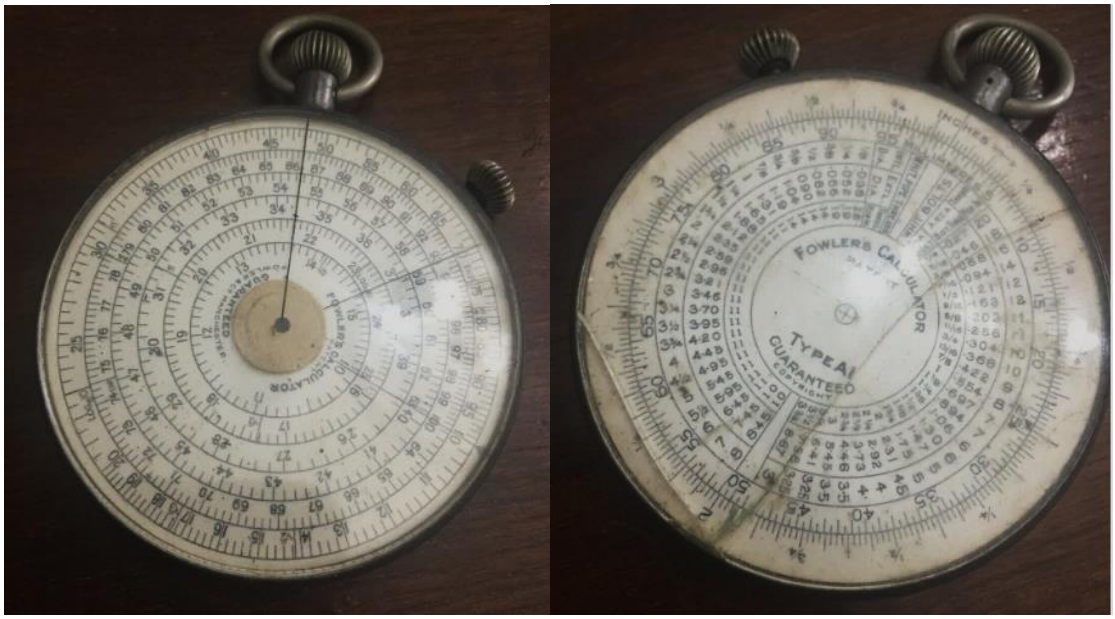


Figure 2.4.1a: Fowler Type A1 calculator

A very recent eBay sale (November 2019) of a Fowler Type A1 calculators is a first and has raised the same questions that applied to the earlier debate relating to 'E' and 'E1' calculators, particularly as there are few obvious (apart from the type number) differences between the two types A and A1.

The rear scales are the same, however a careful comparison of 'A' and 'A1' shows that 'A1' has 'Patent' printed under the 'Fowler Calculators' mark at the top of the centre markings, and 'Guaranteed' above the Fowler address around the bottom of the centre markings. This also implies to me – only because the lack of them on known Type A calculators – that it is an earlier design. This vaguely coincides with the E/E1 as it was the E1 that appeared in the earliest "Back-Button" type

The seller very kindly responded to my question: – there is no serial number engraved on the body of this sintered device, it must be hand-written inside. This – to me – implies again that it is an earlier device than any with a number engraved on the outside. This is all complete speculation, we are unable to confirm any of it!

Type B Textile *3MT1 etc.*

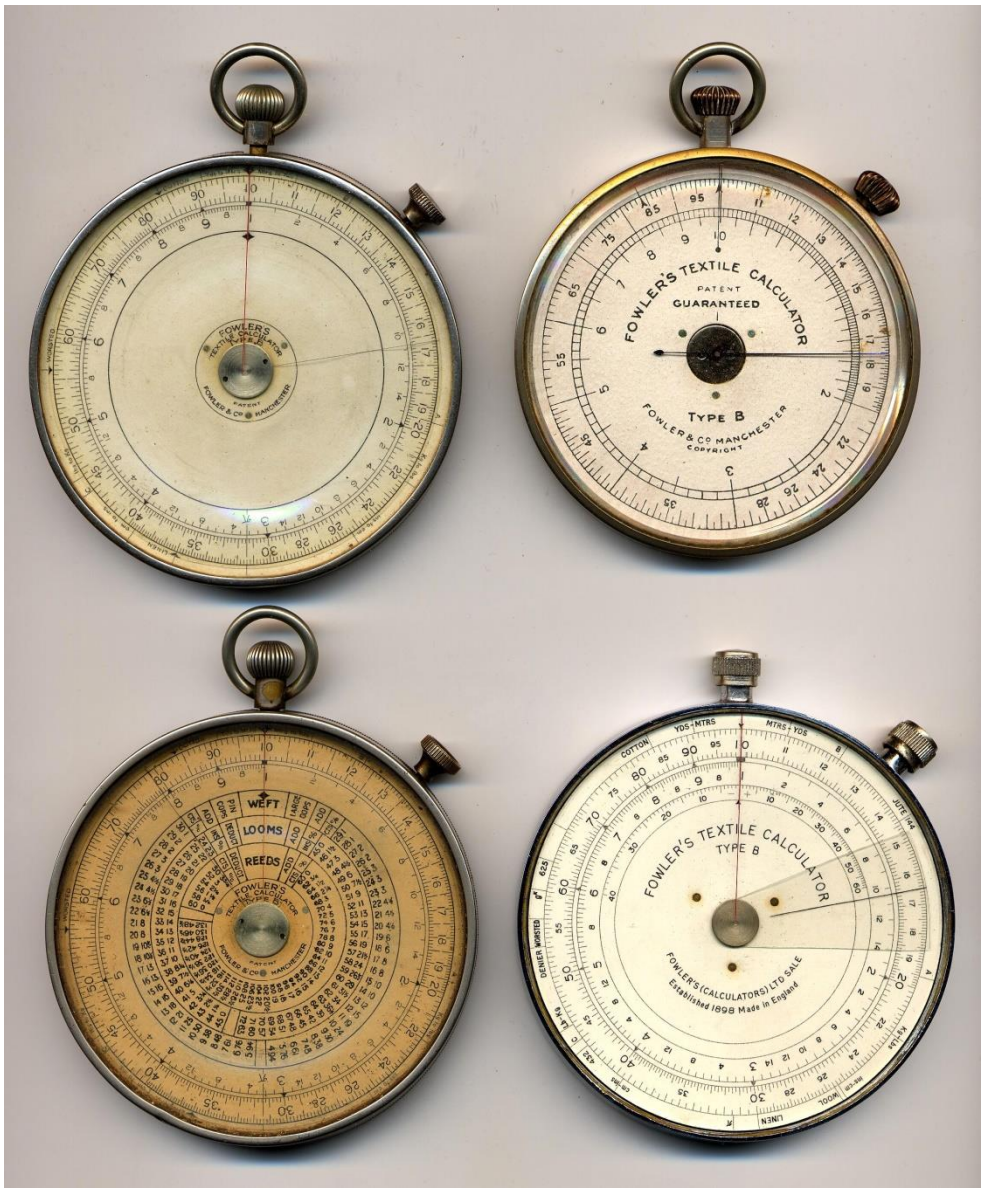


Figure 2.5.1: Fowler Type B Textile Calculators (various)

This was a single sided calculator throughout its life. The earliest version (top right in Fig 2.5.1) shows the Scientific Publishing parentage with its thin pointer and an early version of pressed steel case. This is smaller than the 3½″ (90 mm) diameter pressed case with two scales and gauge points around the outside of the outer scale that the remainder used. The central crown rotates the scale against the red index at 12-o'clock; the second knob rotates the cursor. The second version (top left) has a label around the Centre axle which says 'Fowler's – Textile Calculator – Type B' working inwards towards the axle. Other versions (difficult to date) through to the latest type which has reverted to a cast case again (bottom right) are similarly labeled but carry very different versions of the scales and the data table on the bottom left version are unusual. It is interesting to note the 'Established 1898' notice which sadly proves nothing other than this may be the date for the earliest SP calculators. Top left (with Bakelite back) and right are 3⅜" diameter. Bottom right is larger than this, nearer 3½" diameter.

There was also a Bakelite backed version of this calculator using the two left-hand side scales, some included an Ardenite (Bakelite) case. Also versions with a "Two in a Dent" Weft-Looms-Reeds table

on the reverse (see below) are known. Some Bakelite backed have the Serial number repeated in the centre, others e.g. Bakelite backed Serial No 203 with a table does not. Note that the "Two in a Dent" statement here includes the intriguing figure: '2.952d'. Another carries the serial number 1476-B[18] – why is not known!

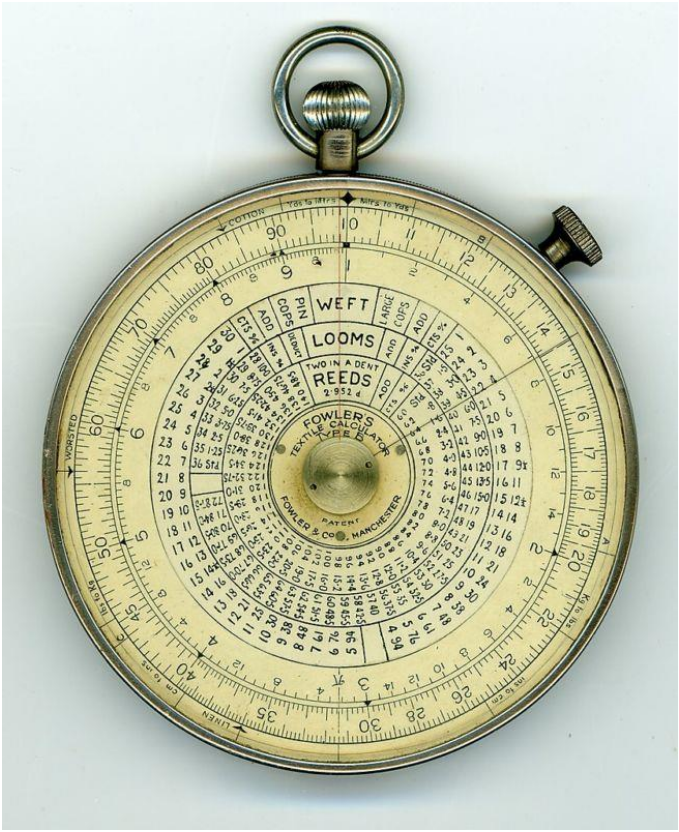


Figure 2.5.2: Type B with 'Two in a Dent' Reeds scale

The Type B Textile Calculator is generally a larger single-sided device at either 3.2" (l) or 3.4" (r) (in Fig 2.5.3) diameter depending on which of the multitude of variants you are observing. Two such devices are shown below. It can certainly be seen that the scales are the same – but larger – and in the case of the right hand variant, even the general appearance, maker's name and so on has the same layout as seen on both Short Scale Textile and E/E1.

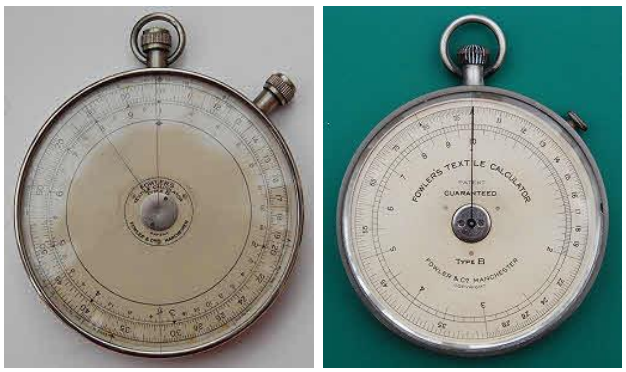


Figure 2.5.3: Two variants of Type B calculator

Known Serial Numbers for the Bakelite backed Type B calculators range from 24 to 1464, and perhaps unusually, the other non-Bakelite (i.e. two-part metal cases) variants do not generally seem to carry a serial number, though one carrying 2862 is known.

[18] http://osgalleries.org/collectors/tarantolo/fowler_info_and_image.cgi?string=FOW021

Another variant has been seen with an unusual case, see below:

Figure 2.5.4: Variant of Type B case

The face is one of the known variants, but the case is the most unusual item. It has two very prominent rivets on the back – (what do they hold?), and the case appears to be a spun one-piece steel case with a serial number B120.

With many thanks to Alistair Pearson, we have an explanation of a number of the Gauge points that feature on Type B Textile and also the Short scale Textile Calcuator. /I am very grateful for him allowing me to quote this scholarship, it certainly has given me an insight into the world of Textile calculators:

Gauge point 'A' is a gauge point for conversion of cloth weighed in pounds and measured in inches wide by yards long, to grams per square metre.

Gauge point 'B' is a gauge point for conversion of a cloth sample weighing less than 1 lb., weight in ounces, and measured in inches wide by yards long, to grams per square metre.

Gauge point 'C' is a gauge point for conversion of a small pattern, measured only in inches by inches, to grams per square metre.

The material gauge points are:

Linen: 300# yards per pound of a hank (single thread) of No. 1 count yarn.

Worsted: 560 yards per pound of a hank of No. 1 count yarn.

Cotton: 840 yards per pound of a hank of No. 1 count yarn.

No.1 count yarn is the thickest, so, e.g., a hank of Cotton No. 4 count would be 3,360 yards per pound.

Later production Textile Calculators can also have gauge points for Wool, and for Denier (presumably nylon).

A Fowler's Gallimaufry

If you want to delve deeper into textile mill terminology and calculations, see "Cotton Mill Handbook - For Superintendents And Overseers In Cotton Yarn And Cloth Mills" published in the USA in 1922, at https://archive.org/details/cottonmillhandbo00newy - although UK and US terminology can differ at times, it seems mostly similar, and UK and US standard weights per yard were the same, except for linen.

As for the arithmetic/application of Wefts, Looms, Reeds, Cloths, and/or Pickfinding, values shown in tables on some Textile Calculators, I'm sorry, you're on your own. I'm guessing (wildly) that 'Two In a Dent' means two warp threads in each dent (slot) in a reed, and 'Plain' is a single warp thread in a dent.

Alistair later corrected one of the values (It has been corrected above) and also gave some further information and very useful references:

Further to this, I must correct an error on my part. The standard for working Linen weight, a "lea", is 300 yards per pound, not 360 (1).

Fowler's (Type B) Calculator - Instructions I've put a scan of the 36 pages (from Peter Hopp, with thanks) in the Files section, in the 'Manuals' folder (see 3. below.)

My Type B Textile (Fowler & Co., no loop, oblate winders, two-part unknurled case, screwed metal back) has a gauge point for Linen of 36, as does an earlier example with the same front dial in Peter Hopp's *A Fowler's Gallimaufry* (2). These gauge points are not for a lea of linen, but for a hank of 3600 yards (3), but this value does not appear to be of great significance, as the Type B instructions make only two glancing references to it, with no worked example, and goes on to make clear that the value of 300 (in **bold** type), should be used for working Linen weight.

Type B and Short Scale Textile Calculators in later production however do show the Linen gauge point at 30 (4). Were customers confused by the Linen gauge point of 36?

Late production Textile Calculators had two more gauge points for materials, Denier at 53.33... (533⅓ deniers per ounce avoirdupois) which appears to be for silk (5), and Wool at 25.6, for the Yorkshire skein system count of 256 yards per pound, based upon the number of yards per dram (5).

1 H. Neville *Arithmetical Calculations For Weaving Students - Part I Yarn and Cloth*, "Standard and Express Office", Blackburn, 1904, page 13.

https://archive.org/details/arithmeticalcalc00nevi. And *Cotton Mill Handbook* Compiled by *Textile World*, copyright 1922, Bragdon, Lord and Nagle Company, Inc. New York, page 5. https://archive.org/details/cottonmillhandbo00newy

2 Peter Hopp *A Fowler's Gallimaufry*, 2019, page 32 Fig. 2.5.1 top left. https://sliderules.lovett.com/uksrc/gallimaufry.pdf

3 *Fowler's (Type B) Calculator - Instructions.* Fowler & Co.(Est.1898). 53 New Bailey Street, Manchester, and Station Works, Sale, Manchester. Undated. Page 6. Scan provided by Peter Hopp. sliderule@groups.io/Files/Manuals

4 Peter Hopp *A Fowler's Gallimaufry*, page 32 Fig. 2.5.1 bottom right. See also Short Scale Textile Types 10, 11, 12, pp.51-52; and the later production "Magnum" Textile at page 58 Fig. 2.16.1.

5 H. Neville *Arithmetical Calculations For Weaving Students - Part I Yarn and Cloth*, page 14.

Type E (Textile) *2CT2a*

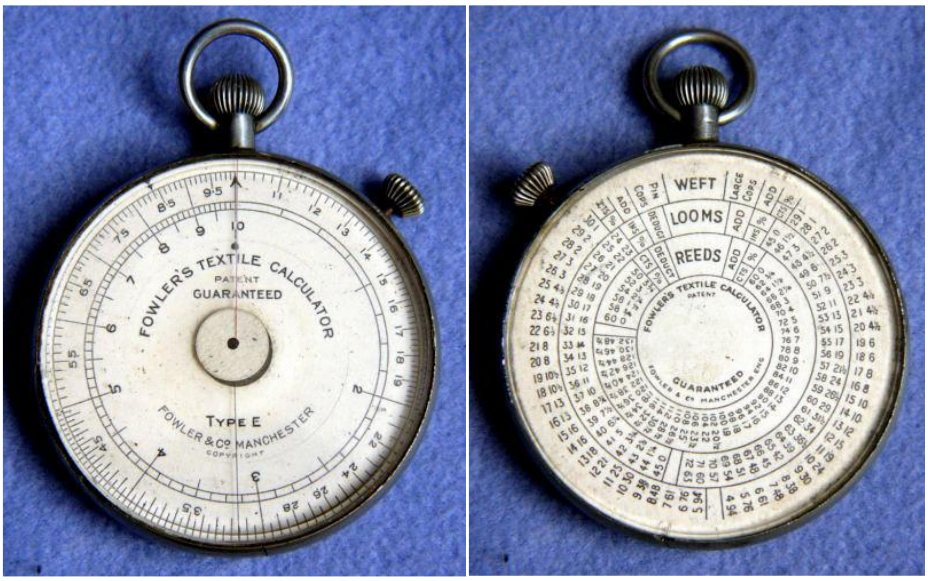


Figure 2.6.1: Fowler Type E Textile calculator

A Type E version has been discovered since PWSR. Whether this is a simple miss-printing or otherwise is not known, but this seems unlikely as at least two examples appear to have been sold on eBay. The device (above) is in a sintered case, but with a slightly later bulls-eye pointer, i.e. dated well after some of the earliest E1 devices listed later.

Intuitively again, one would think that a Type E would precede Type E1, but that might not be the case. This particular example included a serial number (2260) which closer examination showed was actually within the range of those identified in my book[19] (420 dated 26.03.1915 and 3009 dated Oct. 1919) for E1 labelled devices, and the anti-backlash springing is also identical to the later examples. So this is indeed a very strange fit, and there is no obvious explanation as it is identical in all respects to an E1.

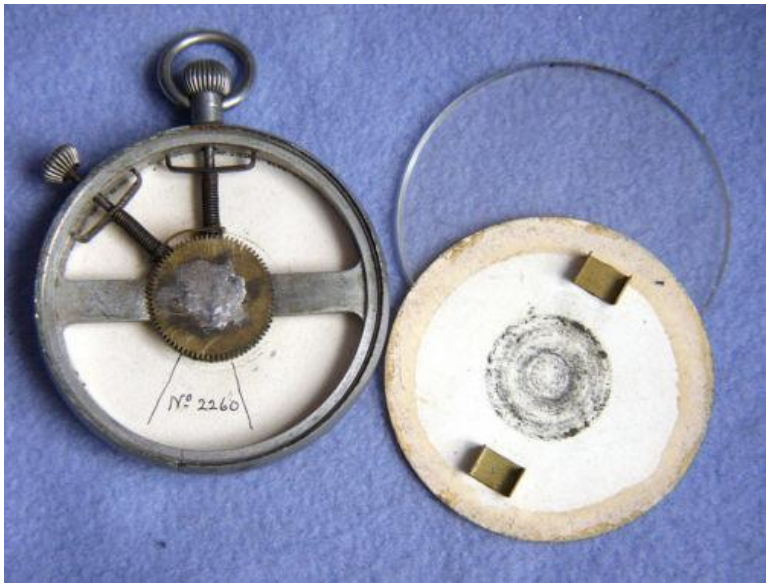


Figure 2.6.2: Fowler Type E calculator – mechanism

[19] PWSR -ibid

Type E1 (Textile) *2CT2b*

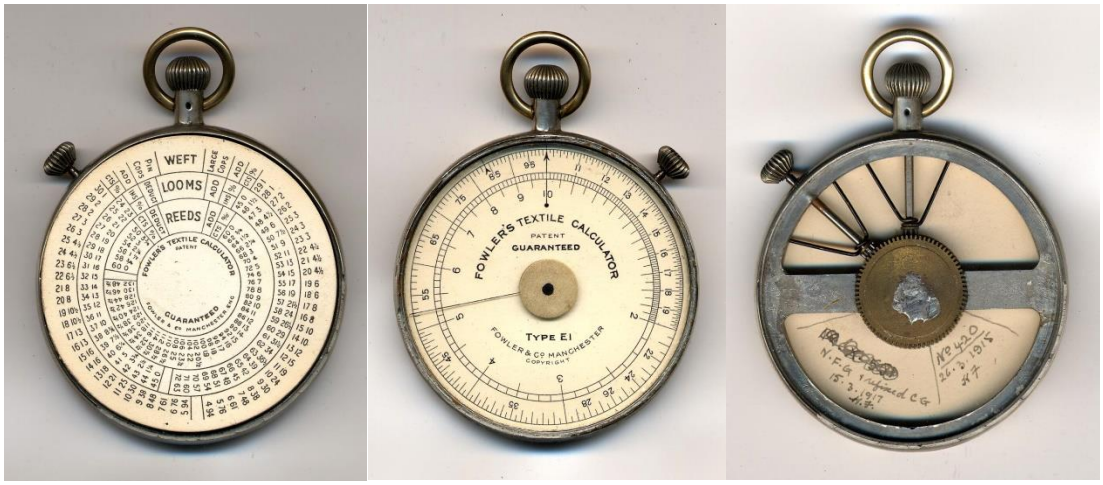


Figure 2.7.1a, b, and c: Fowler Type E1 Textile Calculator

This early example (Fig. 2.7.1) in its sintered metal cast case with its hand-written serial number (420) and date of 26th March 1915, and a later dated repair (15.3.1917), both possibly signed by Harold Fowler allows us to date the possible start of the 'bulls-eye' version of pointer to 1915 or just before.

This later version dated 1919 with a serial number of 2,959, allows us to speculate that the 'bulls-eye' was in use for at least 5 years and possibly more. Note the different version of anti-backlash springing used in this example. The Patent No 3,638 with its different versions of anti-backlash mechanism was dated 1914, so both these examples post-date the patent, and do not seem to provide any clue to more accurate dating. Coincidentally, we also have a picture of another example made during October 1919 with a serial number of 3009 showing that at least 50 devices were made in the month and that the mechanism was probably the same for at least that month.

Figure 2.7.2a, b, and c: Fowler Type E1 calculator, different mechanism

It is interesting to note that the two mechanisms shown in Figures 2.7.1 and 2.7.2 are variants of the anti-backlash mechanisms that is patented in 3,638/1914. Why one should have been used in preference to another is a mystery. All types of mechanism have been seen – see also Fig. 1.14 and 1.15.

Figure 2.7.3: Rare very early Type E1

Really early Type E1 with the milled back button, sintered case and pointer, carries serial number X585 and it could date back as far as 1914, shortly after Scientific Publishing ceased to be used as the manufacturer's name for this type of calculator. So to find a Type E1 with this very idiosyncratic "back button", but labelled Fowler & Co Manchester has begged a number of questions, not least when the transition to the much better known side-winder version of Type E1 actually happened. This is rare and unusual

Figure 2.7.4: Later Type E1

Below that (above) is a later version of the same calculator. This one is the more usual variety with crown and side-winder. This example is serial 1101, another with bulls-eye pointer seen on eBay is 2637 which seems out of step with Serial 4340 shown on the next page.

A Fowler's Gallimaufry

Both of these look to be remarkably similar to the Textile Short Scale, including the layout of the scales in decimals and fractions, manufacturer's name (Fowler & Co Manchester) and so on. These are also 2.7" diameter which is again remarkably similar to the Short Scale Textile.

Serial Numbers for the Type E and Type E1 – which to all intents and purposes are identical – range from 189 to 6043, all engraved in the side of these sintered aluminium cased devices, so there is some considerable overlap of the numbers between E/E1 and Short Scale Textile. E1 serial 6096 (or is it 9609 – I somehow doubt it) also has the bulls-eye front as left, which is most unusual; considering the next Serial Number!

Figure 2.7.5: Type E1 variant

Note that Type E1 Serial 6043 from Tina's Slide Rules[20] has a Weft/Looms/Reeds scale on the back with the "Two in a Dent" addition as with the later Short Scale Textile examples, which partially implies a parallel numbering scheme, where the Type 6 Short Scale Textile was from Serial Number approx. 15,000. This is another minor variant to look out for.

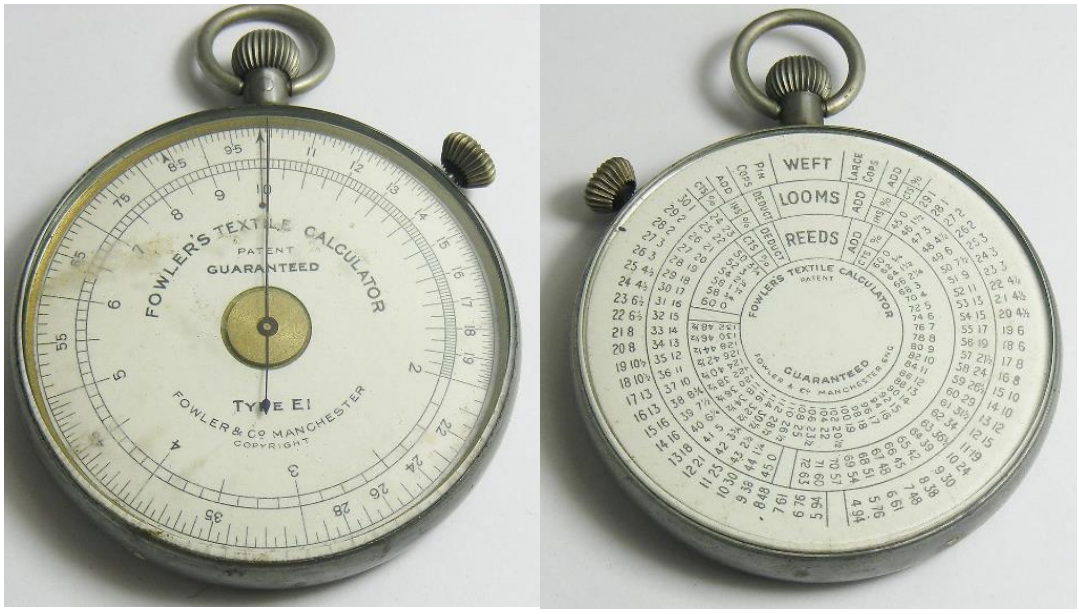


Figure 2.7.6a and b: Early Type E1

Type E1 Serial 4340 with fine pointer, and serial very roughly stamped in a different font. Serial 4370 sold on eBay Jan 2021

Figure 2.7.6c: Showing Serial Number

[20] http://tinas-sliderules.me.uk/Slide%20Rules/PocketWatchSlideRule

Type H (early) *2CG1*

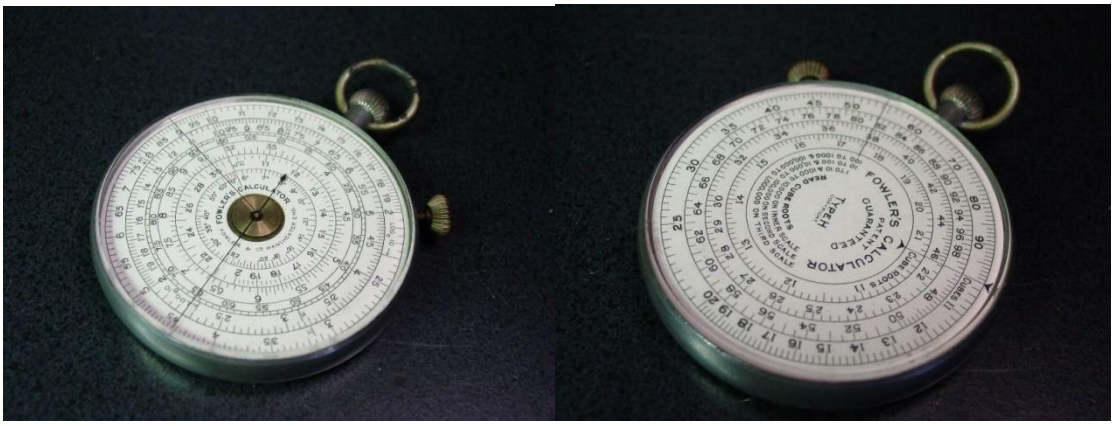


Figure 2.8.1: Fowler Type H Calculator (early)

This early version is almost 'Scientific Publishing' in design. It has the fine pointer, and is also in a cast case. The 'early', i.e. rounded rather than square watch furniture, is also characteristic of an early design. See also the Scientific Publishing Type O which is very similar. Seeing the notes for the later type (below) makes this style with the pointer and no bulls-eye only available for a very short while pre or during 1915

Type H (later) *2CG1*

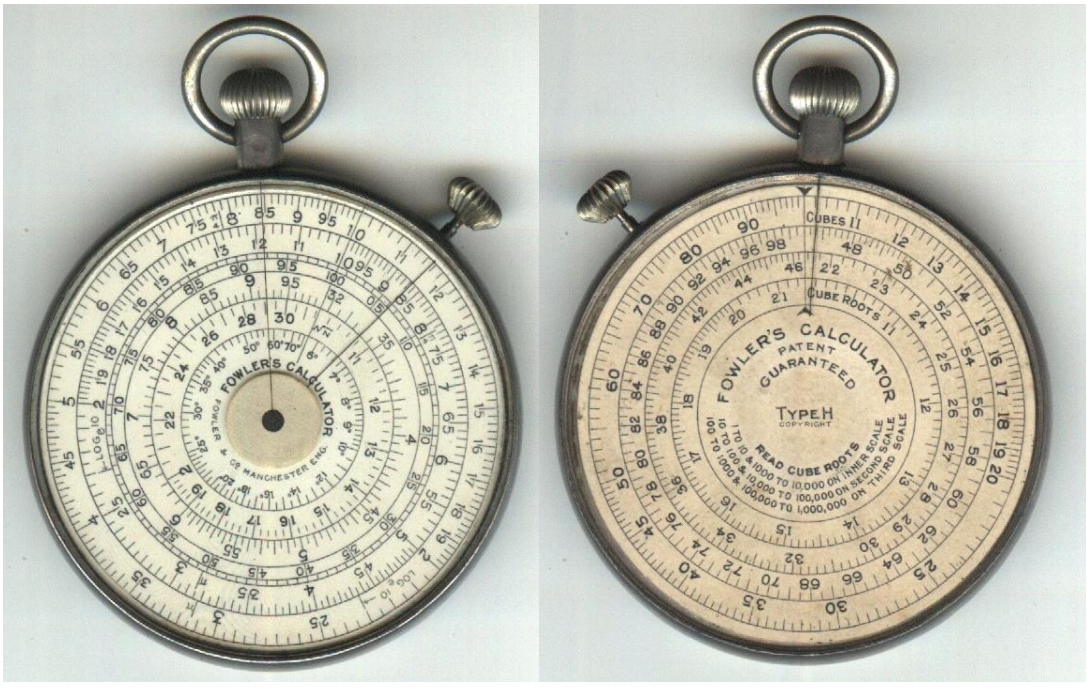


Figure 2.8.2: Fowler Type H calculator (later)

(Author's collection)

A Fowler's Gallimaufry

This calculator is in a cast case 2⅝″ (68 mm) diameter. It could be argued that it is the same calculator, or a later variant, of the Scientific Publishing, 'Fowler's Patent Calculator', see Figure 2.3.1 where the Centre Button would have covered the 'Type H' label. The 'bulls-eye' sticker has already been mentioned as an early Fowler feature and is synonymous with other calculators in a cast case.

Note that one of these calculators in the author's collection, carrying a hand-written Serial No 951, and a hand-written date 11.11.1915[21] was supplied in an early cardboard box with an "Instructions for Working Fowler's Patent Pocket Calculator" with a printed insert stuck into the case stating:

> FOWLER'S CALCULATOR. In the improved type of instrument now made the finger of the front dial and also the back dial are rotated by a nut at the side instead of a button at the centre, but this does not affect the instructions for making the calculations.

It allows us to date this example and the style of fittings very closely – late 1915.

