
Fowler's Pocket-Watch Type Calculators

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Introduction

Pocket-watch type calculators featured in many manufacturer's and retailer's catalogs, and they have always been a popular addition to any collection. Makers such as K&E produced pocket watch devices, and Henri Chate-lain (Calculigraphe), Stanley and a number of others produced the "Boucher" type calculator. We also have Russian pocket-watch types appearing on the collecting scene. Pre-eminent among pocket-watch calculator manufacturers was Fowler, a prolific manufacturer specialising in pocket-watch calculators.

Fowler was one of the longest-lived suppliers of pocket-watch calculators. The company traded under various names from a number of addresses in the Manchester area from 1898 to 1988. The history of Fowler has been covered in John Knott's article in Vol 4 No 2 of the Oughtred Society *Journal*, and Jenny Wetton in the *Bulletin* of the SIS; it will not be repeated here. On the face of it, the Fowler calculator continued with small changes undisturbed throughout this period, with various new models being introduced throughout its life. It is only when they are investigated in detail, that it becomes apparent that there were a substantial number of major changes in the fundamentals of the design such as the case, and considerable minor variations.

The investigations made for this article confirm that Fowler's calculators were hand made. This is very clear from the mass of small changes that appear seemingly at random on the examples studied. Fowler employed small numbers of staff to maintain a constant level of output from "bought-in" piece parts. Additional staff were brought in as necessary to cope with peaks. Towards the end of their life only very small numbers of calculators were produced per week.

Models of Calculator

From a number of sources, primarily John Knott's collection, Tom Martin's collection, the range of Fowler's "Pocket Books" for Electrical, Mechanical, and Architectural engineers, and a number of other documents, it has been possible to produce a listing of the models produced. This is summarized in Table 1.

The most common scales used on the calculators are summarized in Table 2. It should be noted that the scale numbers in the table are listed with scale 1 as the outer scale and numbered in to the center. A number of calculators had up to 14 scales, the majority somewhat fewer. There are numerous small differences that are not specif-

ically listed. These include the name and address information that changes depending on the age of the calculator. "Constants" means that there are either constants or gauge points on the outer edge of scale 1. Name and address information is given in Table 3, with tentative dates when they may have applied.

Details of the format of the calculator, i.e. whether the case was cast or pressed, and the many variants of detail are shown in Table 4.

Fowler used a multitude of different shape and size knobs on their calculators. It can only be assumed that this was a result of what was available from the watch making trade at a particular time, and they may have changed from batch to batch. Details of common known types are shown in Table 5, but this cannot be comprehensive.

Serial Numbers

Some Fowlers are marked with a serial number. These are sometimes on the central axle, on the rim of the calculator, and in some examples inside the calculator. In the latter this is obvious only if access can be gained to the insides of the calculator. As well as the serial number, the types with serial number inside the calculator are sometimes dated. There is no obvious correlation between date and serial number, and sometimes the serial number may actually be a date code - 12235 may be 12 Feb. 1935 and 131260 may be 13 Dec. 1960. I do not propose any rationale on serial number versus dates!

Notes to Table 1 (Next Page)

1. The rear scale is worked from a center knob.
2. There are variants with the manufacturer shown as Scientific Publishing Co.
3. Jenny Wetton in her article says that both Universal and Textile followed the Jubilee range in 1948; however, the 1946 year book shows both types in the listings of available models.
4. There is a smaller variant with knobs 7-4, 1-1; also Magnum above and below Long Scale Calculator.
5. Advertised with "single type" dials, it is not known whether these were Vest Pocket Calculator types or other.
6. This is not a true watch style calculator; see later detailed notes.
7. Special paper weight scales and gauge points for conversion.

Table 1. Summary of Models

Model:	Format: (Table 4)	Diam:	Scales:		Knobs: (Table 5)	Cursor:	Dates from:	Note:
			Front:	Back:				
	2	2 11/16"	B	Y	1	1		1.
Type B	7	3 3/8"	A	n/a	7-7	2		
Type B Textile	6	3 3/16"	E	n/a	5-5	1		
Type E1	1	2 5/8"	E	Z	1-3	2		
Type E1 (Textile)	1	2 11/16"	E	Consts.	1-2	2		
Type H (early)		2 ¼"	U	T			<1915	1.
Type H	1	2 5/8"	S	T	1-6	2	c1915	
Type O	3	2 11/16"	B	Y	1-6	1		2.
Type T (Textile)		2 ¼"	R	Consts.				
Short Scale Textile	5	2 11/16"	E	R	1-4	2	<1940	
"Magnum" Textile	9	4 11/16"	M	n/a	7-7	3	1927?	
Vest Pocket Calculator, Type MD		2 ½"	C	n/a				
Vest Pocket Calculator, Type H		2 ½"	D	n/a				
Vest Pocket Calculator, Type CSR		2 ½"	W	n/a				
Universal Calculator	8	3 3/8"	J	n/a	7-4	2	<1940	3.
Universal Calculator	9	3 7/16"	J	n/a	7-7	2	<1940	3.
"Twelve-Ten" Calculator ("12-10")	7	3 3/8"	G	n/a	7-7	2	1936	
"Magnum" Long Scale	7	4 5/8"	K	n/a	7-7	2/3		4.
"Magnum" Long Scale	7	4 5/8"	L	n/a	7-7	2	1927	
Jubilee "Magnum" Extra Long scale	9	4 11/16"	H	n/a	7-7	3	1948	
Nautical Calculator		4 ¼"	V	n/a			1957	
Artillery Calculator			?	Conv.			<1940	5.
Artillery Calculator			W	Conv.				
Long Scale Type RX		2 3/8"	C	D			1924	
Long Scale	5	2 11/16"	C	D	1-4	2	c1938	
Circular Slide Rule			W	X				
Circular Slide Rule			W	Conv.				
"The Mechanical Engineer" Pocket Calculator		2" & 4"	U	n/a	1-4	1		c1898
Fowler's Calculator		2 5/8"	D	T	4-4	2?	c1935	
Textile Long Scale							<1940	3.
Junior Calculator	Circular	4 ½"	N	P	n/a	2-2		6.
The Mackay Paper & Board Calculator		4 3/4"	AA	n/a	7-7			7.