Note this calculator is also sometimes referred to as a 'Vest Pocket Calculator' Type H, see later

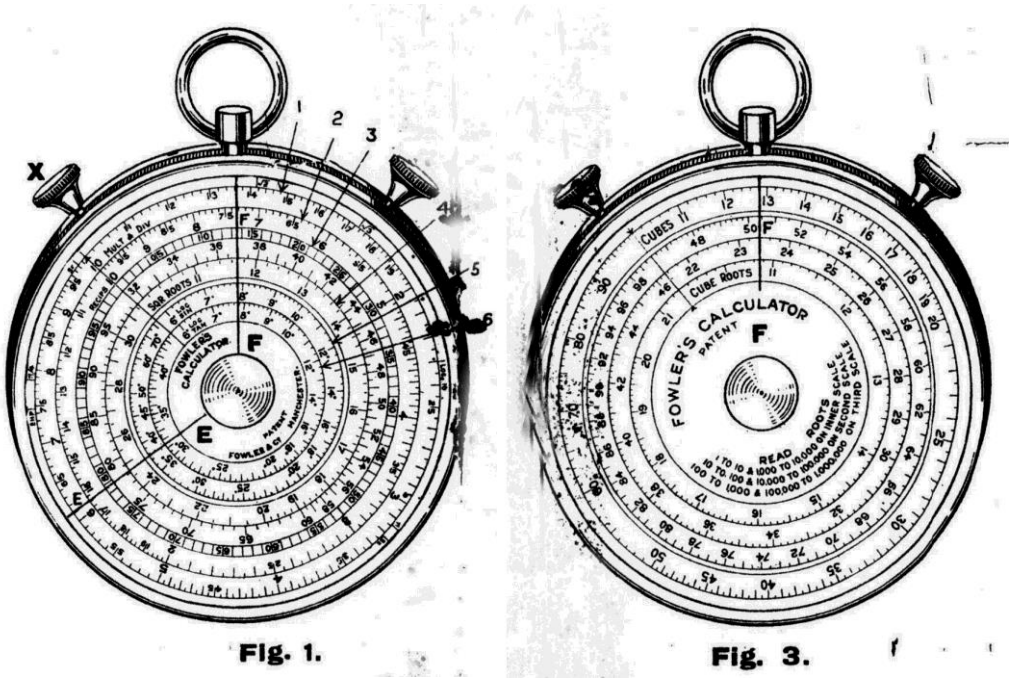


Figure 2.8.3: Fowler Type H Calculator from the Fowler advertising leaflet

[21] This information was only visible prior to replacement of the rear lens covering the Type H rear label. It is fascinating but fruitless to speculate what information might be available within all such designs of calculator.

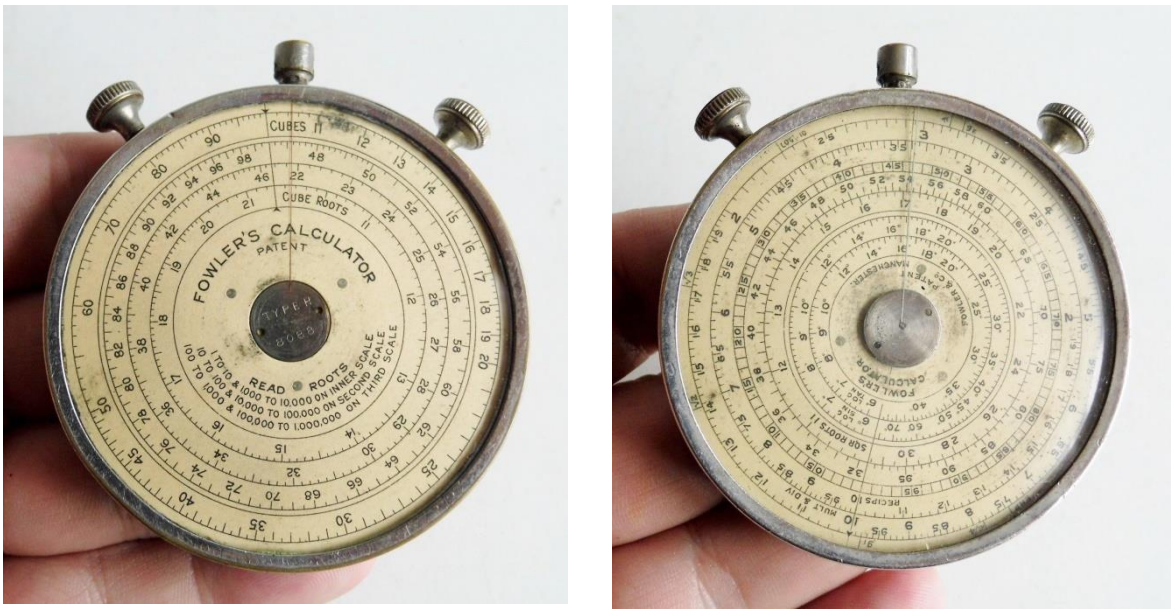


Figure 2.8.4: Later Type H calculator c1925

A later variant which is as illustrated in the previous advertisement has Type H and a Serial No 8088 engraved on one central axle, and nothing on the reverse side. This device has the same scales as we have seen on the previous models, but is in a two-part tin case with the more usual "standard" winders. It was supplied in a tin case. It would date to 1920 – 30. Another similar example with centre loop etc., with Serial Number 6858 (it looks like 6858) also supplied in a very similar tin, has the SERIAL Number appellation on one axle and the TYPE H on the opposite axle, see below. These are minor differences. However the actual serial numbers would make this latter device an earlier variant:

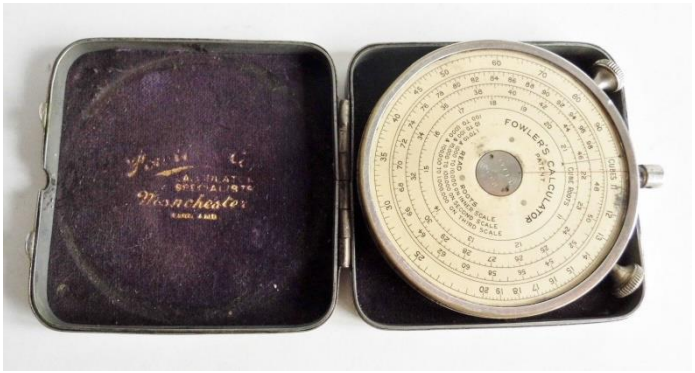


Figure 2.8.5: Type H calculator in tin box

Figure 2.8.6 Showing Serial and Type identity on same axle.

Figure 2.8.7: Alternative type and serial on opposite axles

A Fowler's Gallimaufry

Type M (Textile) *2CT1*

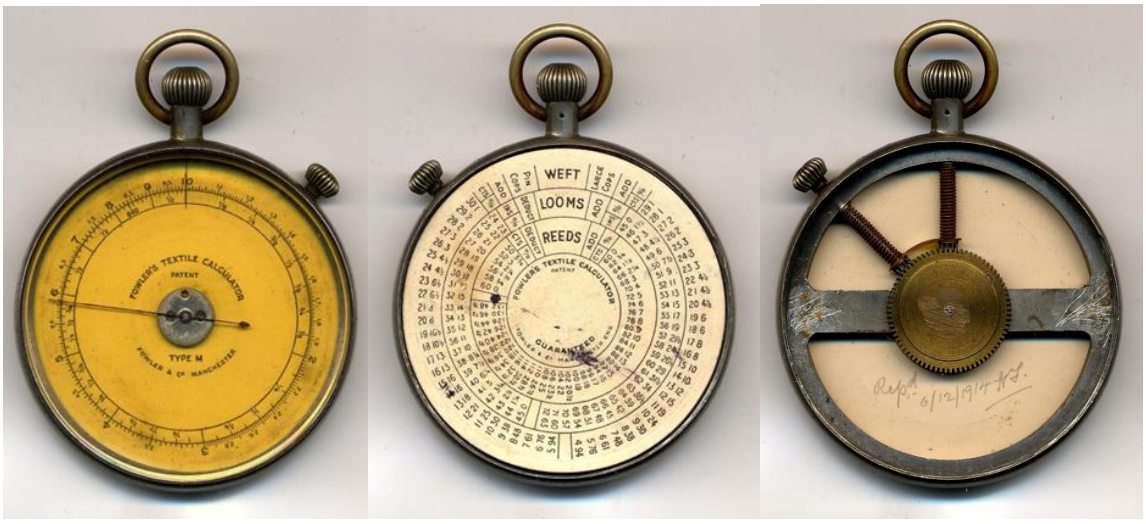


Figure 2.9.1a, b and c: Fowler Type M Textile Calculator

This is also illustrated in the Scientific Publishing section (Fig 1.15) and is an excellent example of a 'transitional calculator' which has all the SP characteristics but carries the Fowler name. It is probably the earliest example of a Fowler calculator, with Fowler maker's name, with a repair date of 1914 and no obvious serial number, implying that serial numbering started sometime after this.

Type O *2CG2b*

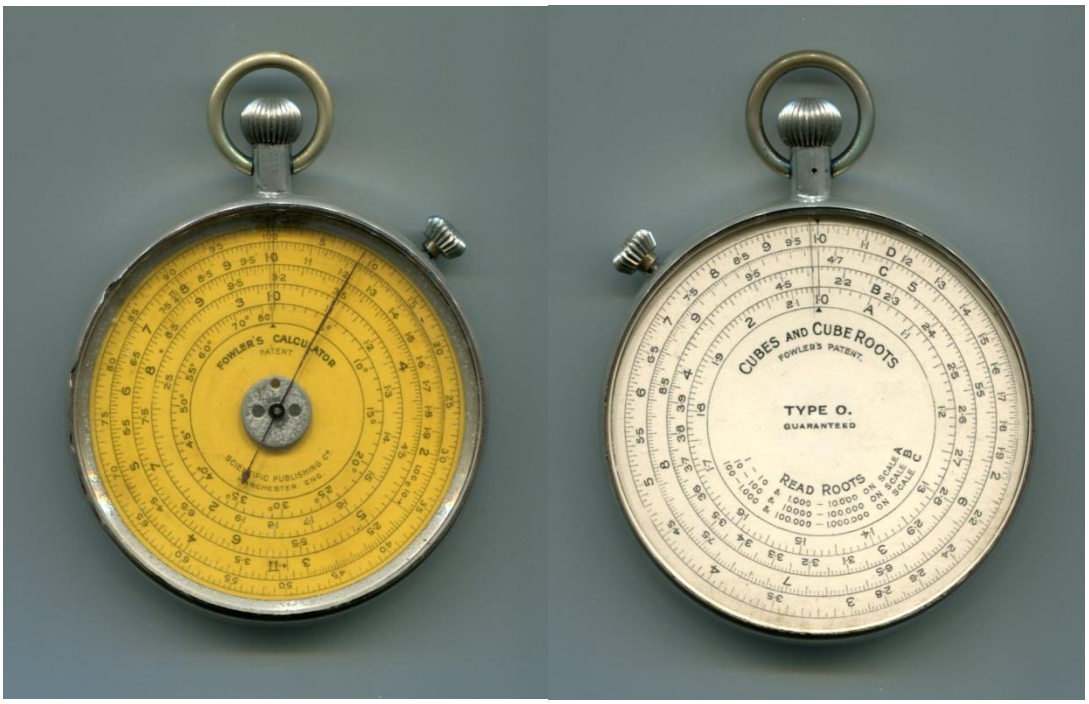


Figure 2.10.1: Fowler Type O Calculator

The Type O is actually a Scientific Publishing calculator, and quite rare. It has the fine pointer and cast case that is typical of the type. I am not aware of any type O with a Fowler label; it probably morphed into a Fowler's Type H calculator.

Note that this is a recent find from the late Tom Wyman's collection.

Type T (Textile) *2AT1*

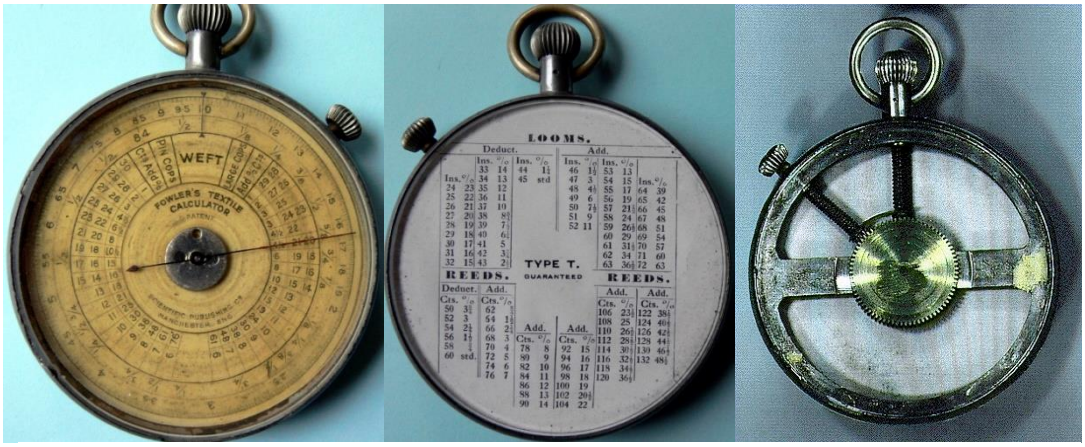


Figure 2.11.1: Fowler Textile Calculator Type T

The Type T Textile is also a Scientific Publishing calculator, and fairly rare, more completely described in the Scientific Publishing section. It has the fine pointer and cast case that is typical of the type. I am not aware of any Fowler labeled Type T Textile calculator.

Textile Conversion Calculator *Not Mentioned*

Figure 2.12.1: Fowler's Textile Conversion calculator

SERIAL 7697 in two-side-winder with central loop case, supplied in a tin box. Note the lack of Serial number inked into the bottom of the rear table as seen on later types; it has the serial number on the axle instead.

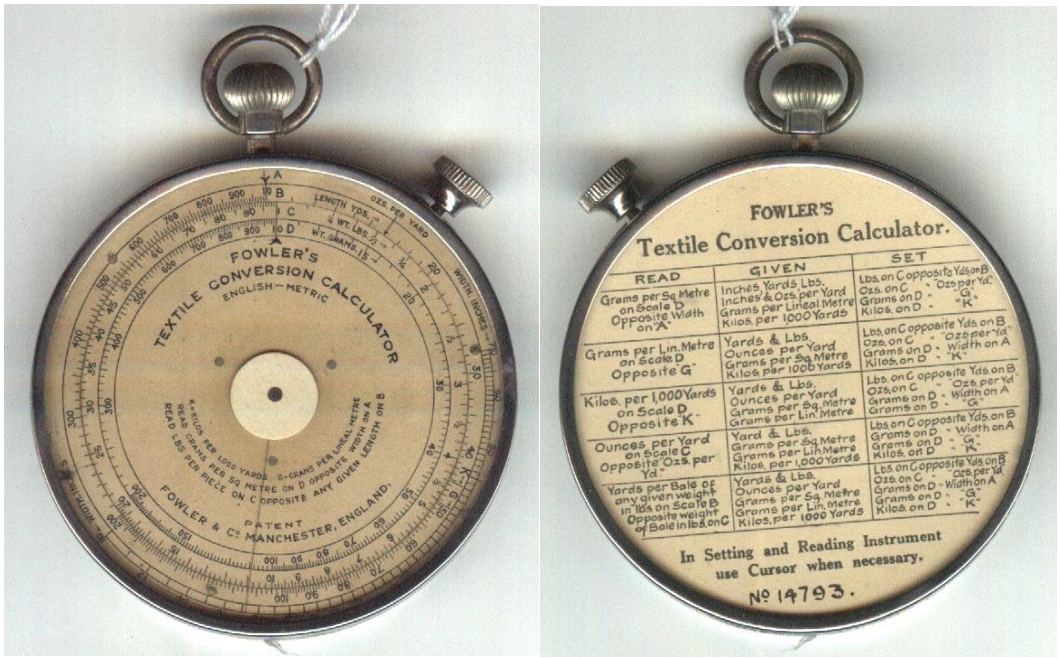


Figure 2.12.2: Later Fowler Textile Conversion Calculator

A Fowler's Gallimaufry

This is an early type of Fowler's calculator with the paper 'bulls-eye' label shielding the axle on the front of the calculator. While this is an earlier form of calculator, it is a transitional design as it is in a pressed steel case rather than the cast aluminum alloy case that would have been typical. The serial number of 14793 with a bulls-eye pointer is counter-intuitive and would imply that the bulls-eye pointer is later than the one shown below with its 23697 number – all attesting to the difficulty of dating these devices.

The Textile Conversion calculator has been seen with many different types of furniture attesting to its longevity, if not its large quantities, in the Fowler catalogue of calculators.

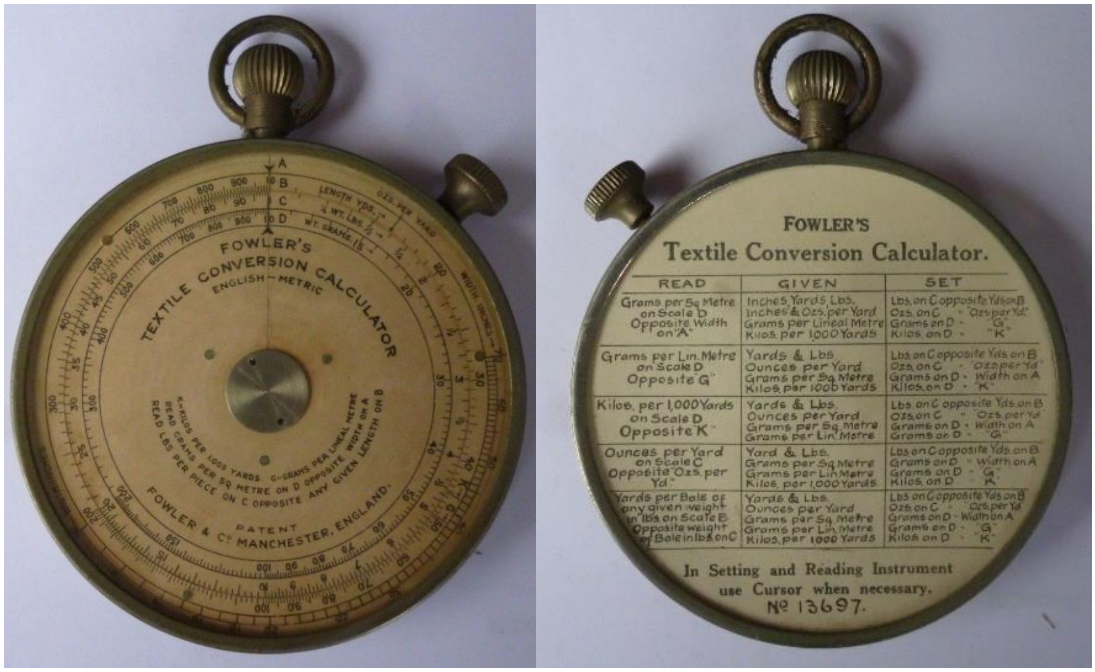


Figure 2.12.3: Fowler's Textile Conversion calculator

Short Scale Textile *2MT1a-f*

A recent study has identified 14 variants of Short Scale Textile calculator. Two further types have been found subsequently, changes are minor, but that is part of the charm!

The simplest way is to list the examples in Fowler serial number order. Examples from my collection have been given integer identity numbers and listed in ***bold italic***, while the 'other' examples are shown in simple **bold** with a letter addition. In the comments we will add any dating evidence, and go from there.

Fowler serial numbering is another long-held problem for me. I believe that Short Scale Textile calculators were numbered in sequence with all other types of Fowler Calculator. I have records of serial numbers 3,764, 5,060, 5,583[22] before 6,653 (below), and 6,768, 7,502, 7,603, 7,701, 7,964, 8,871, 8,976 and many other examples in between those listed here. It is certainly not a 'rare' calculator by any means.

Type 0: Serial No 7525, central loop etc., but does NOT have 'SERIAL engraved in the central axle

Type 1: Serial No 6,653, Central loop (missing), two flat side-winders, knurled edges to two part two-sided calculator. This is the earliest number calculator spotted so far with pictures. It was part of the Colin Barnes collection. 'Serial' 6,638 is part of the David Riches collection. 'Serial' 7,697 on a Textile Conversion is known.

The unusual feature is the word ***"Serial"*** engraved on the axle ahead of the Serial number. I'm not sure of the first and last numbers.

Type 1a: Serial No 7969. Despite being an 'early' "SERIAL" number it has an unusual 2 in a Dent rear scale, with a figure of 2.952d in it.

[22] Rod Lovett Collection, see http://sliderules.lovett.com/fowlerstextile/fowlerstextile.htm

A Fowler's Gallimaufry

Note the most unusual centre to the back scale

My thanks to Peter Fox for the pictures.

Type 2: Serial No 9,769, Central loop, two flat side-winders, knurled edges to two part two-sided calculator. This is another early number calculator ***without the "Serial"*** spotted so far, for which I have pictures. For sale on eBay in January 2016. I will not add pictures as it was identical to No 1 above.

Type 2: Serial No 10,298, Central loop, two flat side-winders, 70.4 gm, knurled edges to two part two-sided calculator.

Comments:

An advertising leaflet which includes 'Long' and 'Short' scale types that came with this calculator is labelled List 42, implying a possible date of 1942.

Type 3. Serial No 10,464, ***Universal Blitz-Rechner, Kurze Scala***. Central loop, two flat side-winders, knurled edges to two part single-sided calculator.

Comments

Why a Fowler's Textile Short Scale Calculator should be so named I have no idea. However the format is entirely contemporary with the similarly serial numbered device Type 1.

The scale has extra gauge marks in addition to the different name, and the cup back has a stamped serial number. Two examples – 10,464 and 10,479, which was missing the loop – have been seen on eBay over several years.

Type 3a. No Serial No, ***Short scale Textile***. Central loop, two flat side-winders, knurled edges to two part single-sided calculator. This is the same as the Type 3 but marked in English and has no serial numbers

Comments

This particular device has some points on the scale high-lit in red pen, but otherwise is the same as the T3 but labelled in English, The lack of serial numbers could imply a later date, but the style is as T3. However the format is entirely contemporary with the similarly serial numbered device Type 1.

Type 4: Serial No 13,205, central spherical winder, side flat winder, 94.4 gm, knurled two-part case, single sided calculator.

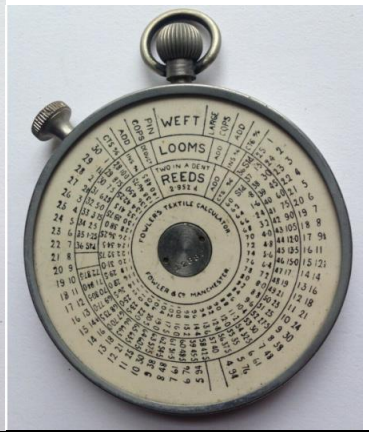
Comments:

This device is unusual as the rear of the case has a ***metal insert,*** rather than a glass as found on the usual two-sided calculators, and is not a one-piece cup.

The surprising "Hidden Details" of this device are covered in much greater detail as an appendix at the end of the (original Gaz) article. Supplied in a square 'Fowler' tin box with red velvet lining and white paper label.

A Fowler's Gallimaufry

Type 4a: Serial Number 12887, This is probably as a "proper Type 4, i.e without the tin back home-made modification, would be, Note however the "Two in a dent" extra and also including the 2.952.d extra gauge point of unknown use



Comments:
This device has the additional "Two-in a dent" rear Wefts etc scales but also carries the extras 2,952.d appellation. Whether these were added at purely random occasions is a complete mystery.

Type 5: Serial No 13,857 central spherical winder, side flat winder, 94.4 gm, knurled two-part case, double sided calculator. 13,590 is the same.

Comments:
This example has been selected to show what Type 4 with its possibly home-made replacement rear metal insert might have been like without the modification.

It can be seen that it has an 'early' – i.e***. no "Two in a Plain" marking – Weft etc. table.***

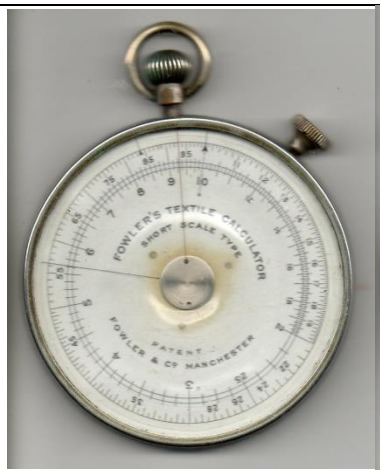
The seller of this device dated it to c1930, I'm less sure.

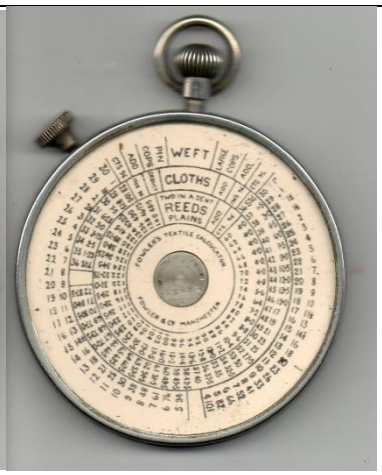
Note: The Instruction manuals covering both Short and Long scale variants which accompanied this calculator still carried the Fowler & Co name and the New Bailey Street address. This is likely to date to before WW2, and a 1930's date is perhaps not unreasonable.

Type 5a: *Serial 14160*; As 5, but the rear "Two-in-a dent" label carries the 2.952.d extra gauge point Ser. 14,460 also known

Comments:
Note the 2.952.d extra gauge point whose use is not known.

Type 6: Serial No: 15,285, 15,491; central spherical winder, side flat winder, 90.7 gm, knurled two-part case, double-sided calculator.





Comments:

Note the "***Two in a Dent / Plains***" addition to the 'Reeds' box in the table at rear. Also there is no longer a "Patent" mark beneath the 'Fowler's Textile Calculator' marking on the rear tables.

Supplied in a more rounded unmarked tin box with blue velvet lining and 'brass' medallion.c1939-42

Note: An undated 25 page Instruction manual covering both Short and Long scale variants shows the "Two in a Dent" form of table. The leaflet is over-struck with the change of name and address to Fowler's (Calculators) and Hampson Street Works so is likely to date to just after WW2 when the name was changed.

Type 7, Serial Nos: 15,067, 16,226 and 17,661; ***17,701***, below, central spherical winder, side flat winder, 90.7 gm***, knurled two-part case***, single-sided calculator. These are the highest serial numbers I have recorded. They were engraved in the back of the tin cup similar in shape/design to Type 3.

Comments:

The winders on this particular example are a mixture of Type 6 and 8, the side-winder being as Type 6 and the crown as Type 8. It makes one think that winders are not an accurate dating artefact! Types 6 and 7 were probably contemporary

This example is missing the loop making the pendant look artificially long. Both the tin and the back of the calculator are marked 'SAPT'.

Type 8, No Serial Number, central oblate winder, side oblate winder, 96.0 gm, ***un-knurled two-part case***, single-sided calculator.

Comments:

The winders on this model are different to both Types 6/7, and Type 9, though the differences are very minor, the crown and side-winders are different whereas Type 9 has them both the same.

There is no FC on the axle. However this appears to be the first non-serial numbered single sided model.

Type 9, No Serial Number, central oblate winder, side oblate winder, 96.0 gm, un-knurled two-part case, single-sided calculator.

Comments:

The rear of this single-sided calculator is made of a one-piece cup, like Type 3, but un-numbered, and is unlike the previously described single sided calculator with its insert, Type 4.

The intertwined FC central logo on the front of the device is very distinctive and seems to have only appeared for an unknown short period of time c1950

I have been unable to take this apart to compare mechanisms.

Note, Another similar un-numbered example, but without the FC logo, is inscribed on the back *'Peter Jones (Canada) 3.2.50 from the Blenkinsops'* enabling a guess that this was the last of the designs prior to the sintered aluminium case becoming standard across the whole range of Fowler calculators.

Type 10, No Serial Number, central oblate winder, side oblate winder, two-part case? Single sided calculator

Comments

I believe this is the latest and last design of calculator, dating from approx. 1948/50 to the end of Fowler's manufacturing.

There are ***additional gauge marks,*** differently marked fractions scale and completely different name and address markings: Fowler's (Calculators) Ltd. Sale Established 1898. Made in England.

Type 11, No Serial Number, central oblate winder, side oblate winder, two-part case?, Single sided calculator

This has the Type 12 scales, i.e. the different layout of the Type title and the addition of the 'Patent'. There is also what looks to be a further additional ± 'Percentage scale inside the two usual outer scales, decimal and fractions.

Figure 2.13.1: Two further minor variants, left looks to be a two-part tin case T11, right a later sintered variant T12

Type 12, No Serial Number, central oblate winder, side oblate winder, shiny sintered aluminium frame, unknown number of sides calculator, but probably single-sided.

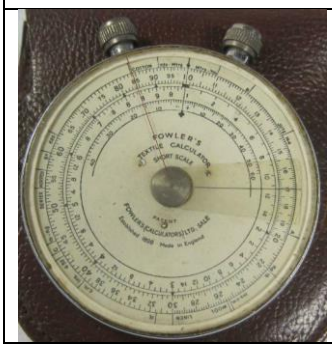
Comments

This is a variant on Type 10. Note the different layout of the Type title and the addition of the 'Patent'. There is also what looks to be a further additional ± 'Percentage scale inside the two usual outer scales, decimal and fractions.

I do not know if it is an earlier or later variant. I am guessing later' as it has an additional scale; Fowler generally did not reduce the number of scales.

This appears to be a sintered case, i.e. not two-part.

Type 12, No Serial Number, central oblate winder, side oblate winder, shiny sintered aluminium frame, single-sided calculator.



Comments

I believe both Type 12 calculators are the same, this second example simply shows the back as well, and has different scales to T13, (below) but is the same format.

Type 13 No Serial Number. Central oblate winder, side oblate winder, shiny sintered aluminium frame, single sided calculator, with Rexene covered back screwed to the internal armature.

Comments

This calculator from the collection of John Bolton is definitely of the final sintered aluminium cased type with ***screwed on back panel***, and is interesting in having no additional gauge points marked on the front scale, and is an "early" scale set.

In fact it has an 'early' scale with 'old' address so it probably predates No 5 and 6 above.

Conclusions

To have found this number of variations in just one type of Fowler calculator is interesting; extrapolating through the whole Fowler range is initially a tad daunting! 40 plus types of calculator at say 12 variants (I think the Type 4 is a home-made red-herring – see Appendix 2) per calculator makes 480 different calculators – Wow! It is also entirely possible that there are yet further real variations in this series I have not discovered, and of course it would be fantastic if we were able to add some accurate dating information. So, please if you have such a device in your collection and it is in any way different please let me have the details. And of course if you can supply any reliable dates that would be brilliant!

Annex One –The broader chronology

Having found Textile Short Scale devices with serial numbers no lower than about 3,700, it raises the question of what device may have chronologically preceded the Fowler Textile Short scale. This is not such an easy question to answer as the Short Scale is actually just a very simple single logarithmic scale calculator, with the scale marked twice, once in tenths and once in eighths. Likewise the "early" scale devices only have one gauge point marked at 8.4 – a point enigmatically marked "COTTON" on those later scaled devices which include many other gauge points. It is probably preceded by the Type E / E1, and at the same time its larger brother the Type B variants was probably produced. They are more fully described under their respective types.

Annex Two - Information tabulation à la TOMCAT

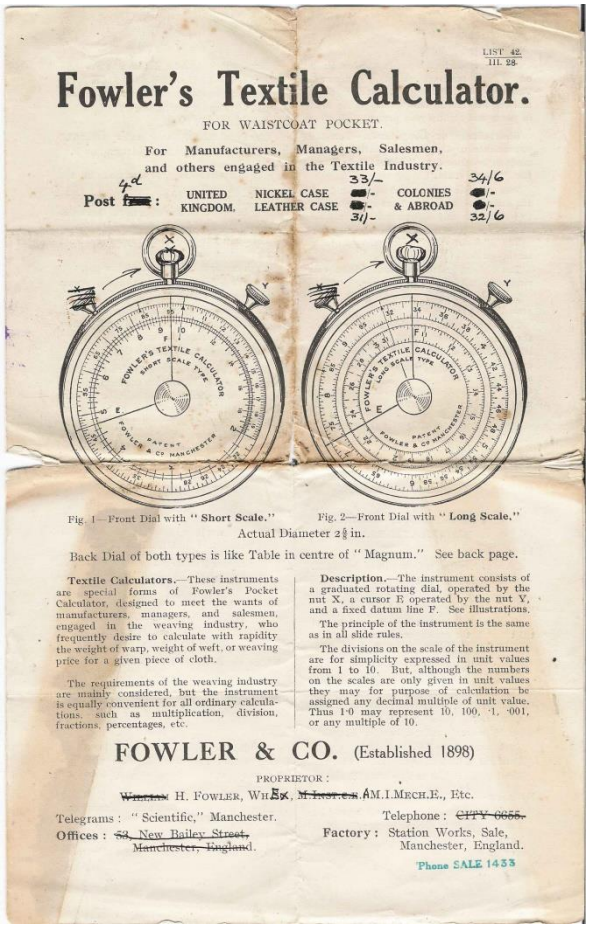
I have made an initial attempt at tabulating the above information in the same way as the TOMCAT duo did for their early F-C information. Does it work, and does it add anything? I'm not yet sure. Let me know what you think please.