Table 2.

The Most Common Scales Used on Fowler 's Calculators

Scale Type/No	A	B	C	D	E
Constants	Yes	Yes	No	Yes	No
1	Short scale	Short scale	Short scale	Short scale	Short scale
2	Eight's scale	) Scale	)	Reciprocals	Eight's scale
3	-	) 21 5/8"	) Scale	Logarithms	-
4	-	) length	) 30"	Square roots	-
5	-	-	) length	Square roots	-
6	-	-	)	Log sines	-
7	-	-	-	Log tans	-
8	-	-	-	Log sines	-
9	-	-	-	-	-
10	-	-	-	-	-
11	-	-	-	-	-
12	-	-	-	-	-
13	-	-	-	-	-
14	-	-	-	-	-
Scale Type/No	F	G	H	J	K
Constants	Yes	Yes	No	Yes	No
1	Short scale	Short scale	Short scale	Short scale	Short scale
2	Eight's scale	Reciprocals	Reciprocals	Reciprocals	Reciprocals
3	-	Duo-decimal	Logarithms	Logarithms	Square Roots
4	-	Duo-decimal	)	) Scale	Square Roots
5	-	Sines, 6° - 90°	)	) 20")
6	-	Sines, 35' - 6°	) Scale	) length	Scale
7	-	Tans, 5° - 64°	) 79"	Sines	) 50"
8	-	-	) length	Sines	) length
9	-	-	)	Tans)
10	-	-))	-)
11	-	-	)	-	Logarithms
12	-	-	)	-	Sines
13	-	-	)	-	Sines
14	-	-	)	-	Tans
Scale Type/No	L	M	N	P	Q
Constants	Yes	Yes	No	Yes	No
1	Short Scale	Short scale	Short scale (F)	Short scale	Short scale
2	Reciprocals	Eight's	Short scale (D)	Reciprocals	-
3	Square Roots	Sixteen's	Logarithms	Logarithms	-
4	Square Roots	-	Square Roots	) Scale	-
5	Logarithms	-	Square Roots	) 20"	-
6	)	-	Sines	) length	-
7	) Scale	-	Tans	Sines	-
8	) 50"	-	-	Sines	-
9	) length	-	-	Tans	-
10)	-	-	-	-
11)	-	-	-	-
12	Sines	-	-	-	-
13	Sines	-	-	-	-
14	Tans	-	-	-	-

Scale Type/No	S	T	U	V	W
Constants	No	No	No	No	No
1	Short Scale	Cubes	Logarithms	Sine/Long	–
2	Reciprocals	Cube Root	Short Scale	Sine/Long	–
3	Logarithms	Cube Root	Square Root	Sine/Long	–
4	Square Roots	Cube Root	Square Roots	Sine/Long	–
5	Square Roots	–	Sines	Sine/Long	–
6	Sines	–	Sines	Sine/Long	–
7	–	–	–	–	–
8	–	–	–	–	–
9	–	–	–	–	–
10	–	–	–	–	–
Scale Type/No	X	Y	Z	AA	BB
Constants	–	–	–	Paper	–
1	Reciprocals	Short Scale(D)	Weft	“C”	–
2	Cubes	Cube Root(C)	Looms	“D”	–
3	Cube Roots	Cube Root(B)	Reeds	lbs/ream	–
4	Cube Roots	Cube Roots(A)	–	–	–
5	Cube Roots	–	–	–	–
6	–	–	–	–	–
7	–	–	–	–	–
8	–	–	–	–	–
9	–	–	–	–	–
10	–	–	–	–	–

Table 3. Fowler’s Addresses and Dates Where Known

1898 - c1915 Scientific Publishing Company, 53 New Bailey Street, Manchester.	early 1940 Fowler & Co., 316 Manchester Road, West Timperley, Manchester (from an advert for 12-10 calculator). Later this is given as the Office, with Factory at Station Works
1908 Workshop in the Family home, Sale Lodge, Sale, Cheshire.	Unknown Fowlers Calculating Co.
< 1914 Oakleigh, the Avenue, Sale, Cheshire.	c1938 - c1960 Fowlers (Calculators) Ltd., Hampson Street Works, Sale, Manchester. also, Fowler’s (Calculators) Ltd, Sale (on Calculator).
c1915 Fowler & Co., 53 New Bailey Street, Manchester.	1960 - 1976 Dalton Street, Manchester.
1920 Factory at Station Works, Chapel Road, Sale, Manchester.	