Fowler's Short Scale Textile Calculator													
	Type 1	**Type 2**	**Type 3**	**Type 4**	**Type 5**	**Type 6**	**Type 7**	**Type 8**	**Type 9**	**Type 10**	**Type 11**	**Type 12**	**Type 13**
Centre Loop	√	√	√	x	x	x	x		x			x	x
"Serial"	√	x	x	x	x	x	x		x			x	x
Earliest Number	6638	9726	10464		13590	15491	15,067	n/a	n/a	n/a	n/a	n/a	n/a
Latest Number	7677	10298	10479	13205	13857		17701	n/a	n/a	n/a	n/a	n/a	n/a
Knurled two-part case	√	√	√	√	√	√	√		x			x	n/a
Flat Winders	2	2	2	1	1		1		x			x	x
Date		1942			<1939	>1945	<1945?		1950			1950?	1950
Double	√	√	x	x	√	√	x		x			?	x

sided													
Single sided	x	x	√	√	x	x	√		√			?	√
"Blitz Rechner"	x	x	√	x	x	x	x		x			x	x
Metal Insert	x	x	x	√	x	x	x		x			x	x
Central Sp;	x	x	x	√	√	√	√		x			x	x
No "2-in-a-Dent"	√	√	x	x	√	x	x		x			x	x
"2-in-a-Dent"	x	x	x	x	x	√	x		x			x	x
Rounded Winder	x	x	x	x	x	x	x		x			x	x
Oblate	x	x	x	x	x	x	1		2			2	2
F-C Logo	x	x	x	x	x	x	x		√			x	x
Different Scales	x	x	x	x	x	x	x		x			x	√
Different Scales 2	x	x	x	x	x	x	x		x			√	x
Sintered case	x	x	x	x	x	x	x		x			√	√
Screwed back	x	x	x	x	x	x	x		x			**x**	√

There are many different instruction sheets for these calculators as befits a design that basically was there throughout the Fowler life cycle. The one shown here below is interesting as it is marked "List 42 III28", which to me implies a date of 1942, and with wartime paper restrictions would explain why there are inked amendments – though inked amendments are regularly found on Fowler instruction leaflets!

The amendments are on an original instruction sheet which was for the two side-winder centre loop design of calculator, and being dated 1942 implies that these carried on through to at least this date, but sometime shortly after were replaced by the more traditional crown in loop with one side-winder – as shown on the amendments.



LIST 42.
III. 28.

Fowler's Textile Calculator.

FOR WAISTCOAT POCKET.

For Manufacturers, Managers, Salesmen, and others engaged in the Textile Industry.

Post free: UNITED KINGDOM. NICKEL CASE 33/- LEATHER CASE 31/- COLONIES & ABROAD 34/6 32/6

Fig. 1—Front Dial with "**Short Scale.**"

Fig. 2—Front Dial with "**Long Scale.**"

Actual Diameter 2⅝ in.

Back Dial of both types is like Table in centre of "Magnum." See back page.

Textile Calculators.—These instruments are special forms of Fowler's Pocket Calculator, designed to meet the wants of manufacturers, managers, and salesmen, engaged in the weaving industry, who frequently desire to calculate with rapidity the weight of warp, weight of weft, or weaving price for a given piece of cloth.

The requirements of the weaving industry are mainly considered, but the instrument is equally convenient for all ordinary calculations, such as multiplication, division, fractions, percentages, etc.

Description.—The instrument consists of a graduated rotating dial, operated by the nut X, a cursor E operated by the nut Y, and a fixed datum line F. See illustrations.

The principle of the instrument is the same as in all slide rules.

The divisions on the scale of the instrument are for simplicity expressed in unit values from 1 to 10. But, although the numbers on the scales are only given in unit values they may for purpose of calculation be assigned any decimal multiple of unit value. Thus 1·0 may represent 10, 100, ·1, ·001, or any multiple of 10.

FOWLER & CO. (Established 1898)

PROPRIETOR:

~~WILLIAM~~ H. FOWLER, ~~WH.Sc., M.INST.C.E.~~ AM.I.MECH.E., Etc.

Telegrams: "Scientific," Manchester.

Offices: ~~53 New Bailey Street, Manchester, England.~~

Telephone: ~~CITY 0655.~~

Factory: Station Works, Sale, Manchester, England.

Phone SALE 1433

Figure 2.13.2: Front sheet of Instructions c1942 showing newer button positions

Textile (Long Scale Type) Pick Finding Variety *2MT1f*

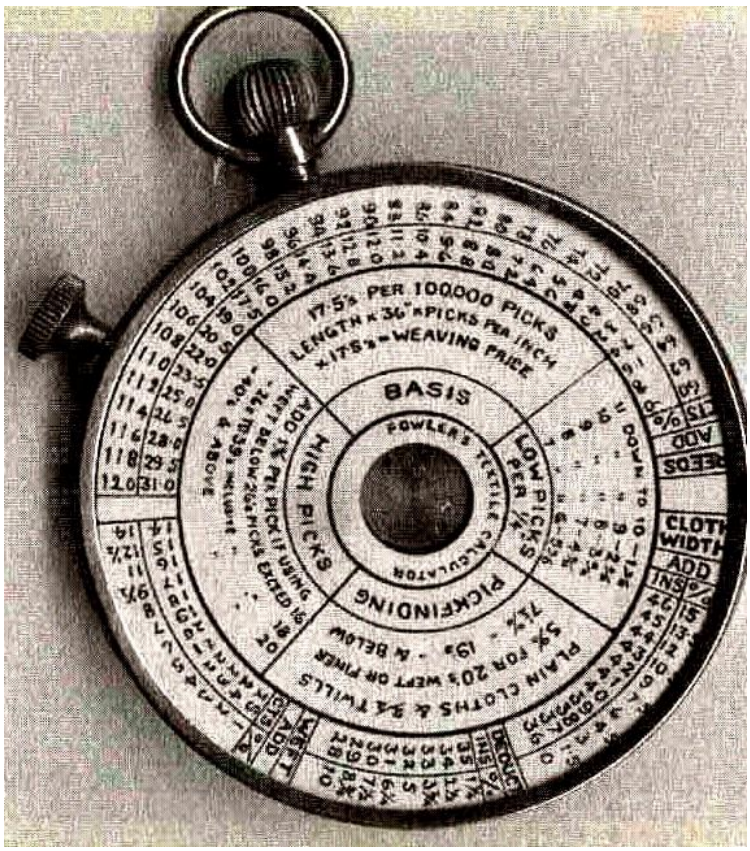


Figure 2.14.1: Fowler Textile calculator (Pick finding variety)

I am not an expert in weaving or the processes that might benefit from the use of such a calculator, however pick finding appears to be something whereby breakage of the yarn in weaving causes problems, and being able to calculate what to do can improve the quality of cloth surface and ease the operation.

The front face would appear to be one of the usual variants found on The Fowler Long Scale Textile Calculator, see next section.

With many thanks to Alistair Pearson, who very kindly let me use the information he has gathered, we have an explanation of some of the terms used here. And also a number of the gauge points which are fascinating and give an insight into the whole textile business

'The table, like the tables that can be found on other Textile Calculators, is for adjustments to the Uniform List of Prices, which was a periodically amended agreement (originally dating from 1892), between Lancashire cotton manufacturers and weavers' trades unions, setting out the piece-work wages payable to a weaver. This was based on a standard piece of plain cotton cloth 36 inches wide, 100 yards long, and made with a reed count of 60, to which percentage uplifts and deductions are made for any variations from the standard. The standard rate was either a fixed amount per 100,000 picks (single weft threads), or a fixed amount per 15 picks per quarter inch, with adjustments for higher or lower pick and reed counts.

The Pickfinding variant table is unusual in several ways, as unlike the standard tables normally seen as on the Short Scale Textiles:

1 It shows an actual rate payable per 100,000 picks, of 17.5d.

2 A 'pickfinding basis' for the base rate is most unusual. Pickfinding is when a weaver stops the loom and turns the cloth backward or forward to where the pick (weft) is broken or missing, and repairs it, before restarting the loom.

This obviously reduces output in a given period, so normally an additional percentage was paid for that piece of cloth (unless it was due to error by the weaver). Presumably in this case this was for either high quality cloths - they wouldn't bother for cheap cloths - or the yarn was consistently of low enough quality that broken picks were a regular occurrence and an adjusted base piece-work rate was better for the mill owner than paying a 10% uplift each time pickfinding needed to be done.

3 There are no adjustments to the Weft counts for different types of cop (reels of yarn).

4 There are additions for weaving 'plains' (three yarns in a dent - a slot in the reed) and '2/2 twill' (a.k.a. 'Two and Two Twill') cloths.'

Alistair continues: "The tables of adjustments such as on the Pickfinding variant and Short Scale Types as shown in the *Gallimaufry* are something of a minefield for dating a Calculator, dependent as they are on the then current version of the Uniform List of Prices.

This leads one to ask what an owner of a Textile Calculator did if there was a significant change to the Uniform List of Prices - were updated tables available to stick on the back dial?

I have managed to track down a few early versions of the Uniform List of Prices online, including the original 1892 List. What I can't yet find is when one of the major pricing variables changed, from loom width to cloth width".

A Fowler's Gallimaufry

Textile (Long Scale Type) *2MTa-e*

Figure 2.15.1: Textile (Long Scale) Type

A Fowler's Textile Long Scale Type, of the two side-winders variety (but missing the centre loop) and single sided is illustrated at left.

The style and the scales did not change with the different case type

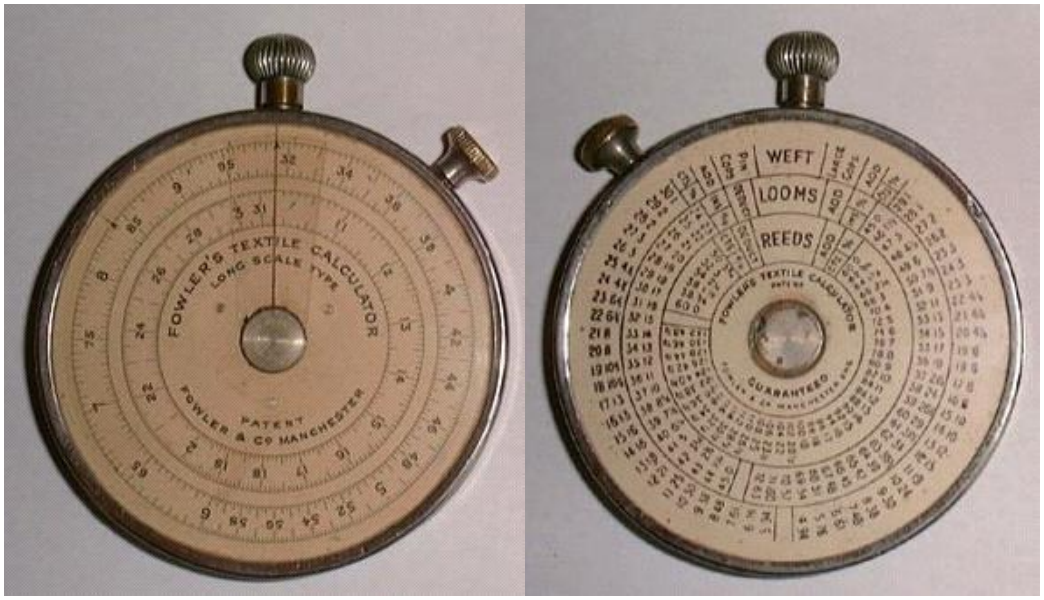


Figure 2.15.2: Fowler's Textile Calculator (Long Scale variety)

Comparing the calculators in any of the 14 variants of Short Scale Textile and 2.15.2, it can be seen that the rear of the two types carried identical sets of tables. These were extremely similar to other textile calculator tables; see Type T and Type M. These were often supplied in a metal box.

It would be no surprise at all if there were similarly 14 variants of this calculator which matched the variants found for the Short Scale variety

They shared an instruction leaflet which has been shown in the Short Scale section, Fig 2.13.2.

'Magnum' Textile *4MT2a,b*

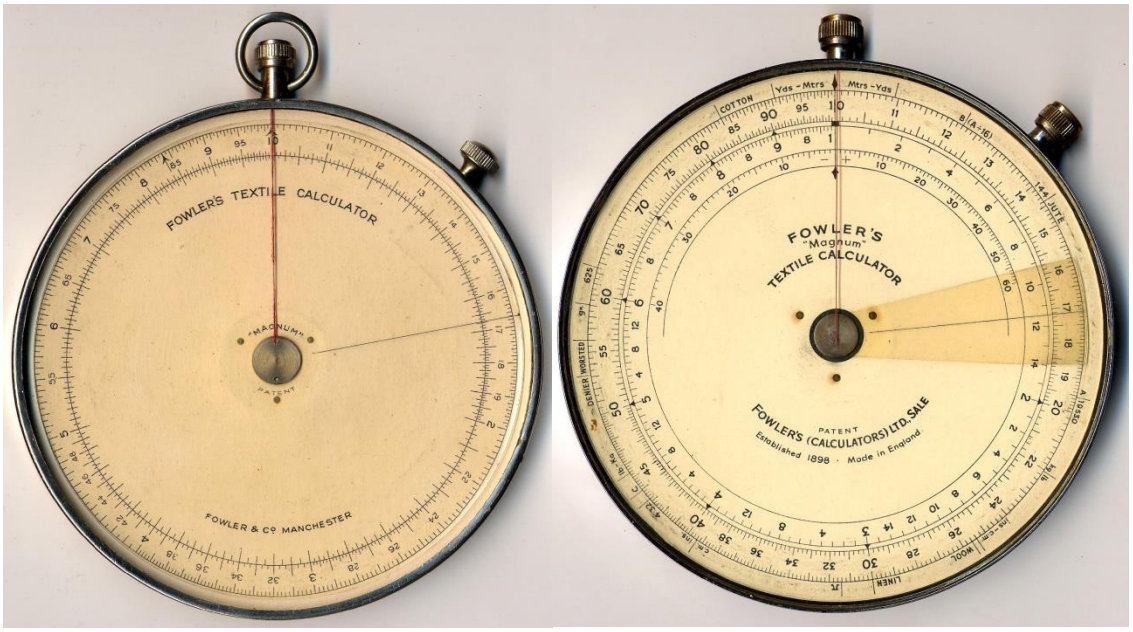


Figure 2.16.1: Fowler Magnum Textile calculator

Two versions of the 'Magnum' Textile calculator are illustrated with considerably different scales and markings. The example on the left is the earlier version (Fowler & Co. Manchester) with a simple double scale and very few gauge points, while the later example at right (Fowler's (Calculators) Ltd. Sale) has additional scales and a large number of gauge points around the outer circumference.

The poor picture at the bottom left (Fig. 2.17.2) of the next section shows a variant of the left hand version which does not have the 'Magnum Textile' marking round the centre spindle and could (should?) be taken as a separate type of calculator if we did not have pictures of these other variants. It makes for an interesting comparison.

Figure 2.16.2: Fowler's Long Scale Textile Magnum

Fowler Textile 'Magnum' Serial number 343 is a variant with the Textiles table mid-scale.

A Fowler's Gallimaufry

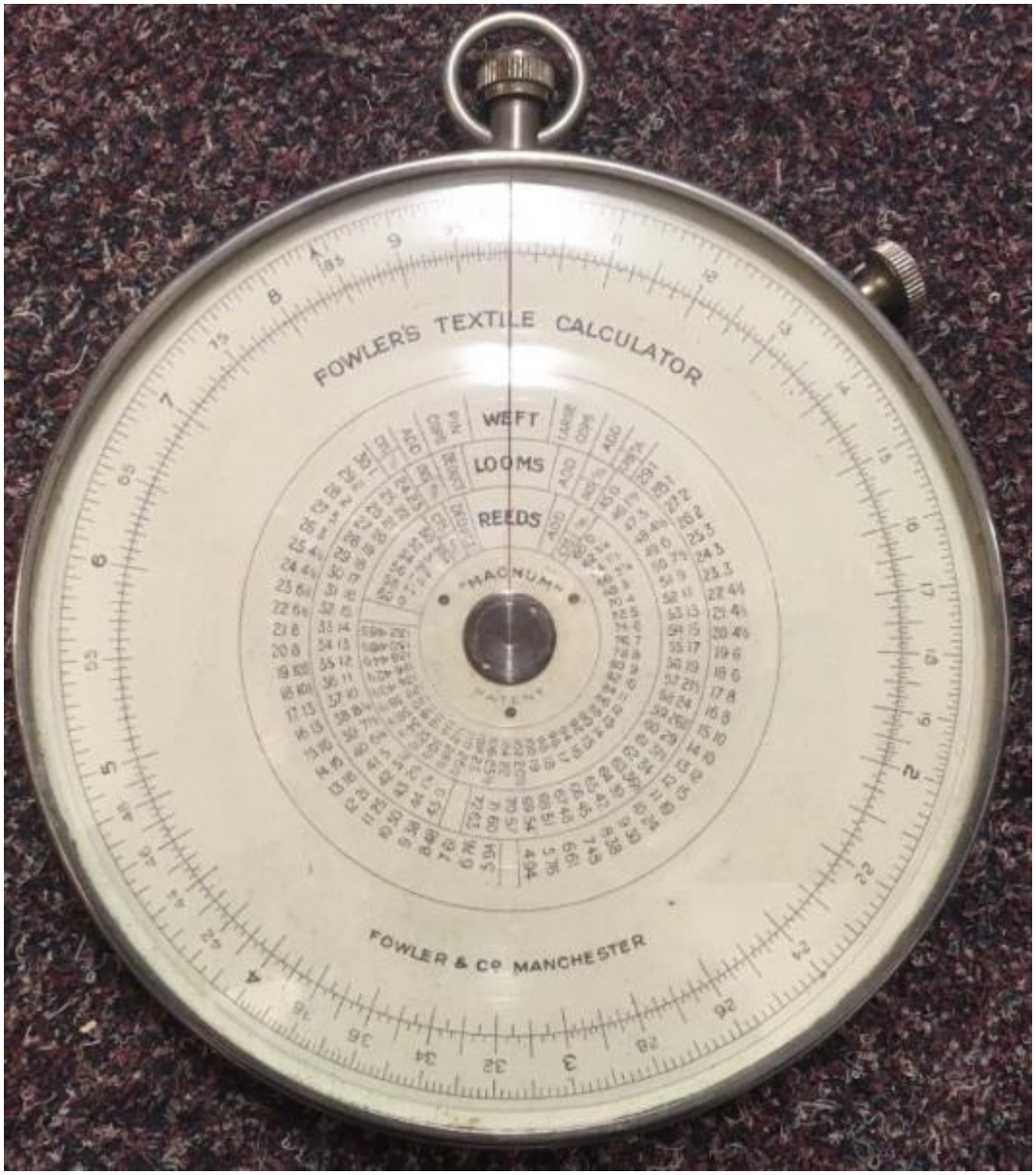


Figure 2.16.3: Fowler Textile Magnum – variant furniture

Fowler Textile Magnum Serial 1374 shows different furniture and the same scales as the much earlier version shown on the previous page

Fowler's Textile Calculator *4MT1a-c*

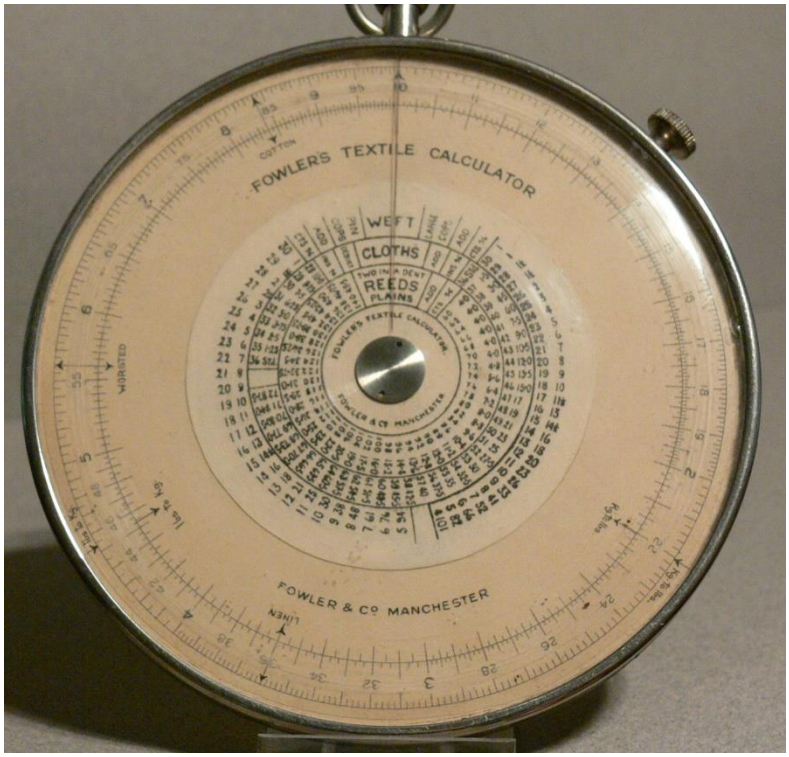


Image Courtesy of the Conrad Schure Collection

Figure 2.17.1: Fowler Textile Calculator

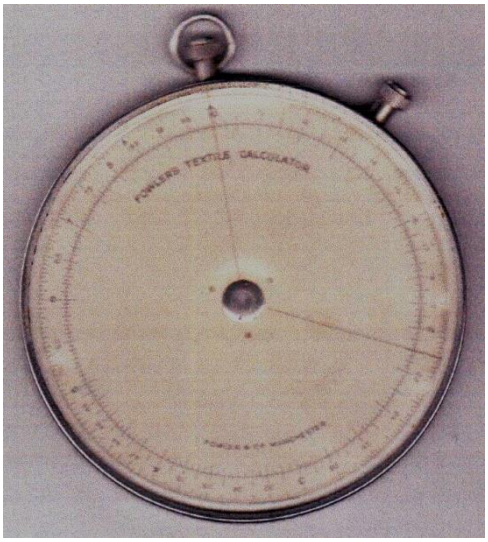


Figure 2.17.2: Fowler Textile Calculator – no Table

Yet another variant (this does not have the 'Magnum' appellation) is shown as a separate type in Figure 2.16.2, and is actually an earlier version (cylindrical knobs) and has the table from the Long Scale Textile calculator included.

It is available with all varieties of furniture showing that it was available for a number of years.

Whether this section and the last section should be coalesced into one section with variants of "Magnum" and non-Magnum, and then with and without tables is a moot point. These are the 'large' 4½" diameter Textile calculator made by Fowler.

A Fowler's Gallimaufry

Vest Pocket Calculator, Type MD

This and the following two types of Fowler's calculator are described in a Fowler's Pocket Book dated 1946 [23] where a paragraph titled 'Fowler's Single Dial Vest Pocket Calculators' states:

> 'These can be supplied fitted with either the front, or the back dial of the Long Scale Instrument, or the front dial of the 'Circular Slide Rule.' They are known respectively as Types 'MD'; H (SD); and C.S.R. (SD). Type 'MD' is useful for those who desire to perform multiplication and division only.'

Identifying these devices becomes a worthwhile challenge!

I believe that these are the equivalent of the Type 'H'; 'RX' and ''R' earlier described in the section on Fowler's Calculator. Indeed it is only the Type H that carried on through time, though very confusingly the appellation 'SD' in the description implies 'Single Dial', and all the Type H examples we have seen are a two-dial device, as is the later described Type CSR. Looking at the examples of Long Scale and Circular slide rule we have in the appropriate sections it is difficult to interpret the information above, particularly for the MD.

I do not believe I have ever seen a Type MD calculator, and likewise a picture of one.

Vest Pocket Calculator, Type H

See illustrations earlier under Type H. This name 'Vest Pocket Calculator' appears to be an alternate way of referring to the calculator when used in various later advertisements.

Vest Pocket Calculator, Type CSR

See later illustrations under 'Circular Slide Rule', for which this would appear to be an abbreviation, as it uses the front dial only for calculation.

[23] 'Fowler's Electrical Engineer's Pocket Book. 1946', page xliii

Universal Calculator *3MG1*

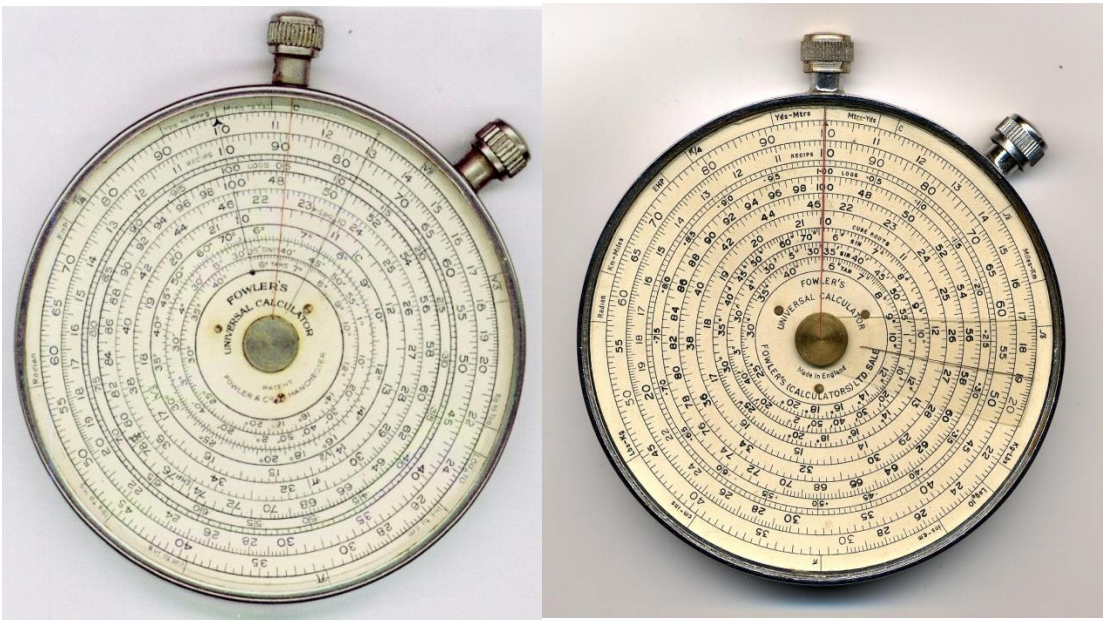


Figure 2.18.1: Two versions of Fowler Universal Calculator

The Fowler Universal Calculator is one of the 3⅜" diameter single-sided calculators that were produced throughout the whole of Fowler's later production life, and which feature all case types and furniture that have been seen. It was a mainstay of Fowler sales. It has to be one of the most popular and regularly seen devices made by them.

"Square" Universal

A particularly unusual variant is a "square" Universal that has been seen on eBay in about 2012. How it operates is not obvious as it now only has one crown, and why it should be in a square metal casing with a fold-over Rexene or leather-cloth cover is also not understood.

It is a most unusual variant. There are two sets of numbers on the top-left of the square metal casing; sadly the image does not have enough pixels to allow these to be deciphered.

Should the present owner happen to read this, I would be delighted to hear more about the instrument.

Figure 2.18.2: Square 'Universal' variant

A Fowler's Gallimaufry

Universal 'Blitz-Rechner' Kurze Scala *Not Mentioned*

Figure 2.19.1: Fowler 'Universal-Blitz' Rechner

This is to all intents and purposes a single-sided version of the Fowler Short-Scale Textile calculator (Type 3, see earlier) which has been given a new "European" / German title. Two examples are known, with Serial Numbers 10,464 and 10,479. They were sold on eBay.

Figure 2.19.2: Second example of 'Universal-Blitz'

The two side-winders, single central loop would make these c1925 - 1942.

'Twelve-Ten' Calculator (12-10) *3MG2*

Figure 2.20.1: Fowler 'Twelve-Ten' calculator with Bakelite back Serial 881

Figure 2.20.2: Fowler 'Twelve-ten' calculator in normal two-part tin case with Serial 2729 following on from the Bakelite versions

This calculator was supposedly introduced in 1936. Hence Bakelite backed calculators must have been introduced after 1936 as well. It is another of the 3⅜" diameter single-sided calculators offered by the company.

A Fowler's Gallimaufry

Three variants of the 12-10 calculator are illustrated. The earliest (top) is likely to be the version with the Bakelite back, next is a version with a steel back, and finally the Rexene covered back of the final version. Note that this is a single sided calculator produced throughout Fowler's life. We have never been able to determine the secrets of Fowler's serial numbering – i.e. is the serial number per type or universal across all types. However in the case of the 12-10 there is a serial number on the back, whatever the type, three digits on the Bakelite, four digits on the steel back, and not obvious on the final one.

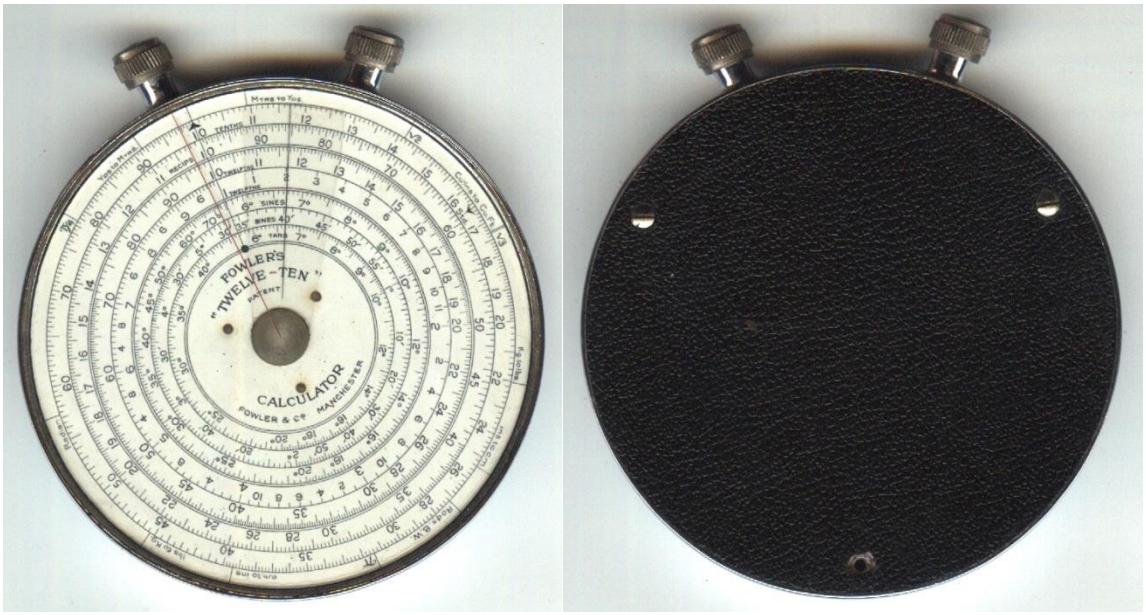


Figure 2.20.3: Fowler 'Twelve-ten' calculator in the last sintered case with Rexene covered screw in back

The sintered case latest versions have been seen with Rexene covered tin backs as well as chromed steel backs.

The twelve ten is amongst the most ubiquitous designs available, but all appear to carry the same scales, with the same names and addresses.

'Magnum' Long Scale *4MG1*

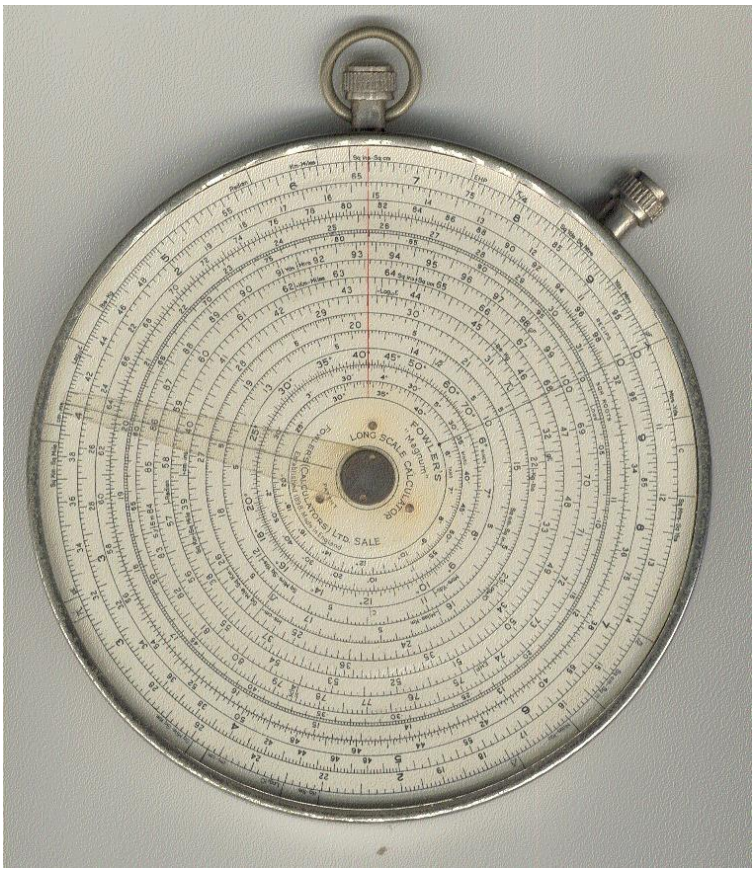


Figure 2.21.1: Fowler 'Magnum' Long Scale calculator

The Fowler 'Magnum' Long Scale calculator is another very common calculator, single sided, 4⅝" diameter, with its own unique set of Serial Numbers.

Apparently introduced in 1927, apart from the usual case variants – two-part tin and sintered, there are two obvious scale variants:

- 'Magnum' at the top, with the Fowler's (Calculators) Ltd. Sale address at the bottom as Fig 2.21.3.

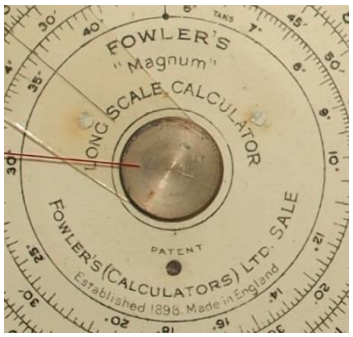


Figure 2.21.1b: Centre view

- And 'Magnum' at the bottom of the centre circle with Fowler & Co Manchester address at the bottom making this the earlier variant. Serial 46 has the 'Magnum'at the bottom.

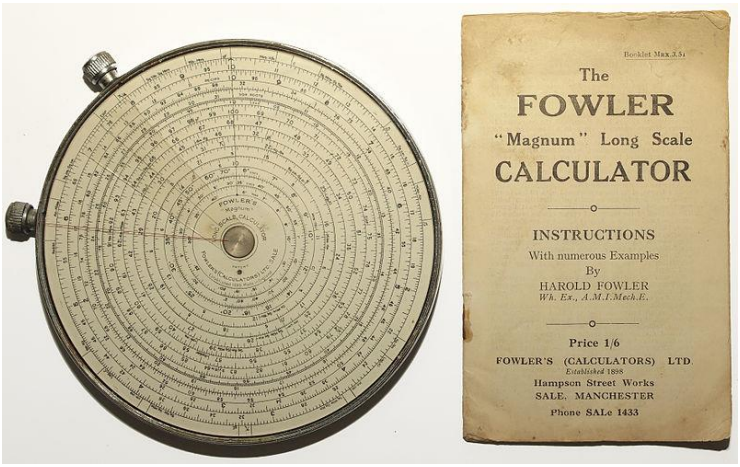


Figure 2.21.2 : Later version of Fowler Magnum Long Scale calcuator with Instructions dated 3.51.

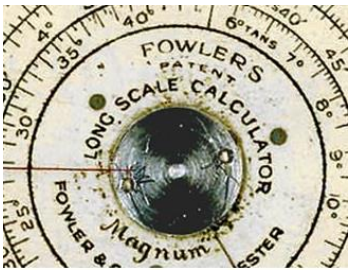


Figure 2.21.3: Magnum at bottom (earlier)

This second example (Fig 2.21.2) of 'later' calculator is in a sintered case with a screwed back.

A Fowler's Gallimaufry

Jubilee 'Magnum' Extra Long Scale *4MG2*

Figure 2.22.1a & b: Fowler Jubilee 'Magnum' Extra Long Scale calculator

Introduced in 1948 to celebrate the firm's 50th anniversary (1898 – 1948), this is a large, 4⅝" diameter single-sided calculator. The first two pictures (Fig 2.22.1a & b) illustrate one example with its Rexene covered screwed back, the third picture (below) is of a slightly later version. The picture of the centre at right shows an FC logo centre and is known to date from its first year of introduction, 1948.

Figure 2.22.3: Centre FC logo variant

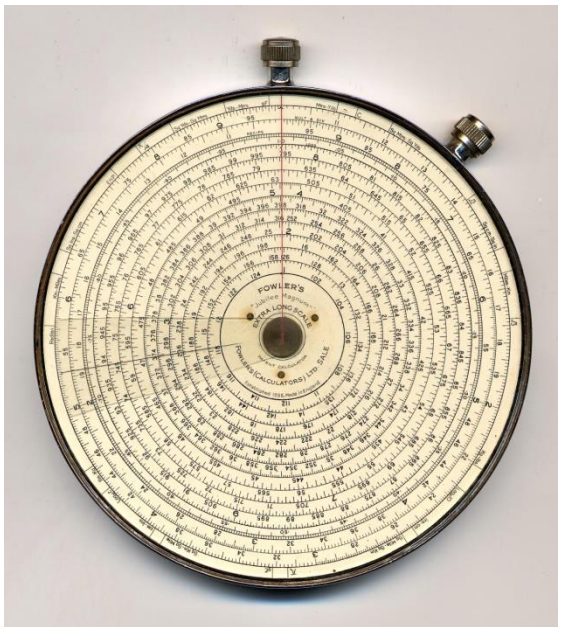


Figure 2.22.2: Fowlers Jubilee 'Magnum' Extra Long Scale Calculator

Nautical Calculator *4MN1*

The Fowler Nautical calculator is one of the special application pocket-watch slide rules they produced at various times. These included the Artillery, Nautical, and apparently a 'Navigator's', though this and the Nautical may be one and the same calculator.

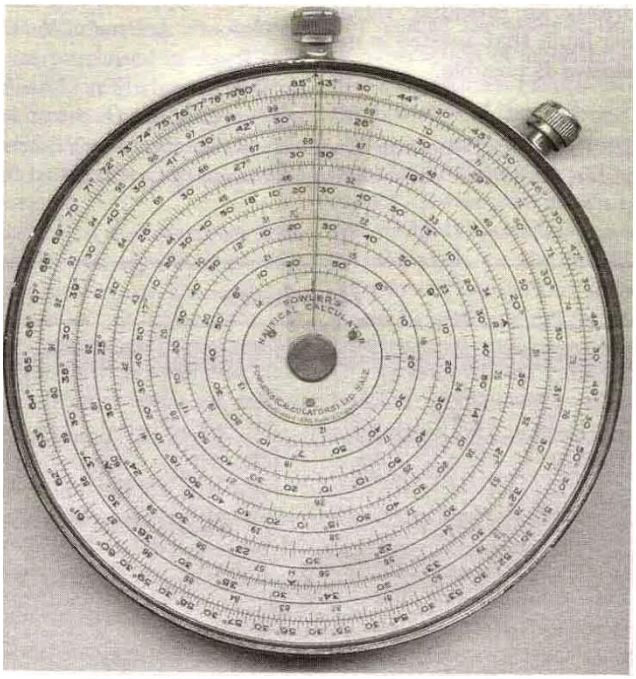


Figure 2.23.1: Fowler Nautical Calculator

Fowler describes the instrument in a publication from approximately 1957 as: 'providing a quick and easy way of accurately solving the calculated altitude, azimuth etc. ', as described in the "Nautical Magazine" of July 1952. It is double sided 4¼″ diameter, with the scale equivalent to a slide rule 6′ 6″. I have no idea what is on the reverse.

Figure 2.23.2: Nautical Calculator variant

A Fowler's Gallimaufry

The second example shows a late sintered case example. On the current page is a presentation example in lined wooden case and also shows an example of the instruction manual that was supplied with it.

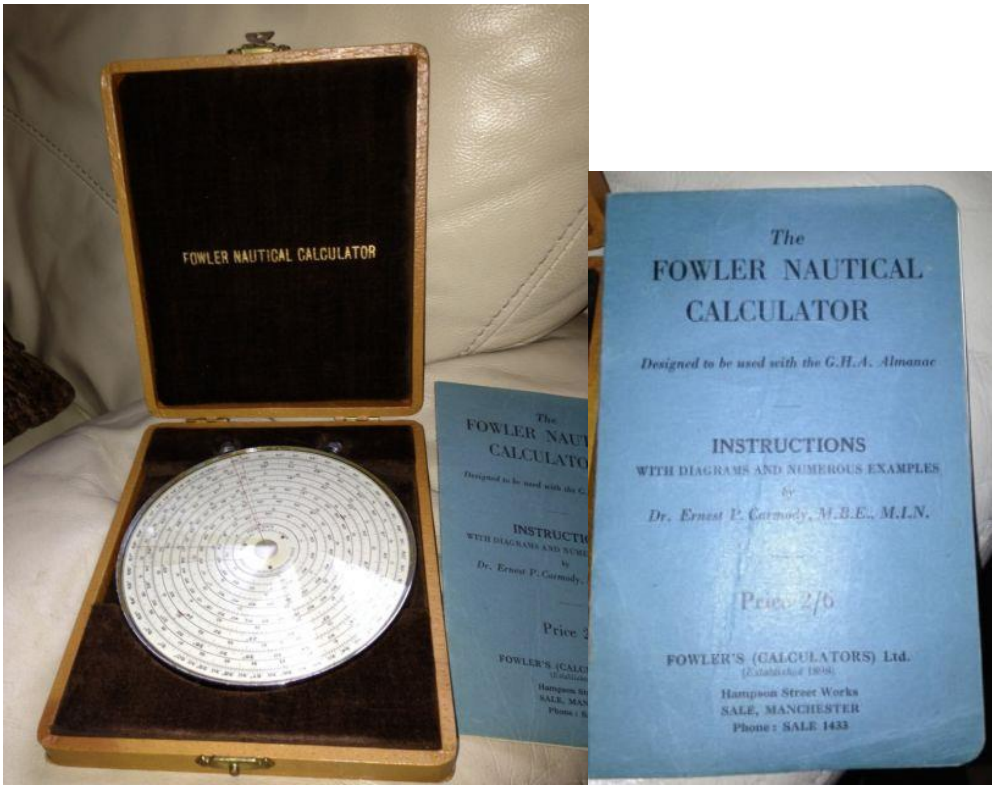


Figure 2.23.3: Nautical calculator in presentation case

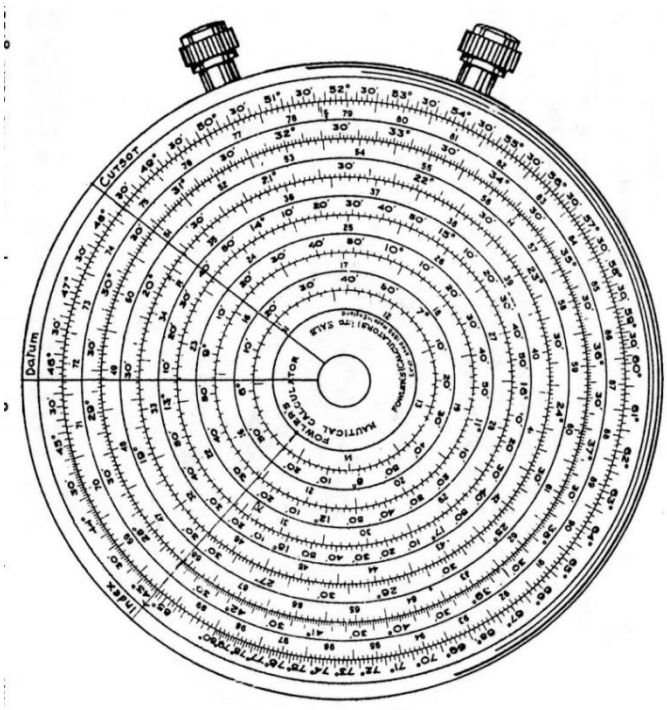


Figure 2.23.4 : Detail of Nautical Calculator Scales

Artillery Calculator *2MA1*

There are at least two versions of the artillery calculator. The scales are the same across all versions, but the detail layout and furniture differs depending on the age of the calculator.

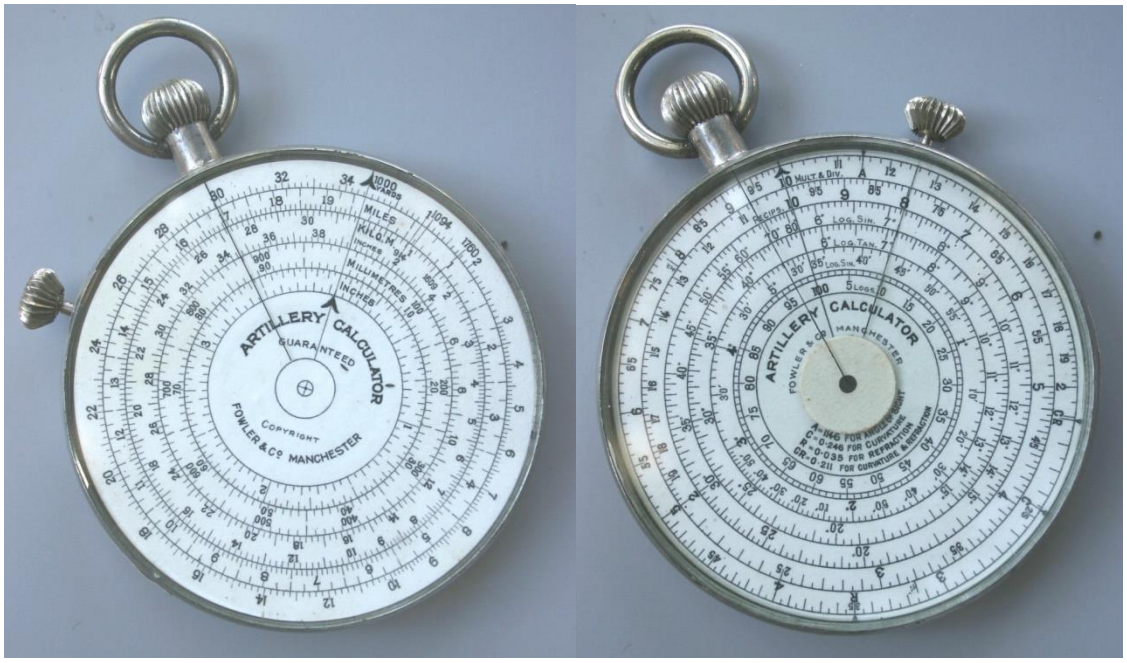


Figure 2.24.1: Fowler Artillery Calculator (early)

Figure 2.24.2: Fowler Artillery Calculator (later)

Illustrations courtesy of John Hunt Snr

In the 'early' version above, (Fig 2.24.1) we can see the traditional 'early' bulls-eye on a cast case and the early rounded furniture, examples are known with Serial Numbers 1952, 1986 and 2051. Below

that is a later version with the more usual prominent axle, complete with a serial number 13,447, and a pressed steel case with red velvet interior.

The scales are marked "Patented" – I am not aware that this refers to the scales but rather it refers to the mechanism.

The later example has a "Conversion Scale" on the rear of the calculator. There is a statement in the C-R that a version of the Type A (a Type A_1a?) with C-R 2CG4 exists with a Type R Front Scale and the Conversion Scales on the Rear. Note this information is repeated in the Type R listing. I have not seen one.

Long Scale Type R *2CG2a*

The pictures of a Type R are from an early sintered case device with no external serial number in the author's collection, where the 'R' appears to be a hand-drawn modification of the more usual 'H' of a Type H label. This was done within the factory as the glass in these sintered devices is not easy to remove. Two further examples sold on eBay during 2009 and 2017 have the same 'R'.

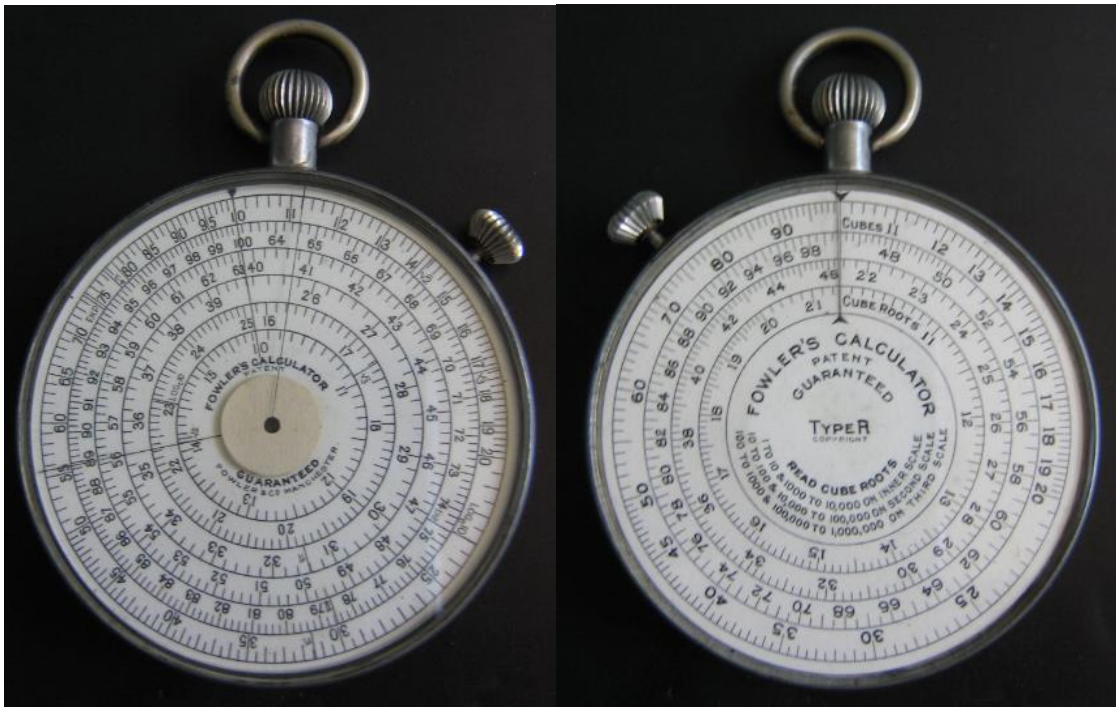


Figure 2.25.1: Fowler Type R Calculator

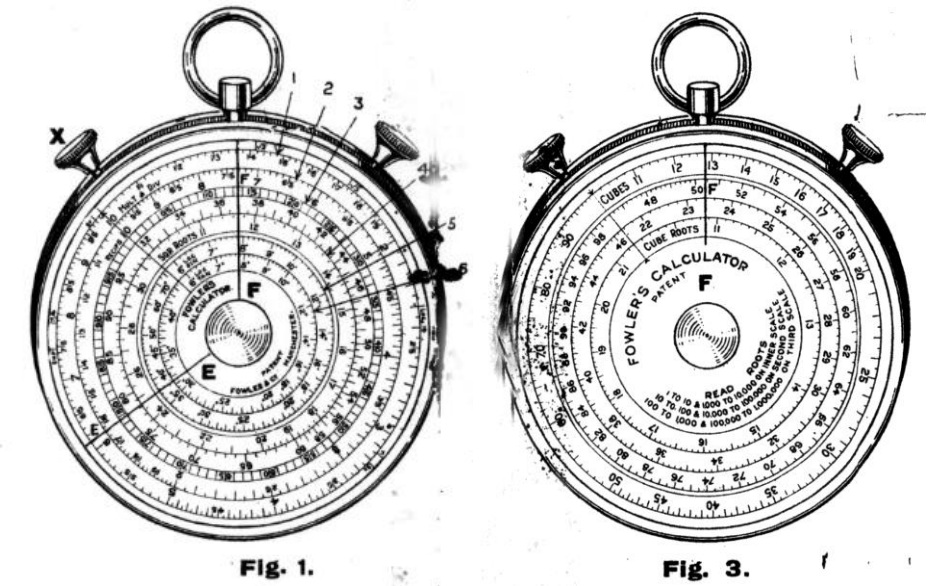


Figure 2.25.2: Fowler Type R from the advertising leaflet

The Type R continued to be described through to 1922 when it featured in a joint Instruction manual with the Type H. The same description was also to be found in 'Newness Slide Rule Manual' [6] by F.J. Camm through its life from 1944 to the end of publication in the 1960's.

Long Scale Type RX *2CG5*

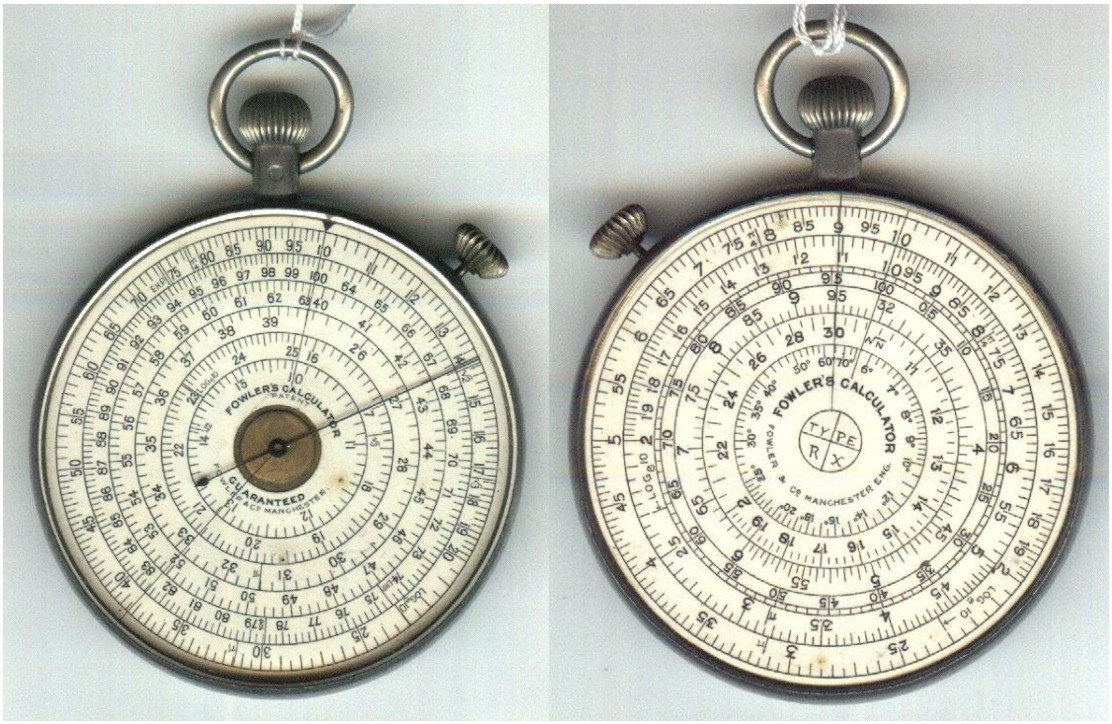


Figure 2.25.3: Fowler Long Scale Type RX

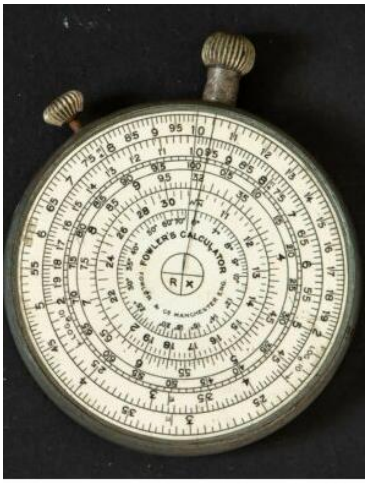


Figure 2.25.4: Type RX variant

This is one of the earliest designs with fine pointer and cast case with early furniture. A later variant with the Type RX engraved into the axle is shown below (Fig2.25.7).

A variant where the 'Type' is <u>not</u> included in the central circular marking can be seen on the left.

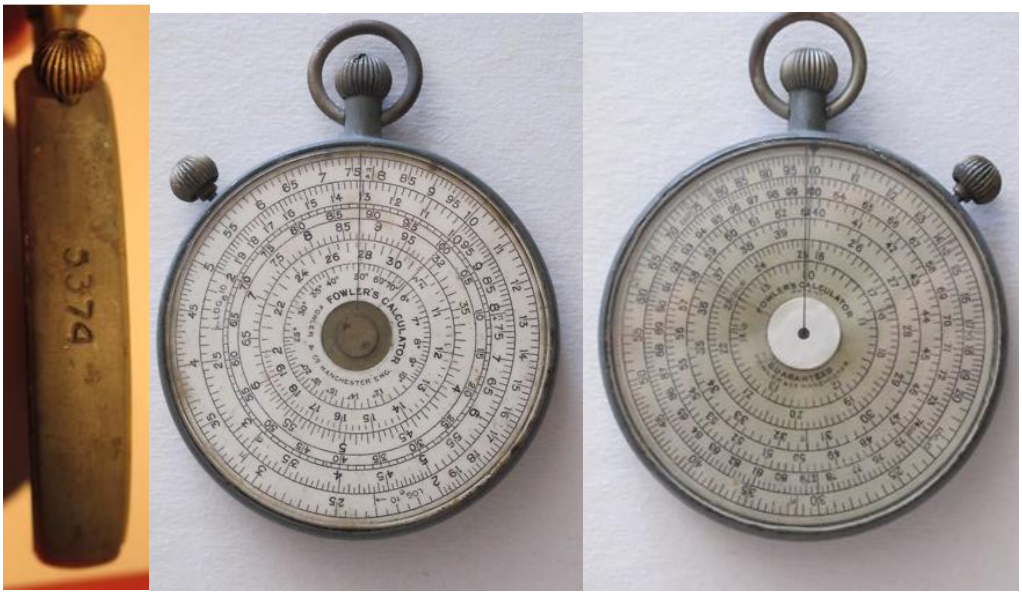


Figure 2.25.5: Fowler Type RX calculator

Then we have a slightly later version Type RX – not stated anywhere on the rule, where the 'RX' was carried on the earliest type and is now covered by an axle, but is obvious from the scale selection, complete with sintered case, bulls-eye pointer and serial number 5374.

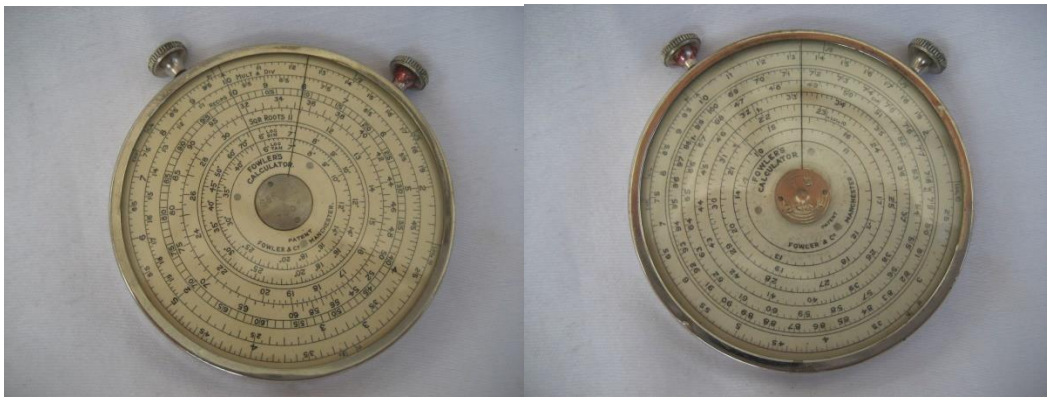


Figure 2.25.6: Fowler Type RX Calculator

The next example of Type RX (Fig. 2.25.6) is a two side-winder single loop (though the loop is missing in this case) more traditional two part tin cased calculator, where the type marking can be clearly seen on the reverse axle. The front axle carries a serial number, which is of the unusual SERIAL and 7007. Another is known with number 6900, both of which were early devices.

Figure 2.25.7: Variant with Type Marking on the Axle

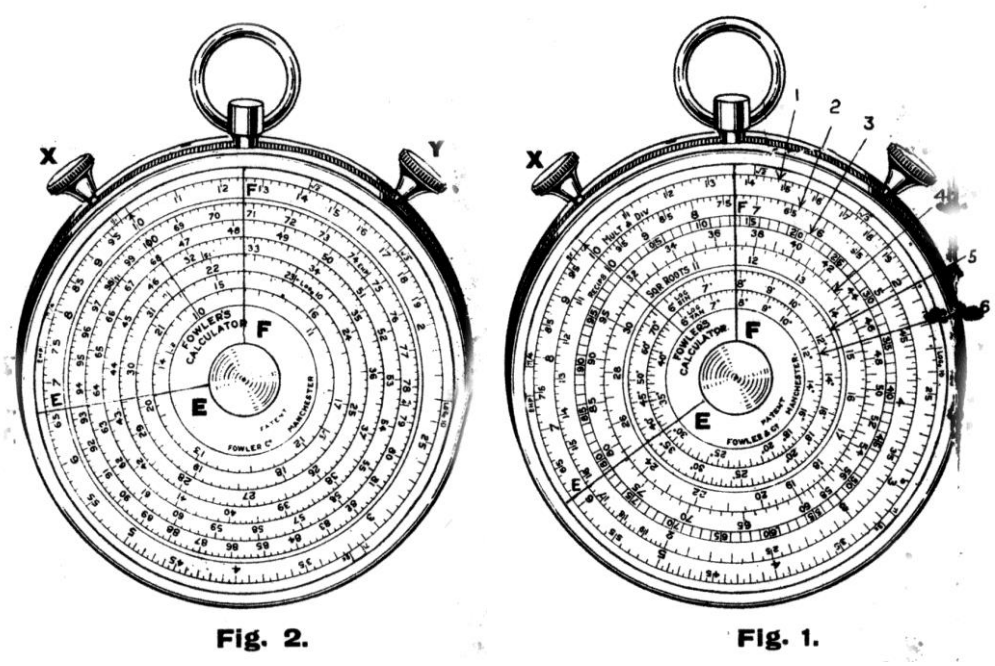


Figure 2.25.8: Fowler Type RX from the advertising leaflet

Our final example of Type RX has a traditional crown in a loop, single side-winder, two-part tin cased variant, Serial No 16772, which we can date to 1943 as it came in an engraved case with that date. Nowhere does it say 'Type RX' but the scales are appropriate and it is as illustrated in the advertising leaflet, (Fig 2.3.5) and has now morphed into the Fowler Long-Scale Calculator of ubiquitous fame.

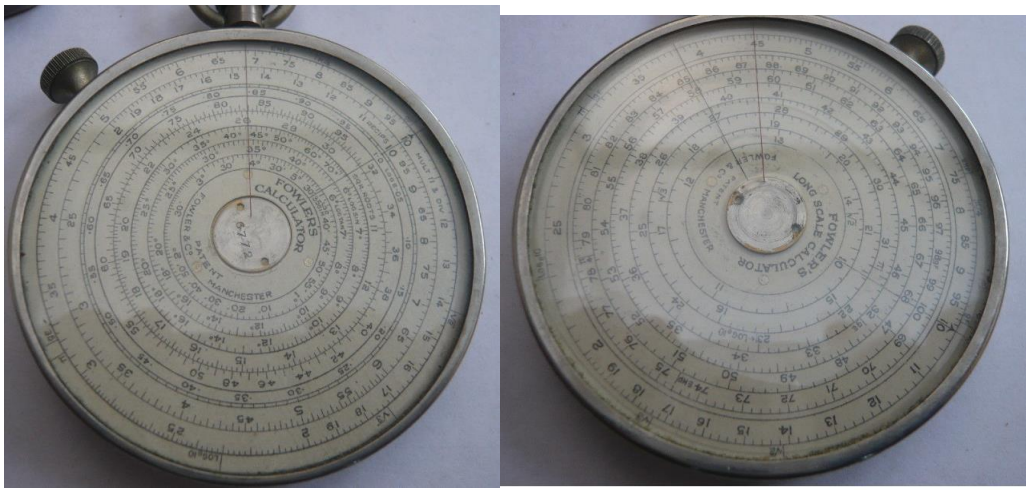


Figure 2.25.9a and b: Later Type RX calculator

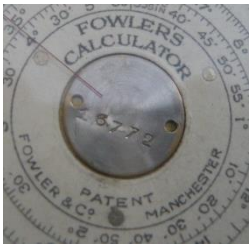


Figure 2.25.9c: Serial Number

The scales have evolved slightly, but are effectively the same suite. The case is dated 1943 which enables a stake in the ground in terms of dates for all subsequent examples!

Figure 2.25.9d: Dated tin case

Long Scale Calculator *2MG2*

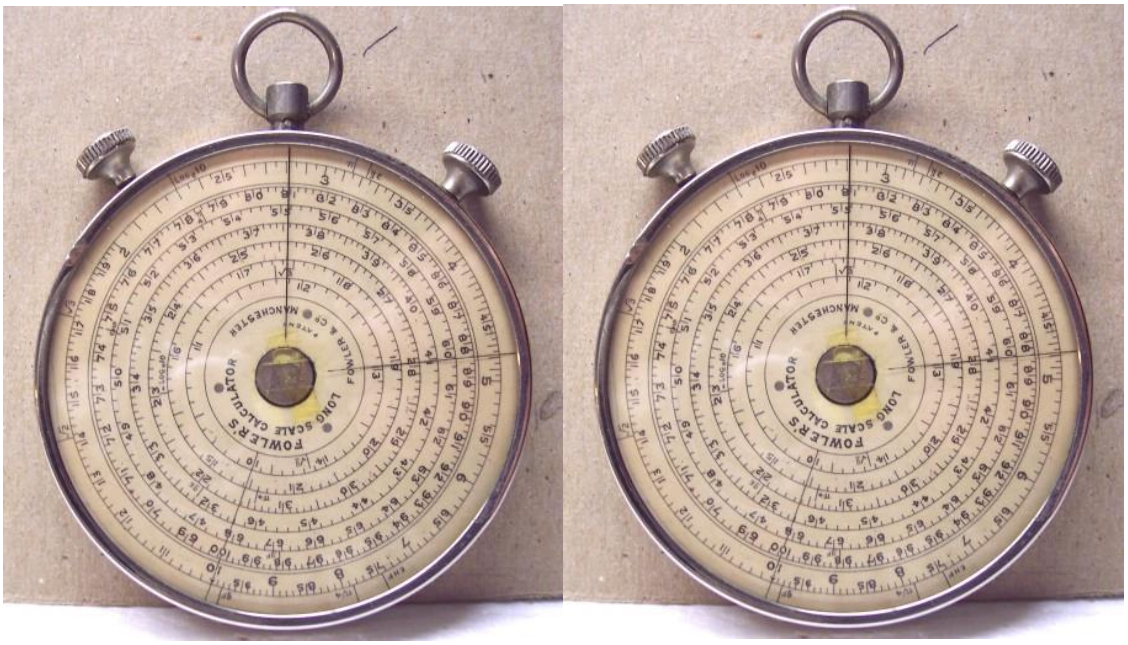


Figure 2.26.1a and b: Fowler's Long Scale Calculator (early)

Figure 2.26.2a and b: Fowler's Long Scale calculator (later)

One of the most popular and common of Fowler's calculators, the Long Scale Calculator, was in production for such a long time that all variants can be found starting with the standard early types: two-side-winder one central loop in two-part tin case with serrated edge (Ser No 7263); single crown in loop,

and one side key as shown above, (Fig. 2.26.2) working through to the later versions with two keys and no central loop. There are also minor variations to be found as shown below, with and without logo and with and without plastic finger cursor.

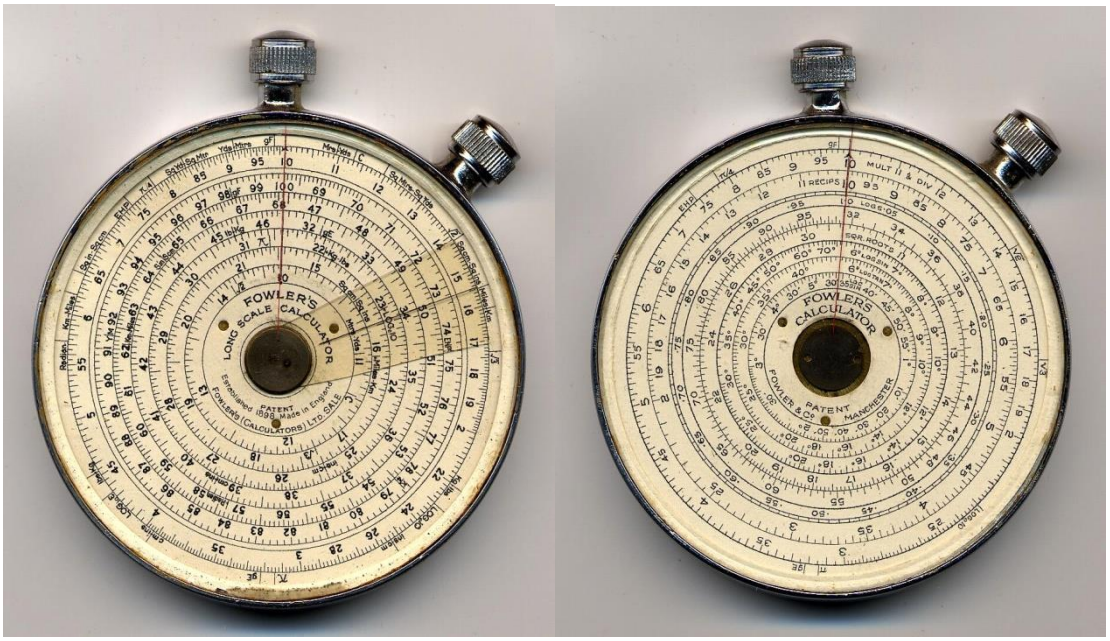


Figure 2.26.3a and b: Fowler Long Scale Calculator (late)

Two versions – early (upper Fig 2.26.1) and late (Fig 2.26.3) with the latest sintered shiny case (bottom) – of the very popular Long Scale calculator, are distinguished by different types of case and furniture, with a mid-age one in between.

Figure 2.26.4a and b: Fowler Long Scale calculator (variant)

The above two illustrations, Figure 2.26.4, show an unusual variant with a plastic cursor different to the more usual sheet pointer and Figure 2.26.5, a much more normal version in pressed steel case with normal plastic sheet cursors, but having the 'FC' logo.

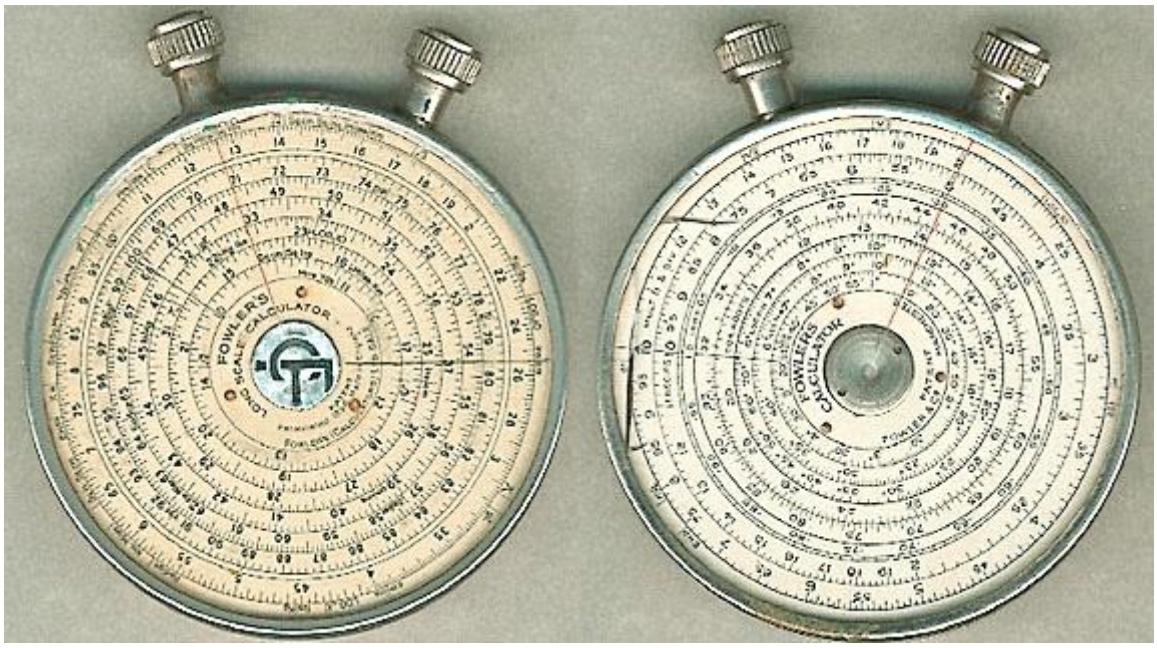


Figure 2.26.5a and b: Fowler Long Scale Calculator (FC logo)

This example with the FC logo is in a two-part pressed tin case, and dates to c1950.

Figure 2.26.6. Unusual single sided Long Scale calculator variant

A most unusual single scale Long Scale calculator with serial number 15675 is shown above

A Fowler's Gallimaufry

Circular Slide Rule *2EG1*

Figure 2.27.1a and b: Fowler Circular Slide Rule / Fowler's Calculator

Confusingly, this is also another name for the Fowler Junior Calculator illustrated later under 'Junior Calculator', and it is unusual that the Type CSR (abbreviation for Circular Slide Rule) is yet another variant of the name.

However, there also was a two-dial pocket-watch rule carrying the same name as shown above, where on one side there are two slide rule scales, one fixed to the outer edge and an inner movable in the same way as any normal circular slide rule. This has a serial number on the reverse axle, is in a two-part tin case with early furniture. While the scales are a variant of the Fowler's Calculator, it is a very different Circular Slide Rule and quite unusual compared to the other Fowler calculators.

Figure 2.27.2: A second example of Fowler CSR

This second example carries Serial 15486 on the reverse axle. A very similar device with Serial Number 12792 with a leather case was on eBay in Jan 2021

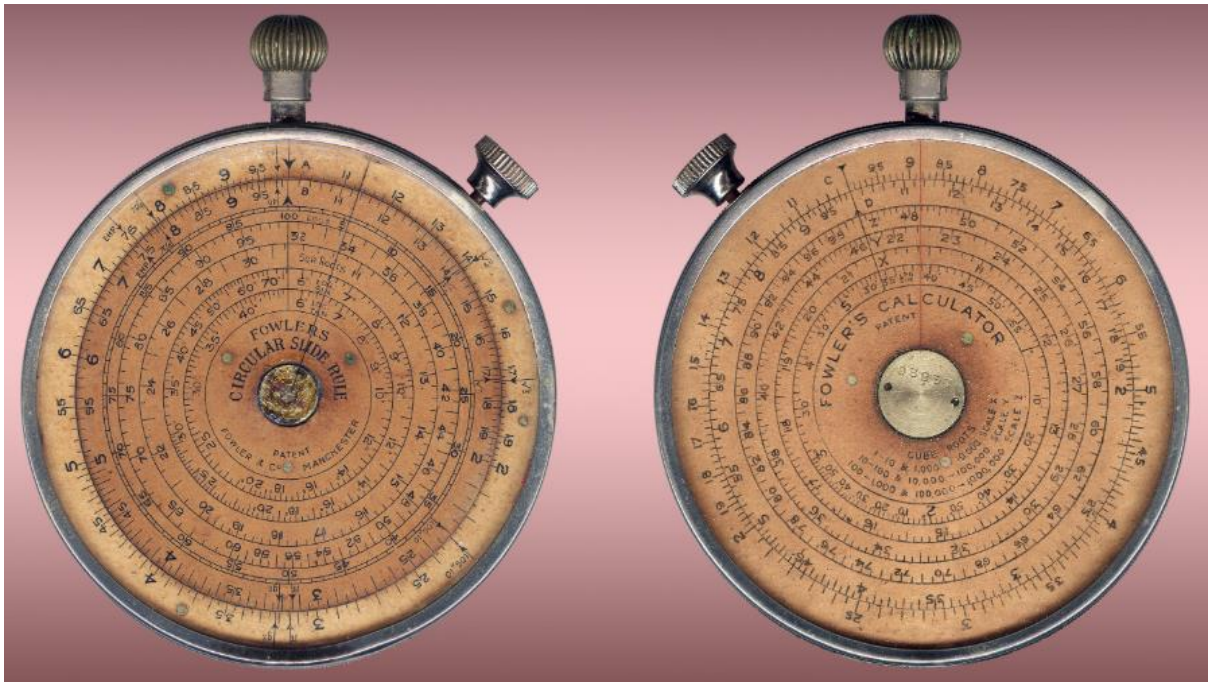


Figure 2.27.3: Fowler CSR emphasising the fixed and movable scales

An example with serial number 14280 shows the fixed and movable scales to advantage

'The Mechanical Engineer' Pocket Calculator *Not Mentioned*

This device has been covered in considerable detail in the Scientific Publishing chapter where it is more accurately placed. A Mechanical Engineer calculator labeled 'Fowler' would be a real rarity and a considerable find!

Junior Calculator *4MJRG1*

Figure 2.28.1: Fowler Circular Slide Rule / Junior Calculator

In no way can this unusual device be called a Pocket Watch calculator, but as it is the only non-watch type calculator made by Fowler it is included for completeness and to show how similar the scales are to some pocket-watch designs, and thus it owed some of its parentage to the rest of Fowler's product line.

The two sided device is called a Fowler's Circular Slide Rule on one side – because it has scales that move against each other - and Fowler's Junior Calculator on the other, a situation that can (and does) cause considerable confusion. However, it is a remarkably tactile device and usually is supplied in a Rexene case with the name on the cover, and has its own instruction sheet as shown left.

Figure 2.28.2: Junior slide rule with case and instructions

Kearns Machine Type Computer *2MMT1?*

Fowler made a small number of specialist Pocket Watch calculators; The Kearns device is unusual and rare. An example has been fully described in the JOS[24].

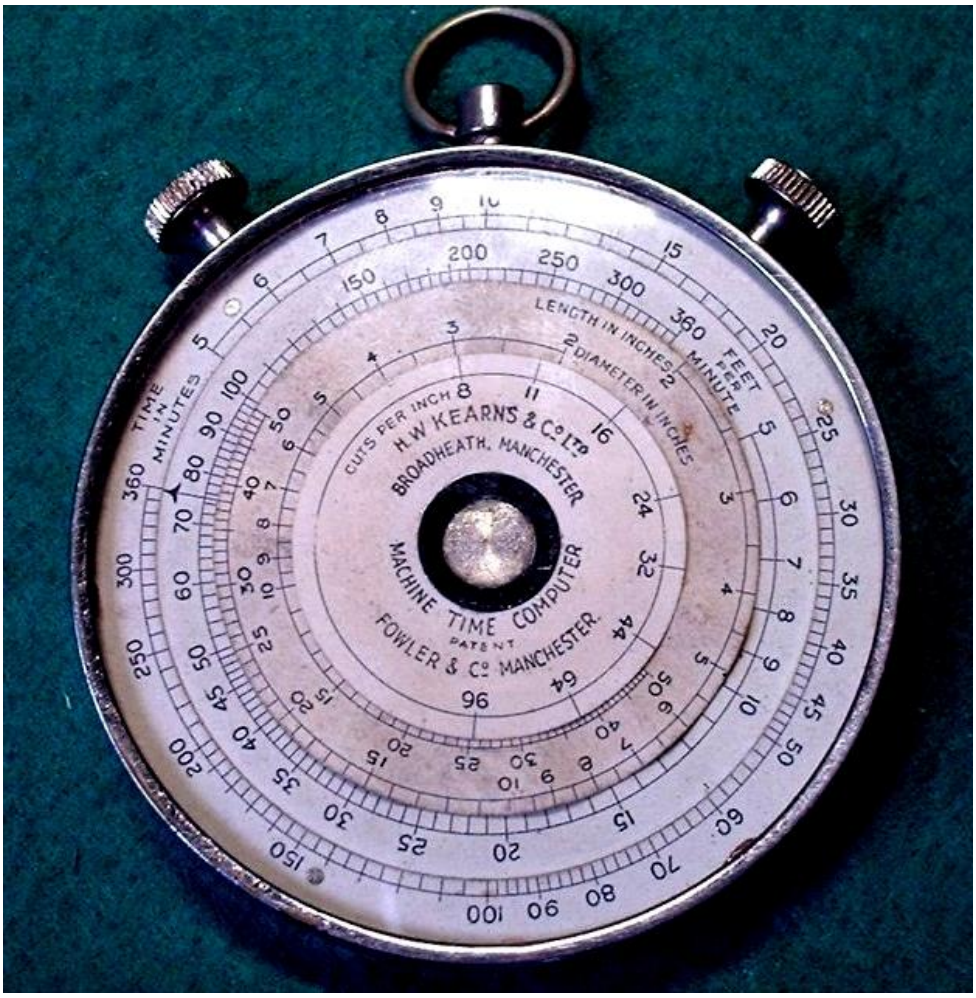


Figure 2.29.1: Fowler Kearns Machine Time Computer

This is a single sided pocket watch slide rule, specifically designed to calculate cutting times on Kearns Boring Machines[25], sometimes supplied in a tin box. This design was remarkably long-lived, the example in Figure 2.50 above is in a central loop, two-side-winder version; examples in all other varieties of case and furniture are known.

[24] 'H.W. Kearns & Co Ltd. – Machine Time Computer by Fowler'; Rick Blankenhorn in *Journal of The Oughtred Society*, Vol. 13 No 2, Fall 2004, pp 19

[25] .W Kearns & Co Limited was a long established (pre World War 1) machine tool maker in Greater Manchester and were known by this name until 1967 when they were taken over, and became Kearns Richards.

Figure 2.29.2: Another example of Kearns calculator

Figure 2.29.3: A Kearns carrying the parent company stamps

A Kearns Calculator carrying Serial number 12,628 and stamped Kearns Boring Machines (one from our sponsors?) is illustrated above with its leather case and instructions.

Mackay Paper & Board Calculator *4MMP1*

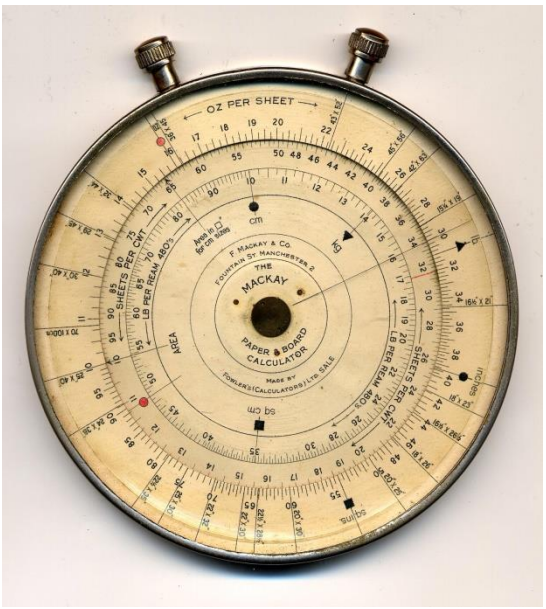


Figure 2.30.1: Fowler Mackay Paper & Board Calculator

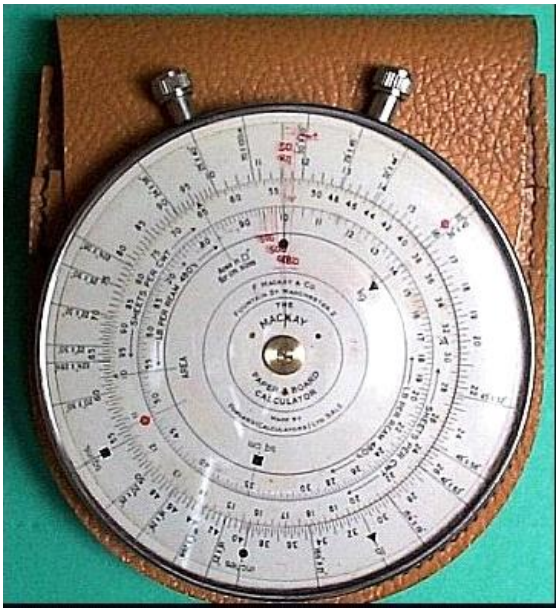


Figure 2.30.2: Fowler Mackay Paper & Board Calculator (variant)

The Mackay[26] Paper and Board Calculator is one of the more common specialist devices made by Fowler, and can be found with a number of minor variations and different highlights as illustrated above. Perhaps only a specialist in Paper science would be able to appreciate the subtleties of the differences.

This calculator is found in many variants of case type and furniture.

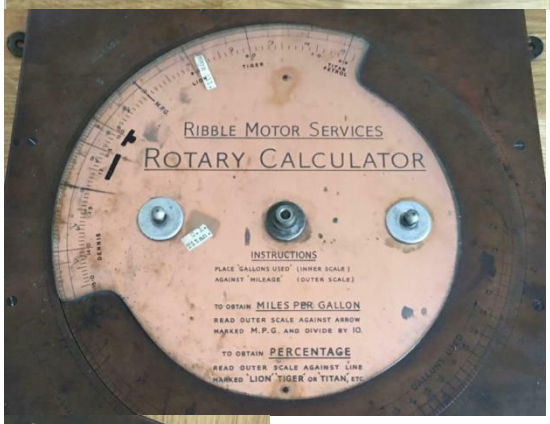
[26] No records can be found relating to F. Mackay and Co of Fountain Street, Manchester 2, but it seems safe to assume that they too were in existence between about 1950 and 1960.

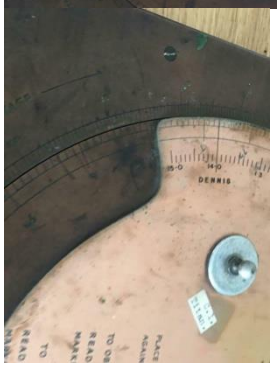
A Fowler's Gallimaufry

Ribble Motor Services Calculator *Not mentioned*

This wall mounted device will have been used at a garage or engineering works and used to calculate miles per gallon and percentages relating to miles per gallon for various bus manufacturers and their models. These models are listed on the inside wheel outer and are DENNIS, LION, TIGER, TITAN PETROL, there are various other amendments in pencil and pen relating to C1 TITAN, and a small paper slip next to LION stating MARK III. Fowler went into liquidation in 1988 but I would guess that this device was considerably earlier, maybe just post WW2 up to 1950, perhaps later 1950s.

The device itself is definitely unique, I have seen no other Fowler calculator made the same way, the nearest similar design is the Fowler "Junior / Circular slide rule" but this 30.3 cm square copper scales with covering Perspex rotatable cursor plate is most unusual!





Without the Fowler label on the base of the device it would be difficult to attribute this to Fowler, however the label is proof positive! A delightful device seen on eBay in August 2020.

Fowler Bakelite Cases

From the information available so far, we know Fowler produced calculators with Bakelite backs in all single-sided models of the day, e.g. Textile Type B, 12-10, and Universal. The known serial numbers are listed in the table below. At first sight, it would appear that the serial numbers were allocated in some specific order by calculator type number rather than randomly. However, the #1464 in the Type B list, # 881 in the 12-10 list and the #845 in the Universal list shows that it is probably not so straightforward. We have not been able to come up with a logical order within the limits of the available serials, and we have also been unable to date when Bakelite was introduced other than saying it was fairly early in the manufacturing life, an assumption taken from the shape of the furniture. Where we know that a Bakelite case (figure 10.56) was supplied with the Bakelite backed device, this is shown in the list with an asterisk by the serial number. It is then confused by the apparent debut of the 12-10 in 1936 – does that explain why the first number for 12-10 calculators is in the 300's?

What is definitely true is that the Bakelite backs appear to be identical across all models including screws and the wording, colour differences are probably from the different batches, and serial numbers are not always in one specific place, although generally earlier numbers (e.g. 103) are at the top, (but so is 916) and later numbers (e.g. 315) are at the bottom as is 24. 4-digit numbers are generally at the top as seen in Fig 2.53. When the transition took place is not known.

Table 1 below covers serial numbers of known Bakelite backed Type B, 12-10 and Universal models, the only ones supplied in this format. From this it is immediately obvious that these are 3⅜″ (85 mm) diameter single-sided calculators, and thus within these 2000 plus numbers there had to be serial numbered double-sided and larger (Magnum) or smaller calculators such as the Long Scale etc. as we show later. Note this table is no longer updated, see instead Appendix B, which is

Fowler Model	Serial Numbers of Bakelite Backed Examples
Type B Textile	24*@, 33*, 34* 117*(?), 171*, 201, 204*@, 254, 268, 390@, 539, 587, 619@, 621@, 668, 766, 821, 906, 907, 926, 945, 1069, 1464, 2830, 2862
12-10	330, 336*, 500, 633, 881, 936, 1222, 1244, 1272, 1343, 1354, 1364, 1442, 1530, 1545, 1558, 1594, 1621, 1631, 1660, 1751, 1810, 1937, 2038, 2205
Universal	103*, 107*, 315, 366, 486, 672*, 775, 845, 862, 968, 1061, 1108, 1112, 1190, 1214, 1260, 1261, 1269, 1390, 1402, 1423, 1425, 1441, 1486, 1540, 1602, 1607, 1649, 1676, 1691, 1727, 1816, 1817A#, 1923, 1971, 2058, 2082, 2083
Unknown type	1840 – possibly Universal, probably Type B[27]
Tot:	81 *Date of latest info: 04.01.20* ***No longer updated***

Table 1: Bakelite Back Fowler Serial numbers

Notes to Table 1:

XX* = is a serial number of a calculator with a Bakelite (Ardenite) carrying case as well. This appears to have been initially available just prior to WW2. These are quite rare and they are a really delightful addition to any collection of Fowler devices. Green serials are earliest post Bakelite numbers found

XX# = a serial number which appears to have an 'A' as part of it, why is not known.

XX@ = serial number of a Fowler Type B textile calculator with a table of Wefts, Looms & Reeds in the centre, others are simple two scale version.

[27] Personal letter from John Bolton who gave me this and other Bakelite Fowler serial numbers. 21.10.2015

Also shown here is an even more unusual variation – a carrying case in Bakelite, with the Bakelite back of the Textile Type B calculator that fits into the case shown beside it. Several examples are known, they are an attractive and unusual combination.

Figure 2.31.1a, b, c and d: Fowler Bakelite Backs

Figure 2.31.2a and b: Fowler Bakelite Case

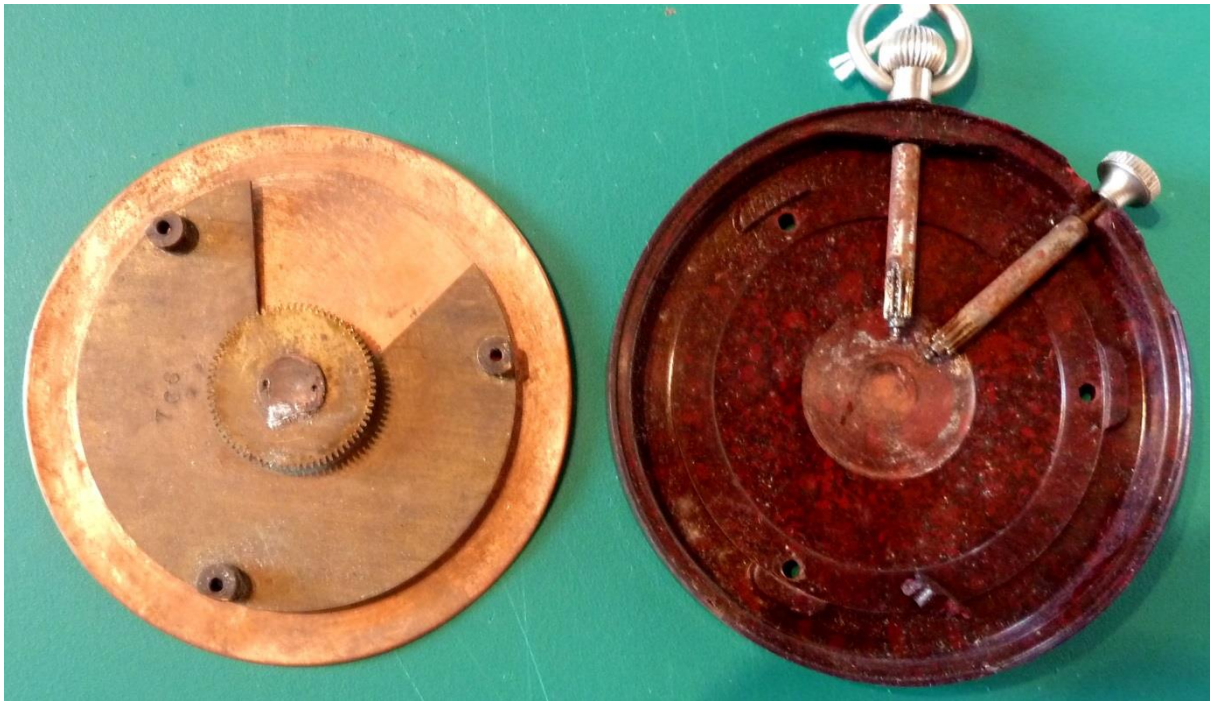


Figure 2.31.3: The mechanism of a Bakelite backed calculator

Fowler Type B Serial 766 showing mechanism and serial number repeated on the mechanism.

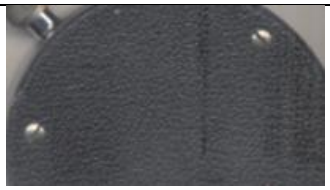
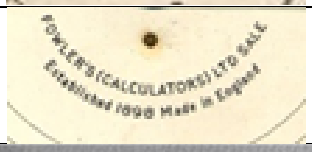
Major Feature of each Calculator Type

The following are features that may be found on any or all versions of all types of Fowler Pocket-watch calculator. We have yet to establish an accurate time scale for the start and finish of this feature.

Centre Loop		The Centre Loop is sometimes missing, usually as a result of the pendant being missing, but this is usually obvious. c1923
"SERIAL"		"SERIAL" plus a number engraved on the axle.
Serial Numbering		The Serial number is usually engraved on the rear scale axle, as in Type 1, but only a Serial number engraved on the axle.
Serial Numbering single sided		As the serial number is usually on the rear axle / face on a 2-sided calculator, the serial number on a single sided is on the back of the case.
Knurled two-part case		The two part case and its knurling is very obvious.
Universal Blitz-Rechner		An unusual and rare variant, only known in single sided format.
No "2-in-a-Dent"		The central portion of the early Weft / Looms / Reeds scale has 'Patent' just above the axle and no other words.
"2-in-a-Dent"		The central portion of the later Weft / Looms etc. scale has had "Two In A Dent" added to the Reeds box and lost the 'Patent' statement.

Round Winder, Central loop		The round winder in the central loop with a flattened side-winder is a familiar format for many Fowler calculators.
Rounded winder		The oblate central winder in the central loop with a single Rounded side-winder is an unusual variant.
Oblate Crown and flattened side-winder		This may be an unusual combination of winder types, or else a short-lived variant.
Oblate winders		Oblate winders can feature either with a central loop or without any loop on later examples.
F-C Logo		The very recognisable stylised F-C (Fowler's Calculators) logo featured on calculators for a time around 1950.
Standard Front Scale		The Standard Front Scale was used for many years on many different Short Scale Textile calculators, even on the Blitz Rechner, with few extra gauge points.
Different Scales		The first change to the scales with additional gauge points, different font and words and the additional %age scale are shown.
Different Scales 2		A variant to the previous "Different Scales" with changed layout, addition of 'Patent', as well as extra scale and gauge points.
Sintered case (later)		The smooth chromed sintered metal case with inset glass is again very obvious and generally does not have a loop on either of the winders c1948 onwards.

A Fowler's Gallimaufry

Screwed back		Showing two of the usual three screws holding on the Rexene covered back on a sintered case. Other materials were used on screwed backs.
Non knurled two-part case		I'm not aware that any versions of short scale textile have this type of case, but be aware of the format, which does exist in other types.
Early Address Banner		The "Fowler & Co, Manchester" banner would appear to have been used through to c1938
Later Address Banner		"Fowler's (Calculators) Ltd, Sale" would appear to have been used from 1938 until the end of production
Unusual Winding Knobs		Seen on a 'later' Magnum Long Scale, with sintered case etc.

Fowler Cases

The Scientific Publishing and earliest Fowler calculators, pre-leather case, were supplied in a sturdy maroon or black leatherette covered cardboard box big enough to take the instruction booklet lying flat in the bottom. They have a hinged lid and are surprisingly long-lived; an example is shown on the right.

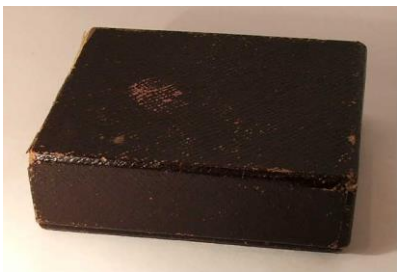


Figure 2.32.1: Early cardboard box

Fowler Calculators have always been typically supplied in a very distinctive leather case with a fold-over flap, the most ubiquitous being the fine saddle leather cases that distinguished the calculators at the peak of their manufacture. Later, this was followed by the not-so-fine faux leather cases that, while looking fine initially, have a habit of falling to pieces, or tearing in some way, and are not as robust.

Figure 2.32.2: Early home-made case

A Scientific Publishing ME is shown in a home-made press-stud closed case, illustrating that these were valued devices.

Figure 2.32.4: Bakelite case and back

The ultimate Fowler's calculator case must be the Ardenite examples that were supplied for some Bakelite / Ardenite backed calculators. These are something very special, and a calculator plus its case must have been a delight to own. It is interesting to note that it was initially offered as an alternative to the standard leather case, but as shown in the adjacent cuts from Type B instructions, only the leather case was latterly available.

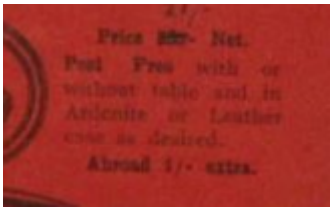


Figure 2.32.3: Type B instructions

There are also Fowler's "Presentation" cases which are available for nearly all sizes of calculator. These have cut-outs for the calculator to fit into, and in some cases "Fowler" is embossed in the leatherette covering. The adjacent illustration shows a Fowler Magnum supplied in just such a presentation case.

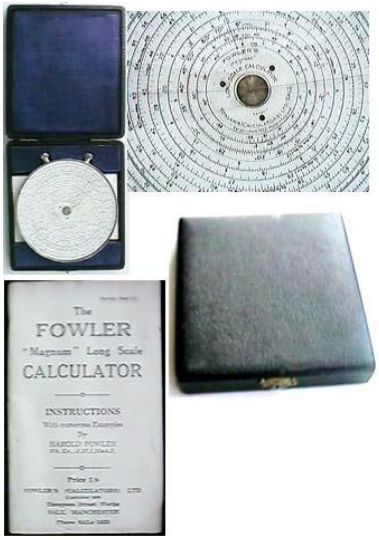


Figure 2.32.5: Leatherette covered Presentation case

A different form of "Presentation Case" with press-studs is also shown. This one has a top and bottom fold and each fold has cut-outs to fit around the calculators in its fitted centre section.

Figure 2.32.6: Press-stud presentation case

Figure 2.32.7: Various styles of tin case

Many of the 2½" calculators were supplied in a Fowler's chromed tin case. These are rather fine and were an available option over many years, with variations in the type and format of the case featuring throughout the life of the company. Fowler Calculators are particularly attractive when they come in one of their nickelled brass cases. What is particularly frustrating is that there are at least four distinct types and putting a date on them has proved virtually impossible. We can list them chronologically:

Figure 2.32.8: Standard early leather case

The very earliest known tins, hinge on the left and the hole for the crown is on top. They have no markings either on the tin itself or any embellishment on the inside of the lid. The velvet is a very dark navy blue. But I have seen one with the brass medallion!

The later tins, hinge left, hole for crown right, and earliest embellished lid (with three-digit serial number on the calculator) is the version with black lettering on a white background label (top). This would appear to have been followed by the version with brass medallion. A number of examples of this are known with all containting a calculator with a four-digit serial number, usually in the 6- to 7- thousand range.

There is a certain logic that the version to follow is the same medallion but on a blue felt background, though it has been difficult to quantify what serial numbers are on the devices in such tins.

The final Fowler version has gold script on blue velvet in the tin lid. Known examples appear to be those with five-digit serial numbers.

Figure 2.32.9: Fowler's impression

A last unusual variant has no Fowler marking other than on the tin lid itself, but instead has a third-party retailer's label and a calculator with a 12,000 serial number. All we now need are some dates to go with this chronology. John Hall Ltd. appears to have been active in Bristol and Birmingham sometime after 1937, which gives a clue.

The leather cases have their own idiosyncrasies. Early reinforced "saddle leather" cases (Fig 2.32.8) complete with green baize covered card inserts usually have a "Fowler's" impression somewhere on the leather, usually on the band for the fold-over flap. This was not continued to the end of manufacture.

Figure 2.32.10: Buckled case

A Fowler 'Magnum' Long Sale with a buckled case is shown, whether this was a third-party case is not known; it is very unusual.

Leather Zip cases are known – often the zip is no longer functioning as the case has shrunk putting undue strain on the zip.

There are also leather Press stud cases; three versions are shown here. The un-labelled single stud version dates to the mid 1920's and the Fowler embossed single stud case is later. This single-stud case – with and without the 'Fowler' embossing – appears to feature regularly with examples of short-scale textile calculators. The two stud example with a Magnum Long Scale is later still – all these examples are unusual.

Figure 2.32.12: Alternate press-stud case

Figure 2.32.11: Press-stud leather case

Figure 2.32.13: Alternate stamped press-stud leather case

Fowler as Manufacturer

Fowler appears to have been the only true English company who we can be absolutely certain 'manufactured' and sold his pocket-watch slide rules, but even here we have to add the rider that he may actually only have 'assembled' parts that had been bought in!

The 'Swiss' markings on some early Fowler (actually Scientific Publishing) pocket-watch slide rules remains unexplained, unless Fowler sourced standard pocket-watch parts from Swiss manufacturers which were then assembled. However, I cannot confirm this as I do not know enough about the manufacture of pocket watches and the parts that are needed, to know whether this is a sensible approach.

An interesting article by Colin Barnes[28] includes descriptions of the watch making cottage industry in the Midlands and elsewhere in England and an illustration of a watch making factory in Coventry from where the Waddington versions of Lord's Calculator came. Whether it was the Waddington's or indeed anyone else who made that type remains unknown.

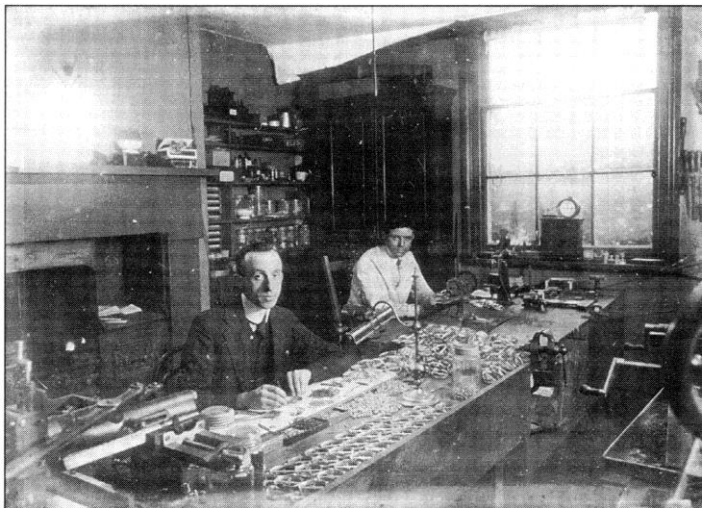


Figure 2.33.1: Harold Fowler and unknown assistant assembling calculators in the workshop at Oakleigh about 1917

Originals of the following photographs are available from the Sale Library, Cheshire; they show the Fowler factory as described in Jenny Wetton's excellent series in the SIS Bulletin[29] on instrument manufacturing in Manchester at the end of the 19th century. Fowler's 'factory' is hardly the ultimate in manufacturing capability. Figure 2.33.1 shows a room with peeling ceiling paper and an open fire, and some rudimentary tools are available for 'fettling' the instruments they were assembling. Assuming it is Harold Fowler in the foreground, he has about 30 calculators laid out in front of him, and a further large pile of parts to his left. How long it would have taken to assemble these would be interesting to know. From the hand-written dates inside two opened examples we know that at least 50 Type E1 calculators were made in one month. How typical this was and what else might have been made in parallel is not known.

The delightful young lady (?) who features in a photograph labelled 17th July 1929, Station Road Works, Sale, is obviously manufacturing small parts for the calculators made at that time

[28] 'Lord's Calculator & W. Waddington - an appendix' by Colin Barnes in the Proceedings of the International Meeting 1999

[29] 'Scientific Instrument making in Manchester 1870 – 1940, III: Flatters and Garnet Limited and Fowler & Company' by Jenny Wetton, Bulletin of the Scientific Instrument Society, No. 53 (1997).

Figure 2.33.2, Young lady worker at Station Road Works in Sale in 1929

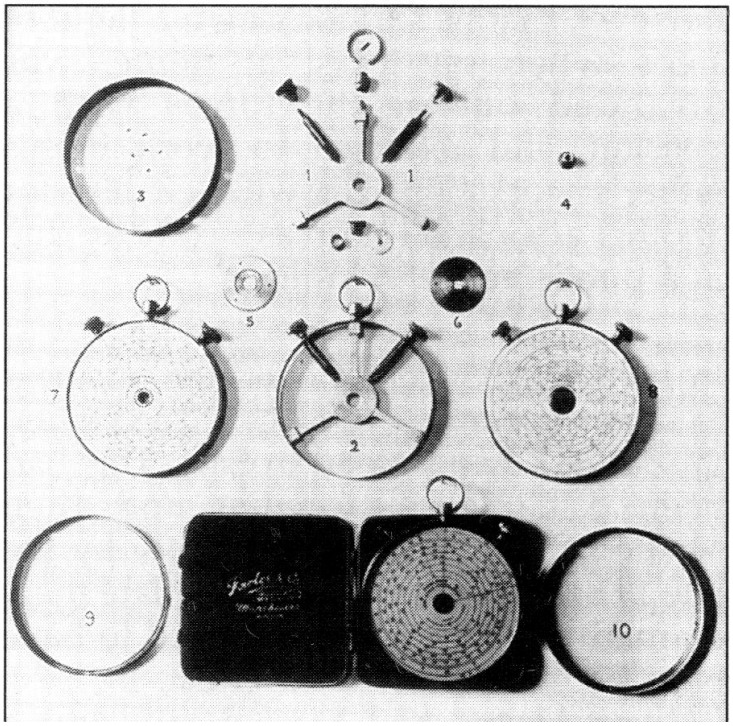


Figure 2.33.3: Parts for the construction of a Long Scale calculator, with a completed example, probably taken at the Station Works in around 1929

The next photo shows the constituent parts with a completed calculator and illustrates just how sophisticated this slide rule was, and yet was made extremely cost effectively, selling for 21/- in 1934.

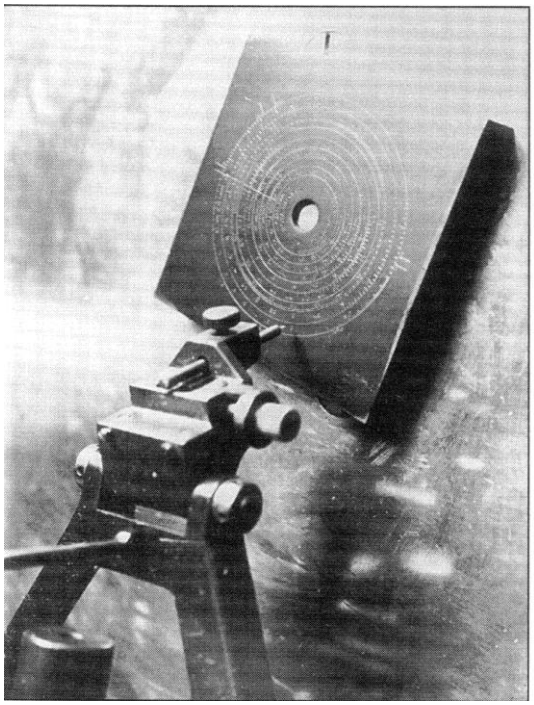


Figure 2.33.4: Cutting Head of the machine used for marking out the steel die for a calculator scale , c1929

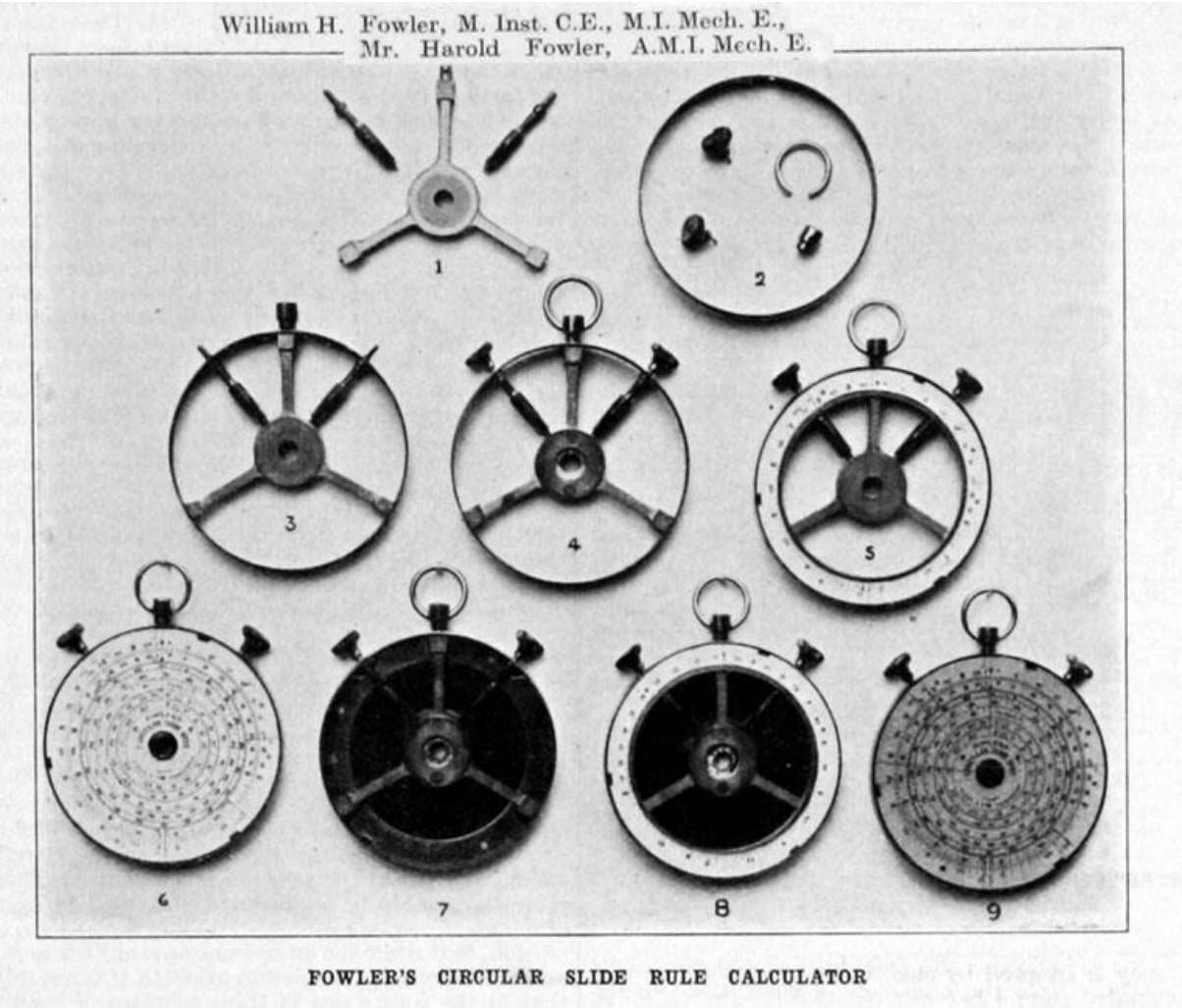
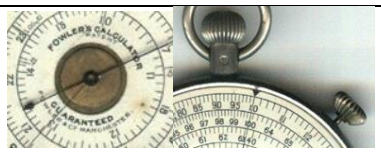
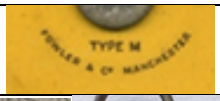
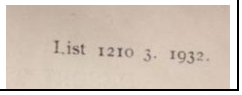


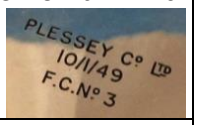
Figure 2.33.5: Fowler's advert c 1926

In ***The Engineer***, of 20.08 1926, a new Fowler's circular slide rule design with two side-winders and a central loop is illustrated on p206. (Note this is a new picture to me, and is different to the one that featured in P-W S R as Fig 10.56 and here as 2.33.3.) It allows us to accurately date the start of the two-side-winder, single central loop calculator style to 1926, and coincides with the dates for Patent 215,648 which was accepted in May 1924. The slide rule featured in the illustration is the Fowler CSR with its very obvious fixed scale

Fowler Design Chronology

Date	***Feature***	***Comment / Co Name***
		Pocket-watch cases used on ME ***Scientific Publishing***
1910?		Early sintered case. with engraved serial number
1910		Back button, fine pointer, sintered case. Patent 5,528/1910 ***Scientific Publishing***
??		Fine pointer, with single side-winder. I believe that this precedes the bulls-eye design, however the serial numbers available sometimes show the opposite to be true. Unresolved.
1915		First Calculators sold with ***Fowler & Co*** maker's name.
1915		Start of Bulls-eye pointer, side-winder (later)
??		Early (post bulls-eye) axles, only one side-winder
??		Two part tin case with knurling
1923		From the date of Patent 215,648/1923
1931		Fowler's 12-10, Ser No 366 carries dated Xmas greeting 1931, Ardenite case.[30]
1932		Furniture on a Fowler's Long Scale Calc. with a 1932 dated instruction leaflet. 

[30] Note that elsewhere it is claimed that the 12-10 was only introduced in 1936!

??		Non knurled two part tin case
1943		Serial Number 16772 and dated 1943
??		Standard front and back axles, rear with serial number used for many years
C1949		F-C logo. As seen on a 12-10 dated 1949, 2-part tin case 
C1948		Last version of sintered case, says UKAEA (created 1954) to give idea of dates.

Fowler Brief History

1853 - William Henry Fowler was born in July, in Oldham.

c1867 - At 14 years old, William begins engineering training at the Oldham firm of Platt Brothers, textile machinery manufacturers, and later became a draughtsman.

c1873 - At the age of 20, he won a Whitworth Scholarship and studied for four years at Owens College in Manchester. He was then appointed as Assistant Engineer to the Steam Users' Association.

1888 - He became General Manager of the Chadderton Ironworks Co.

1891 - W. H. Fowler's career took a different turn and he became Editor of *The Practical Engineer*, a weekly journal published in Manchester.

1898 - He set up the Scientific Publishing Company on Corporation Street, Manchester. It soon moved to 53, New Bailey Street in Salford and published *Fowler's Mechanical Engineer's Pocket Book*, the first of a series of annual pocket books for a variety of trades.

1898 – Fowler's *The Mechanical Engineer* carried an article on a circular calculator. (See Appendix A) It had a nickel-plated case and consisted of a revolving dial, operated by a milled nut at the top, and fixed pointers moving over five scales on its face. Records do not show who designed this instrument or where it was made; it was sold via the Scientific Publishing Company.

1879 - W. H. Fowler's son, Harold is born, initially followed in his father's footsteps, winning a scholarship to the Manchester School of Technology and then to Owens College where he studied engineering.

1905 - Harold worked as an electrical engineer until 1905, when he began working for the Scientific Publishing Company and helped with editorial work of *The Mechanical Engineer* weekly newsletter.

c1908 - Harold also spent a lot of time designing circular calculators and, in around 1908, set up a workshop for their manufacture in a room at his house, Sale Lodge, in Sale. He soon had an assistant to help with assembling the calculators. W. H. Fowler may have financed the purchase of equipment.

1908-1912 - W. H. Fowler takes out three patents in the next four years, the first covering the double-sided *Long Scale* or *Pocket* calculator that was to be the mainstay of production for the next 30 years. The business, however, was never very profitable. Circular calculators had a large number of different parts, compared with straight slide rules, and had to be assembled by hand. Production costs were therefore high and the calculator cost four times as much as straight slide rules.

1914 - W. H. Fowler had moved to a smaller house, Oakleigh, The Avenue, Sale, where he set up a better-equipped workshop. Harold had married an actress and was living at Alston, Old Hall Road, Sale.

1920 - The Fowler's moved the business to larger, separate premises at the Station Works, Chapel Road, Sale. The company introduced the *Universal* calculator, which was a single dial instrument with a scale of up to 10in (25cm).

1924 - William Henry and Harold took out a joint patent for a development of the calculator, in which an extra milled nut was fitted to the casing edge, enabling the user to move the dials on the two faces with the fingers of one hand. They adapted the patented *Long Scale* calculator to include this feature.

1927 - The company introduced the *Magnum Long Scale* calculator which had a maximum scale length of 50in (127cm).

By 1929 - Fowler and Co. employed four machine operators and a works manager. The business was still not very successful, however, and took in various engineering jobs to support the calculator making side.

1932 - W. H. Fowler died in April, and Harold became owner of the firm.

1936 - The company had introduced another model, the 12-10 calculator, designed for architects, builders, surveyors and timber merchants who often had calculations to make with decimal and duodecimal (12ths) notation. All the company's products were still marketed through the pages of the *Fowler's Pocket Books*.

1938 - The business moved again, to Hampson Street, Sale, when the Chapel Street works was demolished to make way for the Town Hall extension. It continued to be a general engineering workshop as well as making circular calculators.

WWII - During the Second World War, Jim Cookson joined the business as the new manager and the company's name was changed soon after to Fowler's (Calculators) Ltd.

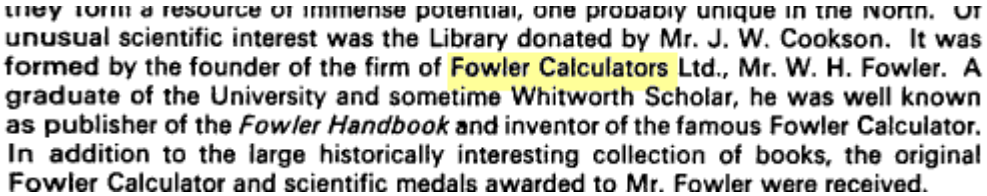
1947 - Listed Exhibitor - British Industries Fair. Manufacturers of "Fowler's" Circular Calculators, Vest Pocket Instruments Give Accuracy equalling 30 in. Slide Rule, larger Models 50 in. results to four and five significant figures. Fowler's Universally Known Engineers and Architects' Pocket Books. (Olympia, 1st Floor, Stand No. H.2182) [2]

1948 - The company introduced the *Jubilee Magnum* extra-long scale calculator which enabled calculations to five or six figures and had a total scale length of 76in (193cm). Later, it produced several new models including the Type B or Textile calculator. The company marketed its full range through Joseph Casartelli and Sons, scientific instrument makers of Salford, as well as through the Fowler's Pocket Books. Jim Cookson ran the business after Harold Fowler's retirement this year.

Early 1960s - The company takes over as proprietors of the Scientific Publishing Co, which had moved to premises in West Timperley, near Altrincham, in the early 1940s, again, in the early 1960s, to the Rochdale Road, and was in business until about 1976.

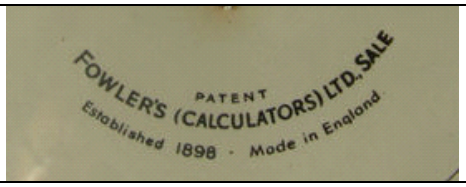
c1988 - Fowler's (Calculators) carried on trading until it went into liquidation in around 1988 following Jim Cookson's retirement.

Unknown date: **John Rylands University Library of Manchester**


they form a resource of immense potential, one probably unique in the North. Of unusual scientific interest was the Library donated by Mr. J. W. Cookson. It was formed by the founder of the firm of Fowler Calculators Ltd., Mr. W. H. Fowler. A graduate of the University and sometime Whitworth Scholar, he was well known as publisher of the *Fowler Handbook* and inventor of the famous Fowler Calculator. In addition to the large historically interesting collection of books, the original Fowler Calculator and scientific medals awarded to Mr. Fowler were received.

References: [1] British Museum of Science and Industry, [2] 1947 British Industries Fair, p106

Fowler Addresses

Years	Company Name	Company Address	Example	Comment
1900 – 1913 Wetton 1900	Scientific Publishing Co	53 New Bailey Street, Manchester		From a Back-button Textile
1920.	Fowler & Co	Station Works, Chapel Road, Sale ex Methodist chapel		From an artillery calc. Early sintered case, serial
1929			Employed 4 machine operators dividing engine etc	
1931 - 1940	Fowler & Co	53 New Bailey Street, Manchester		From a CSR
1938 - 1944	Fowler & Co	Station Works, Hampson Street, Sale, Manchester	After demolition of Chapel Street works	
1946 -	Fowler & Co	316 Manchester Rd, West Timperley, Manchester	Wetton – early 40's	
	Fowler's (Calculators) Ltd		During WW2 Jim Cookson joins and name change	
1947 - 1962	Fowler's (Calculators) Ltd	Hampson Street Works, Sale, Manchester		From a Magnum Textile
1960		Dalton Street off Rochdale Road till 1976		

Advertising Blocks

E-bay in 2018 featured a number of Fowler's printing blocks from their Instruction leaflets at a particular time. The individual blocks that were for sale are illustrated here below, readers may care to identify what each block was advertising – or indeed which instruction booklet they were for.

A Fowler's Gallimaufry


12 5 E
12 4 E
12 5 E

Fowler, Father and Son, Brief Biographies

William Henry Fowler (1854-1932) of Manchester Steam Users Association (Graces Guide)

1932 Obituary

WILLIAM HENRY FOWLER was very well known on account of his technical publications. The picture at left is taken from a family photograph dated c1910 in his back garden at Old Hall Rd., Sale.

In 1898 he founded the Scientific Publishing Company of Manchester, and he was publisher and editor of The Mechanical Engineer until its suspension in 1917. He was also the publisher of engineering textbooks and pocket-books.

In 1906 he turned his attention to the design and construction of a circular slide-rule, and in 1920, ? after many years of painstaking experiment, established a factory at Sale, Manchester, for the manufacture of calculating instruments.

Mr. Fowler was born at Oldham in 1854, and at the age of 14 entered the foundry of Messrs. Platt Brothers and Company, where his father was a foreman moulder.

After two years he entered the drawing office and commenced his theoretical studies at evening classes.

In 1872 he was appointed a junior draughtsman with the Manchester Steam Users' Association, and in the following year gained a Whitworth Scholarship. After further training at Owens College, Manchester, he re-entered the service of the Manchester Steam Users' Association as assistant engineer.

After a period of thirteen years (1885) he became works manager of the Chadderton Ironworks, and later practised for several years as a consulting engineer in Manchester before taking up his literary activities.

Mr. Fowler had been a Member of the Institution since 1885. He was a Past-President of the Whitworth Society and a Member of the Institution of Civil Engineers.

His death occurred on 4th April 1932 age 78.

Harold Fowler 1879 –

Harold Fowler - (1879 - ?) Son of William H. Fowler, participated in the development of Fowler's circular 'pocket watch' calculators. He was acknowledged by his father in a Fowler's Universal Calculator manual: *"To my son Harold Fowler, Wk Ex., A.M.I., Mech E., Whose co-operation through 25 years has contributed greatly to the successful evolution of Accurate Circular Calculators."* The picture at left is clipped from a photograph of him and two female employees at Fowler's Engineering Works, Sale, c1920's. It is a much happier photograph of him then is usually shown!

1902 after Ferranti Ltd Hollinwood

1903, Vulcan Boiler and General Insurance Co

1905, began with SP and 198 set up workshop at Sale Lodge in Sale, the family home

1914, WH Fowler had moved to Oakleigh, The Avenue, Sale; with a better workshop.

C1914 Harold had married an actress and was living at Alston, Old Hall Road, Sale.

During WW1served with Royal Engineers in the signals service in France & Belgium.

Retired c1948 (age 69) when Jim Cookson takes over. Other new Calculator designs follow, including the new sintered cases.

Appendix A

This is the original Article announcing the design and availability of the Mechanical Engineer Pocket Calculator In the *"Mechanical Engineer"* of July 28, 1898 pages 116 et seq.

THE "MECHANICAL ENGINEER" POCKET CALCULATOR.

THE great saving of time and labour in making calculations that can be effected by the use of the slide rule is well recognised by those familiar with its working, especially the more modified form of it known as the Gravêt. The ordinary straight slide rule, however, is inconvenient to carry constantly in the pocket, and a modified form of this instrument, capable of being carried at the end of a chain like an ordinary watch, was introduced a good many years ago. The high price of these instruments, however, and their somewhat inconvenient arrangement, have hitherto prevented their extended use. With a view to overcoming this objection and to meet a serious want, the proprietors of this journal have devoted considerable attention to the construction and arrangement of this form of calculator, and now have pleasure in announcing that they are prepared to supply an instrument of this kind at a price* which will place it within the reach of every student, draughtsman, or engineer who has mechanical calculations to make.

The instrument is not a toy, but an accurate and handsomely finished piece of mechanism in a nickel-plated case, with a glass face, about the size of an ordinary watch (its exact diameter is shown in the illustration), and its usefulness will perhaps be best realised if its arrangement and capabilities are briefly described.

Description of the Instrument.—The instrument consists of a revolving dial operated by the nut A, and having on its face five graduated circles or scales, marked in the illustration, for convenience of reference, Nos. 1, 2, 3, 4, 5. The instrument also carries a movable finger C, operated by the nut B. In addition to these is a fixed radial pointer D, and a nut A, which turns the revolving dial. The dial and the movable pointer C, it should be observed, move quite independently of each other.

Description of Scales:—

No. 1 is a scale of logarithms.
No. 2 is the calculating scale for multiplication and division.
No. 3 and 4 is a scale of square roots.
No. 5 is a scale of sines of angles.

Logarithms.—Use scale No. 1. This is divided into 100 parts, each of which are further sub-divided into two. The readings on this scale are the common logarithms of the numbers radially opposite on scale No. 2, and can be read by the use of either the fixed or movable finger, as happens to be most convenient. The characteristic of the logarithm is found in the usual way, and must be added by the operator just the same as when working from a book of tables.

Multiplication.—Use scale No. 2 and proceed as follows:—

1. Set one factor under the pointer D by turning nut A.
2. Set movable pointer C at 1 by turning nut B.
3. Turn nut A till second factor comes under pointer C.
4. Read off result under pointer D.

Division.—Use scale No. 2, and proceed as follows:—

1. Set the dividend under the pointer D.
2. Set the pointer C to the divisor by turning nut B.
3. Turn dial, by nut A, till 1 comes under pointer C.
4. Read off result under pointer D.

Square Roots.—Use scales Nos. 3 and 4. Although there are two circles, one is really a continuation of the other. The numbers on scale No. 2 are the squares of those on scales 3 and 4. To find square root of a number proceed as follows:—

(1) Set the number on scale No. 2, under one of the pointers (whichever is convenient).
(2) Ascertain whether the number (neglecting decimal figures, if any) is even or odd.
(3) If number is even, read off square root on scale No. 3.
(4) If number is odd, read off square root on scale No. 4.

Squares.—Use scales Nos. 3 and 4, and No. 2, and proceed as follows:—

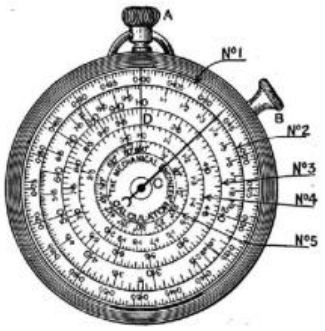
(1) Set one of the pointers over the number on scale No. 3 or 4, whichever the number is on (scale No. 3 being simply a continuation of No. 4).
(2) Read off the number radially opposite, on scale 2. This is the square.

Sine of an Angle.—Use scale No. 5 and scale No. 1, and proceed as follows:—

(1) Set one of the pointers over the angle on scale No. 5.
(2) Read off value of sine radially opposite on scale No. 1.

Cosine of an Angle.—This can be easily deduced from scale No. 5, since the cosine of an angle is the sine of its complement. For example, the cosine of 60 deg. is the same as the sine of 30 deg.

Cubes and Cube Roots, and Miscellaneous Powers Generally.—These can be obtained by means of scales Nos. 1 and 2 just as readily as by the aid of a table of logarithms.



Hyperbolic Logarithms.—These may be found by multiplying the common logarithm on scale No. 1 by 2·30, which point is marked for convenience of reference on scale No. 2.

Areas of Circles.—Proceed as follows:—

1. Set pointer D to circle diameter on scale No. 3 or No. 4.
2. Set movable pointer C at 1.
3. Turn nut A till $\frac{\pi}{4}$ (*i.e.*, ·7854 and which, for convenience, is marked on scale No. 2) comes under movable pointer C.
4. Read off result on scale No. 2 behind fixed pointer D.

Note.—In setting the pointers of the instrument to fractions of a division the judgment of the operator must be used, and the same remark applies to the reading of the results. The position of the decimal place can be determined by inspection without specific rules. With a very little practice the operator will find it possible to obtain results accurate to less than one per cent, which is closer than is required in most engineering calculations.

Fractions.—In working out long sets of fractions many operations and much tedious labour can be saved by the use of the instrument, as may be seen from the following example:—

Required the value of $\frac{29{\cdot}7 \times 43{\cdot}5 \times 82{\cdot}9}{2{\cdot}7 \times 5{\cdot}72}$

* For particulars see advertisement, page 7.

This can be obtained by the instrument in the following way, using scale No. 2.

1. Turn nut A till 29·7 comes under the fixed pointer D.
2. Turn nut B till pointer C is opposite first divisor 2·7.
3. Turn nut A till 43·5 comes opposite movable pointer C.
4. Turn nut B till movable pointer C is opposite 5·72.
5. Turn nut A till 82·9 is opposite movable pointer C.
6. Read off result 695 behind the fixed pointer D.

The actual result by inspection can be seen to be approximately 7000, so the interpretation of the reading may without hesitation be written 6950.

The general rule for dealing with fractional calculations is as follows: Put the sum to be worked in the form $\frac{a \times b \times c \times \ldots\ldots}{m \times n \times \ldots\ldots}$ and disregard the decimal point in the result until it is reached, then proceed as follows:—

1. Set the dial by nut A till first multiplier (a) comes behind the fixed pointer D.
2. Turn the movable pointer C to the first divisor (m).
3. Turn the dial by nut A till second multiplier (b) comes behind movable pointer C.
4. Turn the movable pointer C to the second divisor (n) and so on till all the numbers are used up.
5. Read off result behind fixed pointer D, and estimate position of decimal place.

N.B.—If there are not enough divisions or multipliers in the fraction, use the number 1 instead as often as may be required, that is, **until there is one more factor in the numerator than in the denominator.**

Thus $\frac{a \times b}{m \times n}$ would be worked as $\frac{a \times b \times 1}{m \times n}$

$\frac{a + b}{m \times n \times p}$ would be worked as $\frac{a \times b \times 1 \times 1}{m \times n \times p}$

$\frac{a \times b \times c \times d}{m \times n}$ would be worked as $\frac{a \times b \times c \times d}{m \times n \times 1}$

The fixed pointer is only used to set instrument at first, and read results at finish.

The movable pointer is shifted only for divisors.

The dial is shifted only for multipliers.

THEORY OF THE INSTRUMENT.

For those desirous of mastering the principles on which the working of the instrument is based, the following description of the logarithmic foundation on which it rests may be of service, and though, of course, the instrument can be worked with perfect accuracy without mastering the principles of logarithms, an intelligent appreciation of the scientific principles of any instrument always enables the operator to use it with greater confidence, and hence we have thought it desirable to append a brief description of these principles in the present case.

If 10^2 be multiplied by 10^3 the result is 10^{2+3} or 10^5.
If $10^{0.5}$ " " $10^{2\cdot9}$ " $10^{2\cdot9+0\cdot5}$ or $10^{3\cdot4}$.
If $10^{0\cdot301}$ " " $10^{0\cdot477}$ " $10^{0\cdot301+0\cdot477} = 10^{0\cdot778}$

These indices, 2, 3, 0·5, &c., are called logarithms. Thus 2 is the logarithm of 100, for $10^2 = 100$. Similarly, 0·301 is called the logarithm of 2, for $10^{0\cdot301} = 2{\cdot}0$.

So that, as the above examples show, if we wish to find the logarithm of a product of two numbers we have to add the logarithms of the factors. Also, to find the logarithm of a quotient, we take the difference between the logarithms of the divisor and dividend. Thus:—

$$\frac{10^3}{10^2} = 10^{3-2} = 10. \qquad \frac{10^6}{10^3} = 10^{6-3} = 10^3.$$

Now these logarithms can be obtained from a table of logarithms, and scale No. 2 has been so arranged that distances marked off from 1 along the circumference represent to a predetermined scale the logarithms of numbers; thus the distance between 1 and 2 represents the logarithm of 2, and the distance measured in the same direction between 1 and 5 represents the logarithm of 5. On the dial the words log, or logarithm of, have been omitted. The first circle is an equally divided scale, and consequently the numbers there actually represent the logarithms of the numbers in the second circle.

So that to find the logarithm of say, 2·45, use the fixed pointer, and set 2·45 of the second scale opposite to it. The reading opposite the pointer on the outer scale will give the logarithm. Now, if we wish to add log 2 to log 3, in order to find log (2×3), we can do it by finding from the scales that log $2 = 0{\cdot}301$, log $3 = 0{\cdot}477$, and, adding $0{\cdot}301 + 0{\cdot}477 = 0{\cdot}778$, which, again referring to the scales, we see is = log 6, so that $3 \times 2 = 6$.

But we can do it in an easier way than this. Suppose, with the fixed pointer standing to begin with at 0 on the outer scale, or, what is the same thing, at 1 on the scale No. 2, we turn the dial so that a length = log $2 = 0{\cdot}301$ passes the fixed pointer (*i.e.*, turn the dial till the fixed pointer indicates 2 on second scale.) Then, after putting the movable pointer to 0 on scale No. 1, and leaving it stationary, we move the disc so that 0·477 on scale No. 1 (*i.e.*, 3 on scale No. 2) comes opposite the movable pointer. It is clear that during the second operation, the same length, viz., 0·477, will have also passed the fixed pointer, so that we have really, first, caused a length = 0·301 to pass under the fixed pointer, and, subsequently, an additional length equal to 0·477 to pass the fixed pointer, and since the pointer was at 0 to start with, the result will be that at the finish, the pointer reading $0{\cdot}301 + 0{\cdot}477 = 0{\cdot}778$. Looking opposite this we see that it corresponds to log. 6. Now, consider what we have done merely as a mechanical operation. In order to multiply 2 by 3, we—

(1) Placed the number 2 on the *second scale* under the fixed pointer (*i.e.*, log 2 on the outer scale).

(2) Placed the movable pointer at 1 (corresponding to 0 on outer scale).

(3) Moved the disc so that 3 comes under the movable pointer (*i.e.* shifted the disc through a length = + log 3).

(4) Read off 6 under the fixed pointer.

It is clear from this that we can disregard the outer scale entirely, although it is on this that the whole working depends. In fact we do not need even a knowledge of logarithms to work this calculator any more than a man needs a knowledge of electricity in order to work an electric bell. The reasoning enclosed in brackets, it will be seen, may be omitted entirely in practice. The above is an example of an elementary operation, viz., multiplying 2×3. Consider what is the position of the pointers at the finish. The fixed one points to 6, and the movable one to 3. Now, if the disc be turned back so that the movable pointer again reads 1, it is clear that the fixed pointer will, as before, indicate 2, that is $\frac{6}{3} = 2$, so that to divide one number by another we have merely to reverse the operation as follows:

OPERATION.	EXPLANATION.
(1) Place the disc so that the dividend (viz. 6), in the second scale, is under the fixed pointer.	*i.e.* pass a + length = log 6 past the fixed pointer.
(2) Place the movable pointer at the divisor (viz. 3).	
(3) Move the disc till 1 comes under the movable pointer.	*i.e.* substract a length = log 3.

(4) Read off the answer (viz., 2), under the fixed pointer.

Now this is all right for numbers between 1 and 10. When numbers above 10 or under 1 are considered it does not, as already stated, make the least difference in the working.

Thus 156 and 0·156 would be exactly the same on the second circle as 1·56. The reason of this is that if

log 1·56 = 0·193,
log 156 will be 2 + 0·193,
log 0·156 will be − 1 + 0·193,
log 1560 will be 3 + 0·193; and so on.

The whole numbers correspond to complete circumferences of the outer scale. Thus log. 153 would be represented by two complete circumferences, and 0·193 of a third circumference.

Now it will be quite safe to let the whole circumferences take care of themselves, as they will be very easy to determine by inspection. Just as if a man were mentally adding £1 13s. 4½d. to £1 11s. 2d., he would see at a glance it would come to £3 and something, and he would fix all his attention on the "something" which he would soon see would be 4s. 6½d., so that he would write down as the result, £3 4s. 6½d. Just as when we are multiplying, say, 36 by 67, we see at a glance it comes to somewhere about 2,000. On putting log 3·6 and log 6·7 on the calculator together we see it comes to 241, which we can see at once by inspection stands in this case for 2,410. Now for a long series of multiplications and divisions, suppose $\frac{24{\cdot}7 \times 43{\cdot}4 \times 1{\cdot}49}{9{\cdot}8 \times 72{\cdot}9}$ is required. Proceed as follows:

	OPERATION.	EXPLANATION.
	(1) Put 24·7 on the disc under the fixed pointer	*i.e.*, a length = log 24·7 has passed under the fixed pointer reckoning from O.
	(2) Place the movable pointer at 9·8	
These are, of course, merged into one operation in practice.	(3) Move the disc till 1 comes under the movable pointer	*i.e.*, log 9·8 has passed the fixed pointer in the reverse direction, that is, has been substracted from log 24·7.
	(4) Again move the disc till 43·4 comes under the movable pointer	*i.e.*, log 43·4 has passed under the fixed pointer, or has been added to the previous result.
	(5) Place the movable pointer at 72·9	
	(6) Move the disc till 1 comes under the movable pointer	*i.e.*, log 72·9 has passed under the movable pointer in the reverse direction.
	(7) Again move the disc till 1·49 comes under the movable pointer	*i.e.*, pass + log 1·49 under the movable pointer.
	Read off the number under the fixed pointer	*i.e.*, see what is the value of the total log on the outer circle, and then see what number it corresponds to in the calculator circle. As we are only concerned with the number, and do not care at all for what the log. may be, we omit to consider the outer circle at all, and merely read the inner.

Example 3.—To find any root, say the 4·5th of any number, say 79. Set either arrow to 79 on the second scale and read off the log on the outer scale. This is 0·897, which we see at once really stands for 1·897, because log 10 = 1 and log 100 = 2, so that a number between 10 and 100 must have a log somewhere between 1 and 2. Dividing this by 4·5, we get 0 421, which we see is the log of 2·64, which is therefore the desired root. There are three other scales on the instrument, and we shall now explain their purpose.

The next two inside the calculator scale are both for finding square roots. That is to say, if any number, say 4, on the second scale be turned under the pointer, the reading opposite the pointer on the 3rd and 4th circles will be respectively $\sqrt{4}$ or $\sqrt{40}$. As $\sqrt{4}$ has the same figures as $\sqrt{400}$ or $\sqrt{40000}$, viz., 20000 · · · and $\sqrt{40}$ has the same figure as $\sqrt{4000}$ or $\sqrt{400000}$, viz., 63250 · · · the only difference being in the position of the decimal point, it will be obvious that one or the other will be the figures in the square root of any number consisting of 4, followed by number of 0's. The use of this will be obvious both in squaring and in finding square roots. Suppose, for instance, one wishes to find the area of a $9\frac{3}{4}$ circle.

OPERATION.	EXPLANATION.
Set the fixed pointer to 9·75 on the third circle.	This gives $(9{\cdot}75)^2$ on the second, or log $(9{\cdot}75)^2$ (*i.e.*, 2 log 9·75) on the outer.
Set movable pointer to 1 on second circle, and	*i.e.*, multiply by 0·7854.
Shift disc to the mark 0·7854, which is $\frac{\pi}{4}$.	(Add log 0·7854).
Read result under fixed pointer.	Find resulting log and corresponding number.

Reversing this process, suppose we wish to find the diameter of a circle having an area of 14·5 sq.ft. We know that $d = \sqrt{\frac{14{\cdot}5}{\frac{\pi}{4}}}$.

OPERATION.	EXPLANATION.
Hence set disc at 14·5 under fixed pointer on calculator scale.	
Set movable pointer to $\frac{\pi}{4}$	
Turn disc till movable pointer points to 1.	*i.e.*, divide 14·5 by $\frac{\pi}{4}$
Read off on either third or fourth circle. The readings are 4·3 and 136· of which the first is obviously correct ($4 \times 4 = 16$) the other would refer to a circle having an area of 1·45 ft.	*i.e.*, find the root of this result.

From the innermost circle of all, the values of the sines of various angles can be deduced.

Thus, if one of the arrows points to 30° on the inner scale it will point to 0·5 on the outermost, showing that sine 30° = 0·5.

The Hyperbolic Logarithm of any number may be found by multiplying the ordinary logarithm by $\log_e 10$ or 2·30, which point is marked on the second circle.

Cosines can be found as follows: Required cos 56°. We know that cos 56° = sin (90° − 56°) = sin 34°, which, as can be found from the scales = 0·559. Tangents of angles can be found thus: Required tan 41°

$$\text{Tan } 41^\circ = \frac{\text{Sin } 41^\circ}{\text{Cos } 41^\circ} = \frac{\text{Sin } 41^\circ}{\text{Sin } 49^\circ} = \frac{0{\cdot}656}{0{\cdot}755} = 0{\cdot}869$$

The values of all the other trigonometrical functions can be deduced from the sin cos and tan by the usual well-known methods.

Appendix B

Fowler's serial numbering has been a trial to me ever since I started collecting these devices. It should be absolutely possible to produce a date for a numbered device, certainly within a decade, and that is patently not the case.

So here are a number of articles, part articles and other papers where I have attempted – without much, if any, success – at producing sense out of the confusion that exists at present.

Let us start with some assumptions:

- The majority of Fowler rules used one continuous series of numbers across all types during the period that serial numbers were used (the evidence for this is that we have found incredibly few repeated numbers which would suggest different series)
- Fowler Magnum Long Scale calculators used a separate series of numbers. (We have found one repeated Magnum number with a Bakelite device.
- From the later shiny sintered device calculators, (possibly from the start of Jim Cookson's management c1948) serial numbering ceases.
- Cessation of serial numbering may actually be earlier

Earliest Serial numbers

We can start the trail of Fowler Serial numbers from some of their hidden detail as detailed in an article in UKSRC Gazette No 20 published last year,

Fowler's Calculators at the beginning of their life, immediately after being 'Scientific Publishing' devices, circa 1910, did not obviously give their devices serial numbers. Later, these same sintered devices, not the easiest of devices to get into, had a serial number engraved on the body. As a result of a number of these devices losing one or other of their glasses and allowing us to look inside, it turns out that the earliest versions actually did have a serial number, hand-written in ink, by either William (the founder) or Harold (his son) and – even better – in some cases a record of a repair by one or the other of them, giving us a fascinating insight to these early Fowler devices and the company at that time.

Assembly

A 'snip' taken from a recently discovered picture of the Fowler "Assembling Room" dated 30th January 1917, within the same timeframe as many of the following devices, shows (centre) what

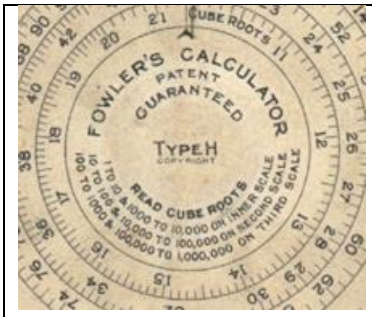
would appear to be an ordered 'pile' of about 100 sintered metal bodies waiting assembly in their "Laboratory" in "Oakleigh" the Fowler's home in Sale, near Manchester. From the various tools on the bench it would appear that assembling them involved fairly crude methods. The chair (right) looks to be one assembly station with the devices to the operator's left and six piles of glasses on his right and some sort of circular (rotating?) 'table' in front of him. There is no obvious collection of paper scales, though it is possible that they are in the wooden box at his left with even more piles of glasses which could be accessed by either this work station, or another on the left of the picture with the chair just out of the picture. It gives us a fascinating view of what was obviously a very cottage industry at that time. William would have been 64, and Harold would have been 38 that year. We have seen pictures of Harold, with an unknown assistant, assembling calculators in a different room at Oakleigh about the same time (Gallimaufry Fig 2.33.1).

The following are images taken from calculators assembled at about that time that have come apart in some way so that the previously hidden interior can be seen, allowing us this otherwise unseen snippet of information. We can look at them chronologically

The earliest devices

Un-numbered
This notice of a repair by Harold Fowler on 6/12/1914 is on a Fowler Type M Textile calculator – surely the very earliest type of transition Fowler calculator and it is interesting to note the different anti-backlash springing. It carries no obvious serial number, but with a repair in December 1914 (the earliest date seen) implies that it was made at the latest in 1914 (just before it was repaired?) and may give us an early point on the Fowler time line.

No 420
This is a Fowler E1, with a serial Number 420 – the earliest such Fowler serial number I have found – and a date of 26.3.1915, and is signed by Harold Fowler. It includes an intriguing note: "N.F.G + refixed CG" which is not immediately obvious as to what it refers to, and then signed by HF and dated 15.3.1917- within 3 months of the earlier picture. The anti-backlash springing is different, but probably of that time.

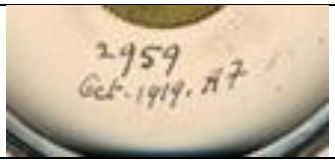


No 951
A Fowlers Type H in the author's collection has a hand-written Serial No 951, and a hand-written date: 11.11.1915 (now lost as the calculator has been repaired). This allows us to compute some numbers: approx. 530 calculators made/assembled between serial 420 and 951 of different types made in the 6 months between the two dates – 1000 plus calculators in the year – does this seem sensible? It seems low to me, but may be reasonable.

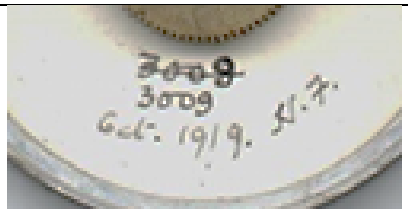
No 986
An unknown Fowler – It has the "Fowler's Calculator" front scale but is missing the back scales and so could be either of Types H, or A, (or A1) depending on the missing rear scale – carries the serial number 986 with a date of 11.12,1915. This allows us another view of numbers made – 35 calculators in one month, 420 in 12 months! This does not compare with the previous calculation, so which is right?

Note: Fowlers Type H, sintered case, Serial No 3165 engraved on outside, featured on eBay January 2020.

No 1616
This is a Fowlers Type A (not an A1) dated May 1916 but not signed. It carries an intriguing extra item of information. It certainly seems to say "Fowler" with a date of "February 1929" but with possibly extra information under the web of the casting – why or what is not known! We will never know!



No 2260 and 2959
No 2260 is a Fowlers Type E, and 2959 is a Fowlers Type E1. The first carries no date the second is also dated October 1919 and is interestingly signed HF, again, one assumes by Harold Fowler. This also give us some ideas of quantities of calculators produced per month i.e. at least 50 calculators, 600 per year. Whether these were all E / E1 is not known.



No 3009
This Fowlers Type E1 – this type features quite a lot here - which has both an engraved number on the body and the same (corrected) serial number inside signed HF by Harold Fowler, dated October 1919, gives us a possible date for the last of the internal serial numbering and the beginning of serial numbering on the outside.
Serial 420 in March 1915 and 3009 in October 1919 gives 2589 calculators in 55 months – about 50 a month seems to confirm a production rate of about 600 per year for the early years!

Conclusions for very early Serial numbers

The seven or eight examples we have seen here enable some simple conclusions to be made. The earliest internally recorded serial number (zero?) was probably in late 1914, the earliest externally marked – somewhere around No. 3000 – was in 1919, a period of four years during which they made about 600 to 750 devices per year of all contemporary types. This is a fascinating snippet of early Fowler history. Does anyone have pictures of other similar examples to add to this "study" please?

Background

My very nerdy attention to serial numbers can lead to considerable frustration when I find that it is not possible to close the circle and, in an ideal situation, put a reasonably accurate date to each serial number for a particular device. It should be possible. This nearly ideal situation has been reached by the Dave Nichols / Peter Hopp collection of serial numbers in our long-running Fuller calculator database where we have been able to produce accurate figures for production per year and so on. The same is nowhere near true for Fowler calculators, where I have been collecting numbers for almost as long. Apart from some very early serial numbered devices where we have some actual dates, the lack of reliable dates later in the series means that this is no longer the case.

The next batch of serial numbers

I am flying a kite here to try and establish the principle of Fowler serial numbering, and will concentrate on serial numbers from "early" double-digit serial numbers up to serial number 2058, which happens to be the earliest follow-on serial number for a steel-backed Fowler Universal after the numbered Bakelite backed devices that preceded it. Here already the frustration sets in:

- as I am unable to put an accurate date when Fowler's either started or stopped supplying Bakelite backed devices, nor am I able to be definitive about how many Bakelite backed devices they ever supplied.

- likewise, it is not immediately obvious how the very early serial numbers up to about 3000, fit in with the numbers for the Bakelite backed devices starting with normal two-digit numbers and going to 2058 , the first steel backed Universal with a number beyond the Bakelite ones. Indeed when you study the numbers in the following two tables it is difficult to find any logic to the serial numbers so far collected!

Table 1 below covers serial numbers of known Bakelite backed Type B, 12-10 and Universal models, the only ones supplied in this format. From this it is immediately obvious that these are 3⅜″ (85 mm) diameter single-sided calculators, and thus within these 2000 plus numbers there had to be serial numbered double-sided and larger (Magnum) or smaller calculators such as the Long Scale etc. as we show later.

It is also strongly suggested that 12-10 calculators started to be manufactured in 1936, which does not follow the logic of a single series of numbers for all devices. One would have assumed they started their own series. I have not seen a Bakelite backed 12-10 with a serial number lower than 330.

Also, with the earlier "hidden" numbers described earlier starting at what would have been zero or a small number anyway, starting the Bakelites with a Type B numbered 24 is illogical, however with small batches numbered in series as shown in the later table one can see the apparent logic of one series of numbers with the types interspersed.

Fowler Model	Serial Numbers of Bakelite Backed Examples
Type B Textile	24*@, 33*, 34* 117*(?), 171*, 201, 204*@, 254, 268, 390@, 539, 587, 596@, 619@, 621@, 668, 766, 821, 906, 907, 926, 945, 1069, 1206. 1246, 1464, 1858, 2830, 2832
12-10	330, 336*, 500, 633, 881, 936, 1222, 1244, 1272, 1343, 1354, 1364, 1442, 1530, 1545, 1558, 1594, 1621, 1631, 1660, 1751, 1810, 1937, 2038, 2205
Universal	103*, 107*, 315, 366, 486, 590, 672*, 775, 845, 862, 968, 1061, 1108, 1112, 1190, 1214, 1260, 1261, 1269, 1390, 1402, 1423, 1425, 1441, 1486, 1520, 1540, 1596, 1602, 1607, 1649, 1676, 1691, 1727, 1816, 1817A#, 1923, 1971, 2058, 2082, 2083
Unknown type	1840 – possibly Universal, probably Type B[31]
Tot:	89 *Date of latest info: 06.12.20*

Notes to Table 1:

XX* = is a serial number of a calculator with a Bakelite (Ardenite) carrying case as well. This appears to have been initially available just prior to WW2. These are quite rare and they are a really delightful addition to any collection of Fowler devices. Green serials are earliest post Bakelite numbers found

XX# = a serial number which appears to have an 'A' as part of it, why is not known.

XX@ = serial number of a Fowler Type B textile calculator with a table of Wefts, Looms & Reeds in the centre, others are the simple two-scale version.

Table 1: Bakelite Back Fowler Serial numbers

The next table, Table 2, shows Serial Number versus Type for all models of Fowler Calculator within this selected number range. It also shows the format – sintered aluminium alloy, Bakelite or two-part tin cases, of the calculator. From this table it can be surmised that during the time period that Fowler did give their calculators a serial number these were in a single continuous series. We can also see that sometimes only small numbers of a particular Type were made (in some cases less than 12) in a particular batch. The almost complete lack of dates is also obvious and adds to the frustration! There is one

[31] Personal letter from John Bolton who gave me this and other Bakelite Fowler serial numbers. 21.10.2015

repeated number, 1607, which has been found on both a Bakelite backed Universal and also on a two-part cased Magnum, see right. Until we find more repeated numbers which might prove to be an alternate system, we can start by assuming that Magnum's had their own separate numbering system. However, within such a collection of numbers one would assume that there would have been more repeated numbers had there been parallel numbering systems for different calculators. But see later.

Fowler Model	Date	Serial No	Comment	Other Notes	
Type B		24	Bakelite	Ardenite case, webs etc. *eBay 04.18*	
Type B		33	Bakelite		
Type B		34	Bakelite		
Long Scale Magnum	c1927?	46	2-part tin case	Engraved on back. *eBay 06.16*	
Universal		103	Bakelite	*eBay Feb 2019, Bakelite case*	
Universal		107	Bakelite	*Paul T. Coll*	
Type B		117	Bakelite		
Type B		171	Bakelite	pmh	
Type E		189	Sintered	Peter F	
Type B		201	Bakelite		
Type B		204	Bakelite	(David R)	
Long Scale Magnum		242	2-part tin case?	Engraved on back. *eBay 12.13*	
Type B		254	Bakelite		
Type B		268	Bakelite	*eBay 12.18*	
Universal		315	Bakelite	*eBay 04.19 ex Ray Hems*	
12-10		330	Bakelite	Peter Holland 01.19, now David R. 03.19	
12-10	**1931**	336	Bakelite	Ardenite Case with dated greeting *eBay 07.16* Reglas de Calculo	
Long Scale Magnum		338	2-part tin case	Engraved on back. *eBay 10.18*	
Textile Magnum		343	2-part tin case	Engraved on back. *eBay 06.16*	
Universal		366	Bakelite		
Type B		390	Bakelite		
Type E1	26.03.1915	420	Sintered	Hand written - Repaired 15.03.1917	
Type B	n/a	R471	2-part tin case	Stamped in back (David R)	
Universal		486	Bakelite	*eBay 05.18*	
12-10		500	Bakelite	*eBay 10.16*	
Type E1	?	X585	Sintered	Back button, Engraved on side (David R)	
Type B		539	Bakelite	*eBay 03.17*	
Type B		587	Bakelite	*eBay 03.15*	
Universal		590	Bakelite	*eBay 08.20*	
Type B (with warps etc)		596	Bakelite	*eBay 08.20 Table Wefts etc*	
Type B (with warps etc)		619	Bakelite	*eBay10.17*	
Type B (with warps etc)		621	Bakelite	*eBay 06.14*	
12-10	**1936?**	633	Bakelite		
"Magnum" Long scale		667	2-part tin case	Norfolk Antiques 10.17. Stamped in back (pmh)	

Fowler Model	Date	Serial No	Comment	Other Notes	
Type B		668	Bakelite		
Universal		672	Bakelite		
Type B		766	Bakelite	*eBay 07.14* (Peter F.)	
Universal		775	Bakelite	eBay, 07.20 (again)	
Type B		821	Bakelite		
Universal		845	Bakelite		
Universal		862	Bakelite		
12-10		881	Bakelite		
Type B		906	Bakelite	*eBay 08.19*	
Type B		907	Bakelite		
Type B		926	Bakelite		
12-10		936	Bakelite		
Type B		945	Bakelite	Now John Bolton 11.18	
Type H	11.11.1915	951	Sintered	Hand written inside	
Universal		968	Bakelite	*eBay 02.15*	
"Magnum" Long scale	c1940	998	2-part tin case	Engraved on back. eBay 10.18 Hampson St. address i.e. after 1938	
"Magnum" Long scale		1035	2-part tin case	Engraved on back. *eBay 03.16*	
"Magnum" Long scale		1037	2-part tin case	Engraved on back. *eBay 10.19*	
Universal		1061	Bakelite		
Type B		1069	Bakelite	*eBay 10.15*	
"Magnum" Long scale		1091	2-part tin case	Engraved on back. *eBay 05.17*	
Type E1		1101	Sintered	Engraved on side. *eBay 01.14*	
Universal		1108	Bakelite	*eBay 01.06.15*	
Universal		1112	Bakelite	*eBay 08.06.16*	
Universal		1190	Bakelite		
Type B		1206	Bakelite	*eBay 02.20*	
12-10		1222	Bakelite		
12-10		1244	Bakelite		
Type B		1246	Bakelite	*eBay 10.20*	
Universal		1260	Bakelite		
Universal		1261	Bakelite	*eBay 04.16*	
Type H		1266	Sintered	*eBay 10.13, 10.17*	
Universal		1269	Bakelite	*eBay, Gemmary 11.18*	
12-10		1272	Bakelite		
"Magnum" Long scale		1335	2-part tin case	Peter F.	
12-10		1343	Bakelite	*eBay 01.20*	
12-10		1354	Bakelite	*eBay 11.16; 04.17b; 06.17*	
12-10		1364	Bakelite	*eBay 08.14 & 11.15, 03.18*	
Textile Magnum		1374	2-part in case	*eBay 10.17*	
Universal		1390	Bakelite	*eBay 02.17*	
Universal		1402	Bakelite	*eBay 03.17, 07.17*	
Universal		1423	Bakelite		

A Fowler's Gallimaufry

Fowler Model	Date	Serial No	Comment	Other Notes	
Universal		1425	Bakelite	*eBay 03&08.14*	
Universal		1441	Bakelite	*eBay 11.18*	
12-10		1442	Bakelite	*Worthpoint 07.19*	
Type B		1464	Bakelite	*Paul T. Coll*	
"Magnum" Long scale	n/a	1465	2-part tin case	Stamped in back. *EBay 03.17*	
Universal		1486	Bakelite	*eBay 04.19*	
Universal		1520	Bakelite	*eBay 05.20*	
12-10		1530	Bakelite	*eBay, 12.17; 01.18*	
Universal		1540	Bakelite		
12-10		1545	Bakelite		
"Magnum" Long scale	n/a	1553	2-part tin case	Stamped in back. *EBay 11.16*	
12-10	n/a	1558	Bakelite	*eBay 05.19*	
"Magnum" Long scale	n/a	1593	2-part tin case	Stamped in back	
12-10	n/a	1594	Bakelite	Reglas de Calculo	
Universal	n/a	1596	Bakelite	*eBay 06-08.20 Sci Coll 12.20*	
Universal		1602	Bakelite		
"Magnum" Long scale	n/a	1607	2-part tin case	Stamped in back (pmh)	
Universal		1607	Bakelite	*eBay 10.15*	
12-10		1621	Bakelite	*eBay 11.14*	
12-10		1631	Bakelite		
Universal		1649	Bakelite	*Paul T. Coll*	
12-10		1660	Bakelite	*eBay 09.18*	
Universal		1676	Bakelite	*eBay 03.16. 04.17. 05.17*	
Universal		1691	Bakelite	*eBay 01.18*	
Universal		1727	Bakelite	*eBay 07.14*	
"Magnum" Long scale		1739	2-part tin case	Stamped in back *eBay 01.16*	
"Magnum" Long scale	**3 / 1951**	1740	2-part tin case	Stamped in back Date from insts. *eBay 08.14*	
12-10		1751	Bakelite	*eBay 05.19*	
12-10		1810	Bakelite	*Paul T. Coll*	
Universal		1816	Bakelite	*eBay 03.16*	
Universal		1817A	Bakelite		
Unknown		1840	Bakelite		
Type B		1464	Bakelite	*eBay 06.20 Paul T. Coll*	
Universal		1923	Bakelite		
12-10	19.8.44	1937	Bakelite	pmh (Date in leather case)	
Universal		1971	Bakelite		
Artillery	n/a	1986	Sintered	Engraved on side. *eBay 01.15*	
Artillery	n/a	1990	Sintered	Engraved on side. *eBay 02.13*	
12-10	n/a	2038	2-part tin case	Engraved on back. eBay 11.19	
Universal	n/a	2058	2-part tin case	Engraved on back. *eBay 08.15*	
Universal	n/a	2082	2-part tin case	Engraved on back. *eBay 01.13*	
Universal	n/a	2083	2-part tin case	Engraved on back. *eBay 04.16*	
12-10	n/a	2205	2-part tin case	Engraved on back. *eBay 05.17*	
Type E		2260		Hand written	

Fowler Model	Date	Serial No	Comment	Other Notes	
Type H	n/a	2535	Sintered	Engraved on side. *eBay 11.17*	
Type B	n/a	2830	2-part tin case	Engraved on back. *eBay 02.19*	
Type B		2832	2-part tin case	Engraved on back, Sci Coll 12.20	
Type B	n/a	2862	2-part tin case	Engraved on back. *eBay 10.17*	

	Bakelite Calculator Type		Case Type	
	Type B		Bakelite case	
	12-10		Sintered aluminium case	
	Universal		2-part tin case	

Table 2 – Fowler Serial Numbers

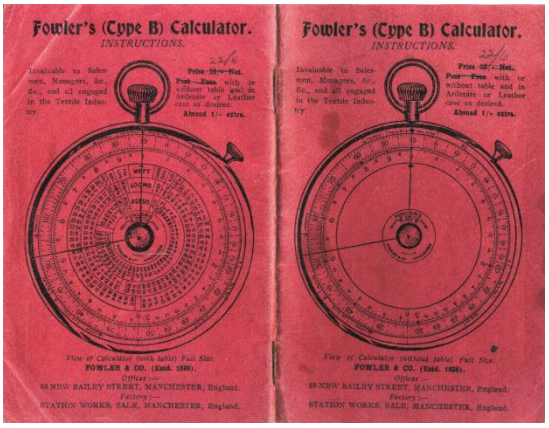
Notes to Table 2:

1. The colours for Bakelite backed calculator type and case type (first and last columns) shows how these intermingled through the years.
2. The significance of 'R' and 'X' annotated serial numbers is not known.
3. Dates in bold are unreliable and not to be trusted. They may be from later instructions or else an eBay seller's unreliable dates.
4. The highest serial number known is 35,283 on a Fowler Long-Scale calculator.
5. Sintered case calculators of the various types are known numbered up to 6,043 on a Type E1.
6. A Long Scale Magnum serial numbered 46 is possibly the earliest known 2-part tin case. Others carrying 242 and 1,335 are also definitely known. It is very likely that they carried their own serial number series.

The 111 serial numbers detailed in Table 2 above include 84 for Bakelite backed devices, 9 sintered aluminium alloy and 21 in 2-part tin cases. This appears to be horribly unbalanced and not at all representative. It only covers about 5.1% of the population total (2,083 serial numbers) while nearly 73% of this 5.1% is Bakelite backed – perhaps because they are more noticeable? I'm not sure.

Discussion

The only mention of Bakelite (called Ardenite[32] by Fowler, and F.G. Stokes Ltd. of Altringham) is on the cover of Fowler's Type B calculator undated instructions where the availability of Bakelite cases is mentioned as a no-cost option: *"… in Ardenite or Leather case as desired"*. It is estimated that this booklet was produced circa 1935, but this date may be way out.



For how long this situation lasted is not known, the price has been hand corrected on the copy shown here implying that printed stocks of the handbook remained available over a period which included a price change at an unknown date.

Bakelite backed devices carry serial numbers ranging from 33 to 1971. At some stage the numbers shifted from being engraved below the *'Fowlers'* to above it – when and why is not known. (Serial No 500 is above, 315 is below) This might be completely random, 105 is also above!

[32] http://www.plastiquarian.com/index.php?id=2&subid=33. The Plastics Historical Society lists Ardenite as a Trade Name used by F.G. Stokes for a Phenol Formaldehyde plastic (same formulation as Bakelite) sometime prior to 1933, Stokes were wound up in March 1931, so that would make the earliest use sometime prior to that.

Sintered aluminium cased devices carry serial numbers from 189 to 6,043 (well beyond the range of these two Tables)

Two-part tin case calculators carry serial numbers from 46 to over 35,000 (far beyond the range of the Tables in this article). The caveat for a separate series with respect to Long Scale Magnum (created 1927) calculators may apply.

It is known that the earliest types of these and similar calculators carrying the Scientific Publishing manufacturers name were in Sintered cases from about 1910 up until about 1915.[33] These tended not to have a serial number.

We can thus surmise that Fowler Serial numbers start in about 1914 or 1915 – there may have been a start-up overlap with Scientific Publishing labelled stock – and these dates tie in with the earliest dates in Table 2.

If we take the two earliest reliable dates we have in Table 2, 26.03.1915 for the Sintered Type E1 serial number 420, and 11.11.1915 for the similar sintered Type H with serial number 951, we can calculate that some 530 calculators were made in nearly eight months – about 70 per month. Or else about 1,000 calculators made in 1915. This seems an unusually small and probably unlikely number. This also included sintered case and two-part tin cased calculators.

However it also leads to the inescapable conclusion that Fowler Bakelite backed devices were part of the Fowler product line from this date (1915) and before that as well! Or where is my logic flawed?

We have one possibly reliable date for a Bakelite Backed device. 12-10 Serial 336 (left) carries a Xmas greeting engraved on the Ardenite case: *"H.R. Xmas. 1931." From* this it is possible to speculate that some other dates might also be accurate, e.g. 12-10 Serial 633 in 1936, i.e. 300 Bakelite calculators made in 5 years, i.e. 60 per year. This seems surprisingly small, but may be true for just Bakelite devices.

The next calculation we can do is from 11.11.15 for serial 951 (above) and 19.8.44 on 12-10 Bakelite backed calculator with the serial number 1937. This, in round numbers, is 1000 calculators in 29 years, or 348 months, an impossibly small production rate of about 4 calculators per month!

Another possible calculation is that we know from somewhere (Where?) that Fowler 12-10 calculators were introduced in 1936. This "fact" does not tie in with Serial 336 and its date of 1931 – does it mean that it is the wrong calculator in the Ardenite case, or is the 'fact' wrong?

The next earliest serial number we have so far is 633 for a Bakelite backed 12-10. This allows two calculations: Serial 420 in 1915 to 633 in 1936, some 200 calculators in 21 years, likewise 633 to 1937 in 1944 – which gives 10 calculators a year for the first; and 1300 calculators in 8 years in the second, some 150 calculators per year. This makes a complete nonsense of the serial numbers and quantities made we have just argued (see above). There are also 12-10 serial numbers 1558 and 1594 which occur interspersed with known serial numbers for Magnum calculators which would also indicate that Magnum serial numbers are a different series.

I believe that all we can safely assume is that all 3 methods of manufacture, Bakelite backed; 2-part tin cases and sintered aluminium cases were running together in parallel for at least some of the

[33] **Pocket-watch Slide Rules**, by Peter M. Hopp, C.Eng. M.B.C.S. Astragal Press, 2011, ISBN 978-1-931626-31-6. Pages 57 to 63.

time. However, the one repeated number probably makes it unsafe for us to assume that they all carried serial numbers in one range. Is this one repeated number showing us something that is hard to understand when it is a single example in over 150 numbers collected to date? Statistically, it is probably not unusual; however it does seem odd that the repetitions are indeed so low.

A help in trying to establish the serial numbering scenario would be the discovery of steel backed Type B, 12-10 and Universal calculators with serial numbers lower than the highest Bakelite backed number listed for these types in Table 1; 1464, 1937 and 1971 respectively. Confirming the lowest steel-backed serial numbers (in green) would be interesting anyhow – presently 2830, 2038 and 2058 respectively. Note 2830 seems somehow out of kilter when compared with the next two numbers!

We do not have an end date for Fowler Serial numbered devices. We know that many two-part cased devices had no serial numbers, and the latter type of sintered case with chromed finish, supplied from about 1950, were similarly not serial numbered.

Other dates in the mix

It is believed that the Fowler MAGNUM Long scale was introduced in 1927, it is entirely likely to have started with its own separate serial numbering scheme.

The Fowler Jubilee Magnum was introduced 50 years after they started in business, in 1948. There are none in this listing. None are known to carry a serial number.

The latest sintered metal, highly chromed calculators, with a glass let into the front, were supposedly introduced around 1950 (from a date code seen on the instructions) and they too do not carry serial numbers. This may have been slightly earlier and coincided with Jim Cookson replacing Harold Fowler as managing director when he retired.

Conclusion

Fowler Serial numbers are not an obvious science and there is lots of further research required to come up with any reasonable logic which can lead to accurate dates for a numbered device. Readers may help in a number of ways:

- Let me have any serial numbers and Type / format from your Fowler Calculator collection.
- If you have a serial number and reliable date – invoice etc., this will be doubly welcome.
- Let me know of any alternative theory for Fowler serial numbering!

Final lists of Serial Numbers

The following lists are simply an incomplete listing of all serial numbers I have noted when looking at these devices, there is obvious repetition with the previous two sections in this Appendix and there is an obvious dearth of dating information to accompany the numbers. The major items of information that can be gathered is that the highest number I have recorded is 35,823, and secondly apart from the previously recorded duplicate Bakelite and Magnum Long scale, there are no duplicate numbers,

Calculator	Date	Serial No	Comment	
Type B		24	Bakelite	Ardenite case, webs, ebay 04.18
Type B		33	Bakelite	
Type B		34	Bakelite	
Long Scale Magnum		46	Engraved on back	2-part tin. e-bay 06.16

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Calculator	Date	Serial No	Comment	
Universal		107	Bakelite	Paul T. Coll
Type B		117	Bakelite	
Type B		171	Bakelite with Bakelite case	pmh
Type E		189	Sintered	Peter F
Type B		201	Bakelite	
Type B		204	Bakelite	(David R)
Long Scale Magnum		242	Engraved on back	e-Bay 12.13
Type B		254	Bakelite	
12-10	Xmas 1931	336	Bakelite with Bakelite case	Engraved greeting eBay 07.16
Magnum Textile		343	Engraved on back	2-part. eBay 06.16
Universal		366	Bakelite	
Type E1	26.03.1915	420	Hand written	Sintered Repaired 15.03.1917
Type B	n/a	R 471	Stamped in back	2-part (David R)
12-10		500	Bakelite	E-Bay 1.16
Type B		539	Bakelite	e-Bay 03.17
Longscale Magnum		576		e-Bay 08.20
Type E1	?	X585	Engraved on side	Back button, Sintered (David R)
Universal		590	Bakelite	e-Bay 09.20
Type B (with warps etc)		619	Bakelite	E-Bay 10.17
Type B (with warps etc)		621	Bakelite	E-Bay 06.14
12-10	1936?	633	Bakelite	
Type B		668	Bakelite	
Universal		672	Bakelite	
			Bakelite	
Type B		766	Bakelite	E-bay 07.14 (Peter F.)
Universal		775	Bakelite	
			Bakelite	
Type B		821	Bakelite	
Universal		845	Bakelite	
Universal		862	Bakelite	
12-10		881	Bakelite	
Type B		907	Bakelite	
Type B		926	Bakelite	
12-10		936	Bakelite	
Type B		945	Bakelite	
Type H	11.11.1915	951	Hand written	Sintered pmh
Universal		968	Bakelite	e-bay 02.15
Fowlers Calc	11.12.1015	986	Hand written	Sintered
Long Scale Magnum		1053	Tin case	Engraved on back. eB 03.16

Calculator	Date	Serial No	Comment	
Universal		1061	Bakelite	
Type E1		1101	Engraved on side	Sintered. e-Bay 01.14
Universal		1109	Bakelite	e-Bay 01.06.15
Universal		1190	Bakelite	
			Bakelite	
Universal		1214	Bakelite	
12-10		1222	Bakelite	
12-10		1244	Bakelite	
Type B		1246	Bakelite	eBay 10.20
Universal		1260	Bakelite	
Universal	12.04.52 on Bakelite 17.08.40 on case	1261	Bakelite	eBay 04.16 pmh
Type H		1266	Cast case	e-Bay 10.13
12-10		1272	Bakelite	
Long scale Magnum		1335	Tin case	Peter F.
12-10		1354	Bakelite	E-Bay, 04.17
12-10		1364	Bakelite	E-Bay 08.14, 04.18
Magnum Textile		1374	Tin case	e-Bay 10.17
Universal		1390	Bakelite	e-Bay 02.17
Universal		1402	Bakelite	e-Bay 13.17
Universal		1423	Bakelite	
Universal		1425	Bakelite	e-Bay 03&08.14
Type B		1464	Bakelite	Paul T. Coll
"Magnum" Long scale		1465	Stamped in back	e-Bay 03.17
			Bakelite	
12-10		1530	Bakelite	
Universal		1540	Bakelite	
12-10		1545	Bakelite	
"Magnum" Long scale	n/a	1592	Stamped in back	Two-part E-Bay 08.16
"Magnum" Long scale	n/a	1593	Stamped in back	Two-part
Universal		1602	Bakelite	
"Magnum" Long scale	n/a	1607	Stamped in back	Two-part (PMH)
Universal		1607	Bakelite	
Type A	May 1915	1616	Hand written	Sintered
12-10		1621	Bakelite	e-Bay 11.14
12-10		1631	Bakelite	
Universal		1649	Bakelite	Paul T. Coll
Universal	n//a	1676	Bakelite	e-Bay 03.16, 04.17
Universal		1691	Bakelite	e-Bay 01.18
Universal	n//a	1727	Bakelite	e-Bay 06.15
Magnum Long Scale	n/a	1739	Stamped in back	. e-B 01.16
Magnum Long Scale	3 / 1951	1740	Stamped in back	Date from insts. e-B 08.14
12-10		1810	Bakelite	Paul T. Coll
Universal		1817A	Bakelite	
Unknown		1840	Bakelite	
Universal		1923	Bakelite	
Universal		1971	Bakelite	
Artillery	n/a	1986	Engraved on side	Sintered e-Bay 01.15

Calculator	Date	Serial No	Comment	
Artillery	n/a	1990	Engraved on side	Sintered –e-Bay 02.13
Universal	n/a	2058	Engraved on back	Two part –e-B -08.15
Universal	n/a	2082	Engraved on back	Two part –e-B -01.13
Universal	n/a	2083	Engraved on back	Two part –e-B -04.16
Type H		2143	Sintered case	Peter F.
12-10	n/a	2205	Engraved on back	Two part –e-B 05.17
Type E		2260	Hand written	Sintered
12-10	n/a	2451	Engraved on back	Two-part (pmh)
Type E1	n/a	2515 (5152?)	Engraved	Sintered
Type H	n/a	2535	Engraved on side	Sinterd e-Bay 11.17
12-10	1930??	2644	Engraved on back	Two part e-bay 06&07.14
Type E1	No Date	2637	Engraved on side	Sintered e-Bay 07.15
12-10	No date	2659	Engraved on back	Two part, e-Bay 12.20
Type E	No date	2660	Hand written	Sintered e-Bay12.11
12-10	No date	2699	Engraved on back	Two part – e-Bay 12.12
Type RX	No date	2712	Engraved	Sintered eBay 07.17
Type E	No date	No number	e-bay 332734	Sintered 2002
Type H	No date	2746	Engraved	Sintered e-Bay 07.16
Type H	n/a	2756	Engraved	Sintered
Type H	n/a	2786	Engraved	Sintered (David R)
Type A	n/a	2803	Engraved	Sintered
Type B Textile	n/a	2832	Engraved on back, steel	Two part Sc Coll 12.20
Type B Textile	n/a	2836	Engraved in back	Two part (e-bay 03.14)
Type H	n/a	2947	Engraved	Sintered
Type E1	Oct 1919	2959	Hand written	Sintered
Type E1	Oct 1919	3009	Hand written & Engraved	Sintered. Fig 10.7
Type H		3165		Sintered
Type E1	n/a	3239	Engraved	Sintered (pmh)
Type E1	n/a	3259	Engraved	Sintered
Type RX	n/a	3403	Engraved	Sintered (e-Bay 04.18)
Type RX	n/a	3431	Engraved	Sintered (e-Bay 017.15, 11.17) Sci Coll 12.20.
Type RX	n/a	3434	Engraved	Sintered (e-Bay 04.16)
Type H		3498	Engraved	Scientific Collectables 12.20
Type RX	n/a	3577	Engraved	Sintered (pmh)
Type RX	n/a	3583	Engraved	Sintered (e-Bay)
Type E1		3684	Engraved	Sintered. Peter F
Type E1		3697	Engraved	Sintered. (e-Bay 05.17)
Short scale Textile	n/a	3764	On axle	Two part. e-Bay 01.13
Type RX		3886	Engraved	Sintered (Peter F.)
Type RX	n/a	4284	Engraved	Sintered e-Bay 02.16
Type E1	?	4340	Engraved	Sintered e-Bay 02.15
Type E1	?	4370	Engraved	Sintered e-Bay 01.21
Short scale textile	n/a	5060	On axle	Two part. isrm
Fowler Calc	n/a	5704	Engraved	Sintered
Type RX		5950	Engraved	Sintered e-B04.18
Type E1	n/a	6043	Engraved	Sintered (tina) No bulls eye
Type E1	n/a	6096	Engraved	eBay 04.19 Bulls eye
Short scale textile (2-	n/a	6653	On axle	Two part, centre loop. CAB.

Calculator	Date	Serial No	Comment	
side)				Says "Serial" above number
Short scale textile	n/a	6768	On axle	Two part
Type RX	n/a	6960	On axle	Two part – e-B 02.13
Type RX	n/a	7007	Both Type RX and Ser No on axle	Two plus ring, tin box eB 10.17
Long scale	n/a	7182	On axle	Two part e-bay
Long scale	n/a	7363	On axle	Two-part e-Bay
Long scale	n/a	7369	On axle	2-part (e-Bay 2009)
Short scale textile	n/a	7502	axle	2-part 661778
Short scale textile	n/a	7701	axle	2-part 160318
Textile	n/a	7934	axle	2-part
Short scale tex		7964	On axle	2-part. Loop centre, Peter F
Type H	n/a	8097	On axle	2-part, Loop centre, Tin case, eB 02.116
Long Scale		8202		Two part eB 04.18
Long scale	n/a	8292	On axle	Two part (pmh) Cent loop + 2 stems
Fowlers Calculator	N/a	8299	On axle	Two part, e-Bay 08.14
Short scale textile (2-side)	n/a	8871	On axle	Two part – e-Bay Bromley books
Long scale	n/a	9151	On axle	2-part e-Bay 5275
Long scale	n/a	9230	On axle	Two part 3 stems 66890
Fowlers Calculator	n/a	9496	On axle	Two part, eBay 04.16
Long scale	n/a	9515	On axle	Two part (HvH)
Long scale	n/a	9595	On axle	Two part (cab)
Short scale textile	n/a	9769	On axle	Two-part eBay 01.16. centre loop
Short scale textile	n/a	9956	On axle	Two part (RL)
Short scale textile	n/a	10298	On axle	3-stem,Two part (pmh)
Universal-Blitz-Rechner (Kurze scala)	n/a	10479	Engraved in back	Two part (German)
Long Scale	n/a	10852	On axle	Two part, eB 03.17
Short scale textile		10983		Two part (Peter F.)
Long Scale	n/a	11353	On axle	3-stem. isrm
Long Scale	n/a	11680	On axle	2 part, tin box, 2-stem eB 03.16
Long Scale	n/a	11691	On axle	2 part Tin box 2-stem, e-B 07.14
Long Scale	N/a	11898	On axle	2 part Tin box 2-stem, e-B 09.14
Long scale	N/a	11990	On axle	Sci Coll 12.20
Long Scale	n/a	12064	On axle	Two part e-B 09.14
Long Scale	">1937"	12133	On axle John Hall Tools	Two part, eB 01.16 pmh tin box
Long Scale	n/a	12254	On axle	Two part 70275
Circular slide rule	?	12792	On axle	Two part eBay 01.21
Long scale textile	n/a	12891	On axle	Two part 024599
Long scale	1931?	13023	On axle	Two part 64571
Long scale	n/a	13167	On axle	Two part

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Calculator	Date	Serial No	Comment	
Short scale textile	n/a	13434	On axle	Two part 203482
Artillery	n/a	13447	On axle	Two part (John H)
Long scale	n/a	13456?	On axle	Two part
Long scale	n/a	13523?	On axle	Two-part e-Bay
Textile Conversion	n/a	13697	Hand written	Two part eBay 08.16
Long scale	n/a	13802	On axle	Two part e-Bay 01.13
Long scale	n/a	14144	On axle	Two-part e-Bay
Short scale textile		14160	On axle	Two part eBay 08.20
Long scale	n/a	14239	On axle	Two part e-Bay, tin case
Circular slide rule	?	14280	On axle	Two psrt
Long scale	n/a	14310	On axle	2part red tin box eB 09.17
Short scale textile	n/a	14398	On axle	Comp Hist Museum
Long scale	n/a	14468	On axle	Two-part (HvH)
Long Scale	N/a	14696	On Axle	Two part e-Bay 08.14
Textile Conversion	n/a	14793	Hand written	Two-part. Fig 10.23
Long scale Textile	n/a	14851	Engraved in back	Two part e-Bay
Short Scale Tex one sided		15067	Engraved on back	Two part eBay 01.21
Short scale tex 2 side	n/a	15226	On axle	Two part ebay 03.17
Short scale tex 2 side	C1937-42?	15285	On axle	Two part eBay 01.21
Circular slide rule	?	15486	On axle	Two part
Fow Calc/ Circ slide rul	n/a	15488	On axle	Two part e-Bay
Short scale Tex 2 side	n/a	15491	On axle	Two part e-Bay. 11.15 pmh
Scan 009	n/a	15617	On axle	Two part
Single sided Long scale	n/a	15675	On back	isrm
Long scale	n/a	15691	On axle	Two part e-Bay
Long scale	n/a	15814	On axle	Two-part 372791
		16226		Steel back PWC 12.20
Short scale Tex 2 sides	n/a	16244	On axle	Two part eBay 08.16
Long scale	n/a	16390	On axle	Two part
Type RX	1943	16772	On axle	Two part in tin box (engraved with date)
Long scale	n/a	16908	On axle	Two part (RL)
Long Scale		17002	On axle	John Bolton
Long scale	n/a	17175	On axle	Two part
Long Scale	n/a	17256	On axle	Two part, tin box, e-B
Long Scale	1942?	17435	On axle	Two part, tin box, e-B 05.14
Long scale	n/a	17490	On axle	Two part (Gilai) red
Long scale	n/a	17502	On axle	Two part (9351) red
Long Scale	n/a	17514	On axle	Two part, tin case. eB 03.16
Long Scale	n/a	17608	On axle	Two part e-B 04.14
Short scale textile	n/a	17661	Engraved in back	Two part 96730
Long scale	n/a	17780	On axle	Two part tin case eB03.17
Long Scale	n/a	18289	On axle	Two part tin box, eB 03.16
Long scale	n/a	18494	On axle	Two part (cb)
Long scale	n/a	23226	On axle	Two part eBay 04.17
Long scale	n/a	35823	On axle	Two part 226681
Notes:				

Calculator	Date	Serial No	Comment	
New Sintered	1949, 1951	No serials		From insts
12-10 introduced 1936?				
FC Logo on centre	1948	none	12/10 Engraved example	

19.01.21

Tentative Conclusions that can be drawn from this Appendix

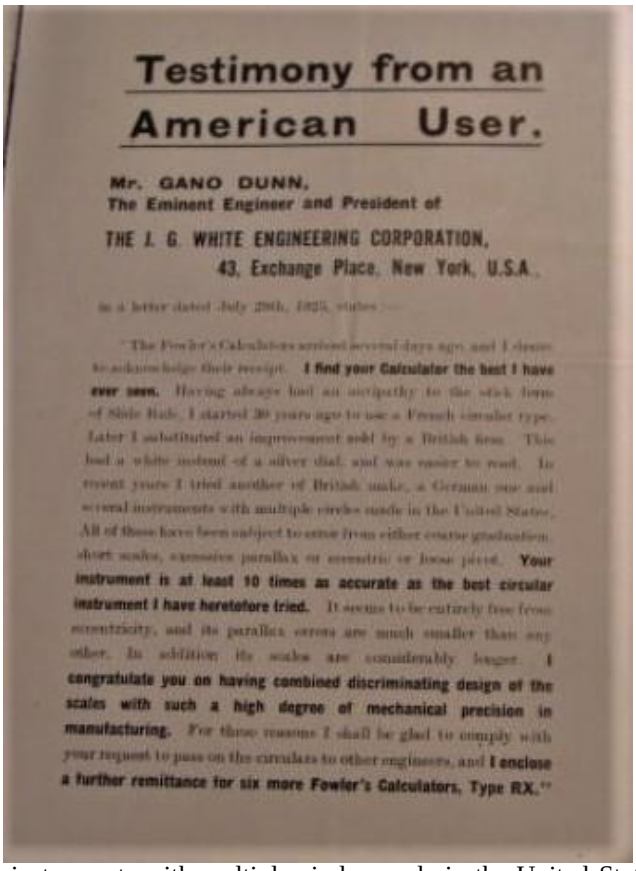
These are few, but:

- It still looks like generally a single series of numbers that finished at around 35,000 in an unknown year
- There were Fowler two part calculators – generally without knurling on the centre band that did not carry a serial number. These obviously immediately preceded the last sintered metal designs with separate screwed-on back from c1948.(when Jim Cookson became MD).
- The earliest serial numbers started c1910 immediately after the formation of Fowler and Co and after calculators sold under Scientific Publishing Co name, particularly ME which were un-numbered
-

Appendix C

Fowler's produced various items of stand-alone documentation apart from instruction leaflets. These are quite interesting and entertaining, a few of these are included in this section, with some comment.

The first of these documents is a "Testimony from an American User," produced as a separate stand-alone document which was covered in the UKSRC Skid Stick 56 in June 2016shown below, with a transcript and comment.



Testimony from an American User.

Mr. GANO DUNN,
The Eminent Engineer and President of
THE J. G. WHITE ENGINEERING CORPORATION,
43, Exchange Place, New York, U.S.A.

in a letter dated July 29th, 1925, states:—

"The Fowler's Calculators arrived several days ago, and I desire to acknowledge their receipt. **I find your Calculator the best I have ever seen.** Having always had an antipathy to the stick form of Slide Rule, I started 30 years ago to use a French circular type. Later I substituted an improvement sold by a British firm. This had a white instead of a silver dial, and was easier to read. In recent years I tried another of British make, a German one and several instruments with multiple circles made in the United States. All of these have been subject to error from either coarse graduation, short scales, excessive parallax or eccentric or loose pivot. **Your instrument is at least 10 times as accurate as the best circular instrument I have heretofore tried.** It seems to be entirely free from eccentricity, and its parallax errors are much smaller than any other. In addition its scales are considerably longer. **I congratulate you on having combined discriminating design of the scales with such a high degree of mechanical precision in manufacturing.** For these reasons I shall be glad to comply with your request to pass on the circulars to other engineers, and **I enclose a further remittance for six more Fowler's Calculators, Type RX."**

I have always been somewhat cynical about "unsolicited testimonials". However, the following (with the above heading) issued by Fowler, presumably in 1925 or shortly after, is a fascinating view of what could be interpreted as being better with a Fowler's calculator when compared with other similar contemporary devices. I have tried to copy the same capitalisation and bolding as in the original document:

Mr. Gano Dunn
The Eminent Engineer and President of
THE J.G. WHITE ENGINEERING CORPORATION
43, Exchange Place, New York. U.S.A.

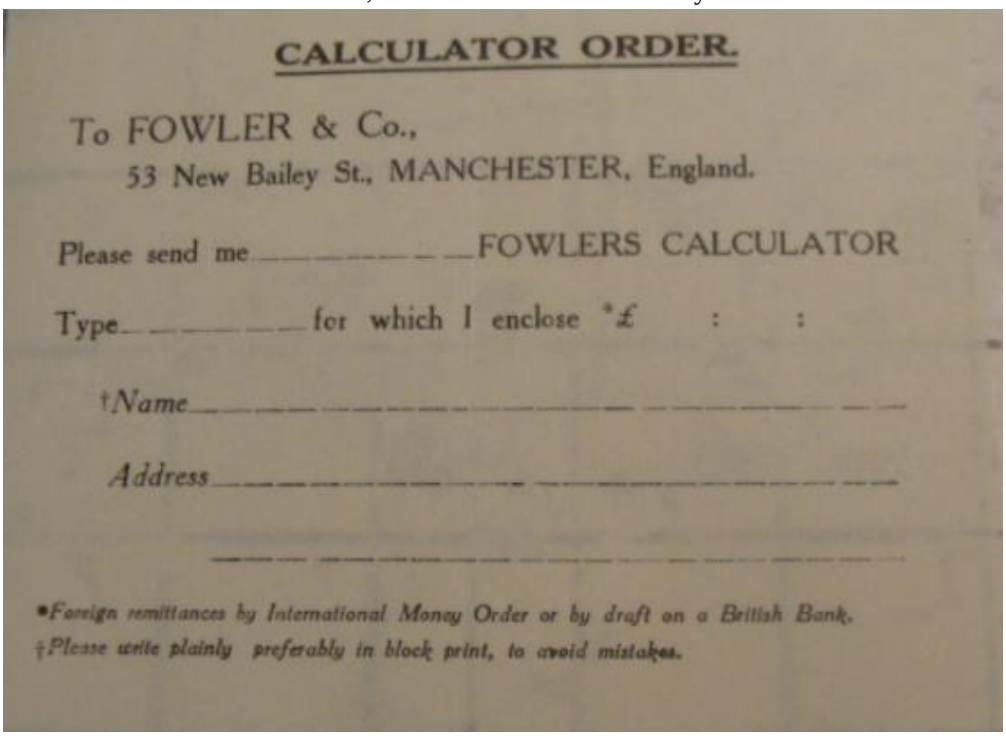
In a letter dated July 29th 1925 states

The Fowler Calculators arrived several days ago, and I desire to acknowledge their receipt. **I find your Calculator the best I have ever seen.** Having always had an antipathy to the stick form of Slide Rule, I started 30 years ago to use a French circular type. Later I substituted an improvement sold by a British firm. This had a white instead of a silver dial and was easier to read. In recent years I tried another of British make, a German one and several instruments with multiple circles made in the United States. All have been subject to error from either coarse graduation, short scales, excessive parallax, or eccentric or loose pivot. **Your instrument is at least 10 times as accurate as the best circular instrument I have heretofore tried.** It seems to be entirely free from eccentricity, and its parallax errors are much smaller than any other. In addition its scales are much longer. **I congratulate you on having combined discriminating design of the scales with such a high degree of mechanical precision in manufacturing**. For these reasons I shall be glad to comply with your request to pass on the circulars to other engineers, and **I enclose a further remittance for six more Fowler Calculators, Type RX."**

This does provide an interesting insight into what Fowlers may have considered the high-points of their designs if they produced this, or else, if genuine, then equally what their customers might have thought! My cynicism being what it is, I googled "J.G. White… etc." and found a most interesting Google book published by the company sometime in the 1920's: *"Achievements of the J.G. White Engineering Corporation and Associates in American and Foreign Fields".* http://tinyurl.com/zr7pca4. In the 35 pages are quite incredible lists of many major power systems of all types in all parts of the world they had completed. Also confirmation that their president since 1913 was indeed Gano Dunn. His entry in Wikipedia shows a long, varied and interesting life (1870 – 1953) with a great emphasis on engineering. It also shows a plaque honouring the man and his incredible achievements, see next page. (https://en.wikipedia.org/wiki/Gano_Dunn)

In the face of this evidence, I have had to revise my thoughts on this unsolicited testimonial. It must indeed have been genuine. It also shows that with Dunn's interesting comparison with contemporary pocket-watch devices we can make an educated guess that he had previously tried: an original French Boucher of about 1895 with its silver scales, then a British Stanley Boucher with paper scales. It is more difficult to guess which would be the later British and which German devices he was talking about. The American has to be K&E Sperry. A fascinating and unusual comparison of pocket-watch slide rule features, and an interesting document.

Our second document, and I am unsure where you would have found such a document, is a CALCULATOR ORDER form which could be sent to the Factory to order anf of the Fowler calculator range. The New Bailey Street address dates it between 1931 and when they had to move during WW2



CALCULATOR ORDER.

To FOWLER & Co.,
53 New Bailey St., MANCHESTER, England.

Please send me _____ FOWLERS CALCULATOR

Type _____ for which I enclose *£ : :

†Name _____

Address _____

_____

*Foreign remittances by International Money Order or by draft on a British Bank.
†Please write plainly preferably in block print, to avoid mistakes.

I assume this would have only been after consulting the only stand- alone advertising leaflet I have come across, an undated "List 50", the front page of which is used for the Cover page of Gallimaufry, or else one of the famous Fowler Engineering booklets which all carried adverts for their range of calculators.

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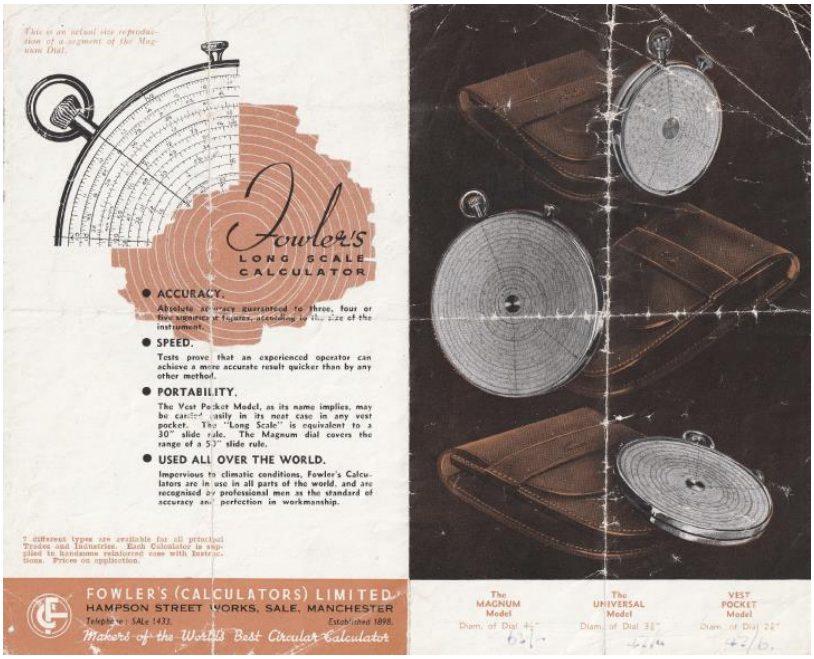

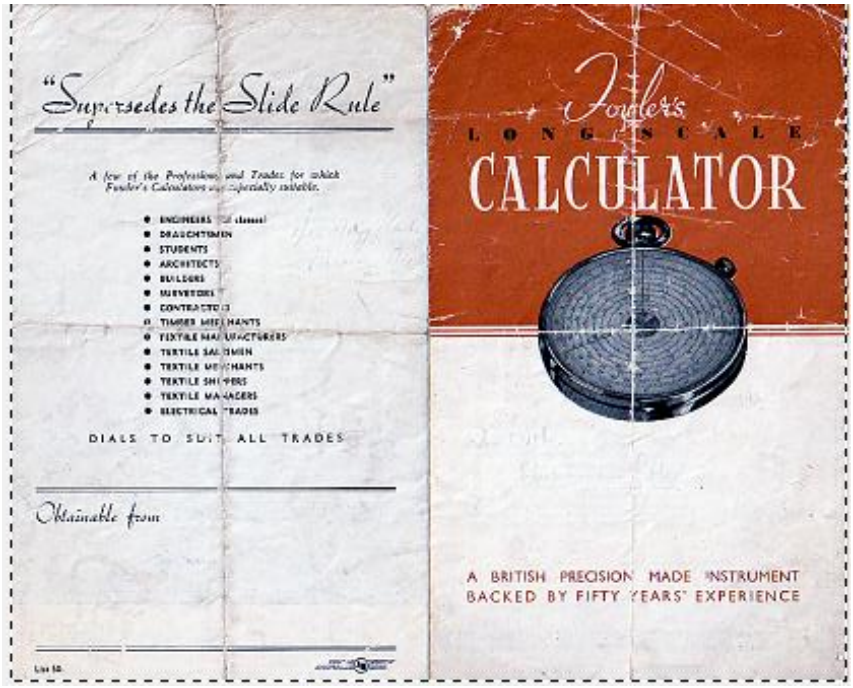

Bibliography

[1] *Slide Rules, their History Models and Makers*. Peter Hopp: Astragal Press 1999

[2] *Patent Applied For – A Century of Fantastic Inventions.* Coppersmith, Fred, Lynx J.J.: Co-ordination Press, 1949. Pages 14 and 17 deal with this particular device

[3] *A History of the Logarithmic Slide Rule and associated instruments.* Cajori, Florian: Astragal Press reprint, 1994

[4] *The Use and Working of the Watch Calculator and the Slide Rule.* Anon. Scientific Publishing. 1st edn. c1900?
The Preface states: '…or Watch Form of Calculator, which was introduced by the proprietors of the *'Mechanical Engineer'* a few years ago …'
Chapter 1 paragraph three states 'The instrument made by the proprietors of '*The Mechanical Engineer'* is shown in Fig. 1, Plate l, full size". (Plate 1 shows two sizes of ME with 1¾" and 2½" dials). The advert is very similar to Fig 9.4 in here.

An undated Second Edition has a different advert and Figure 1, where only the 2" dial is mentioned in the text and shown in Figure 1 of Plate 1. The advert is very similar to Fig 9.5 in here.

[5] *The Slide Rule;* C.N. Pickworth; Various editions, especially edition 6, 1900.
This has an advert for SPC with the same ME diagram as [4], priced at 7/9d. or 12/9d. for 2½" dial. See also Fig 9.4 in here.

[6] *Newnes Slide Rule Manual;* F.J. Camm; Various editions, from 1, 1944 to 6, 1963. Published by George Newnes Limited, London. This carries a description of how to use a Calculex and Fowler Calculator, various pagination.

[7] *Slide Rules and How to Use Them* by Thos. Jackson, Chapman & Hall, Limited, London; published in about 1900.

[8] *Calculating Machines and Instruments: Catalogue of the Collections in the Science Museum* by D. Baxendahll & Jane Pugh, Science Museum; London 1975.