Descriptions of Calculators

The following brief descriptions of some of the calculators are taken from the 1946 *Electrical Engineers Pocket Book*, though some descriptions are repeated for many years in later editions.

Type T Textile Calculator. The instructions mention two types, Type T, which has calculating circles and some tabular information on the front, and tabular information on the back.

Type E1 The second type of Textile Calculator from the Type T instructions is described as having only a calculating circle on the front and tabular information on the back. This is likely to be the Type E1.

“Magnum” Textile Calculator Single-sided calculator, there are two knobs.

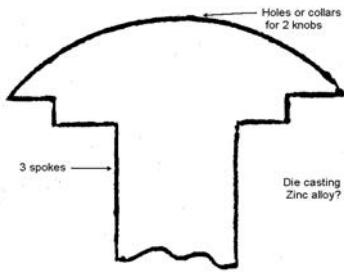
“Long Scale” (Type RX) Calculator Advertised as “... the most popular, comprehensive and accurate calculator ...” in the Fowler range.

Type H Calculator This is described as “A double dial type calculator having the back dial of the type RX arranged as a front dial, with a dial giving Cubes and Cube roots fitted at the back. This is a very useful type where the accuracy of the long scale is not required and where direct readings of cubes and cube roots are an advantage”. The description continues “Alternatively a scale of English - Metric conversions can be fitted as a back dial (as the Artillery calculator)”.

This design was available from c1915 and well beyond 1946 as described above.

Table 4.
Fowler's Circular Formats

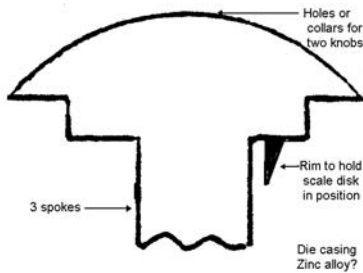
1. Center and right knobs



2. Center knob only

As Format 1, but only one hole or collar for knob

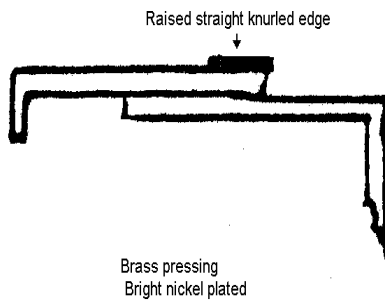
3. Center and right knobs



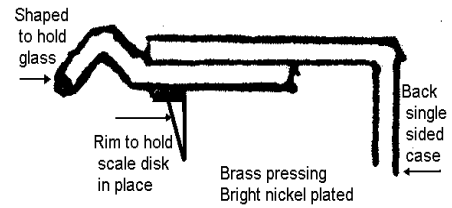
4. Not known

Probably as Format 1, except has 3 knobs on the circumference. Information from advertisements.

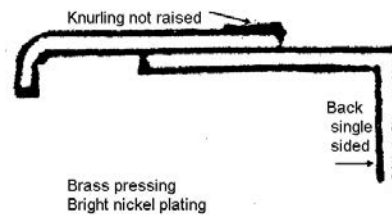
5.



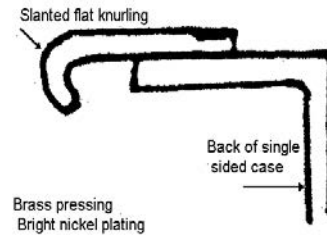
6.



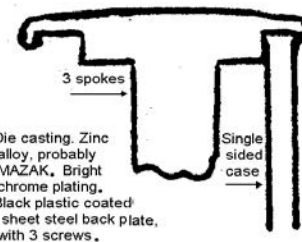
7.



8.



9.



10.

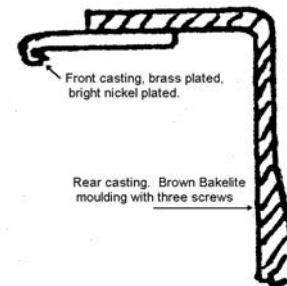







Table 5.
Knobs used on Fowler's calculators
 All are brass with bright nickel plating

Knob 1.	Knob 3.	Knob 4.	Knob 5.	Knob 7.
				
3/8" diameter	5/16" diameter	3/8" diameter	3/8" diameter	3/8" diameter

No. 2 is the same as No. 1 but smaller (5/16" dia.). No. 6 is the same as No. 5 but smaller (5/16" dia.). With No. 7, sometimes the knurling is part depth of the knob.

Artillery Calculator Constructed with either "Single" or "Slide Rule Type" dials. "For the rapid solution of all artillery range finding problems. A Metric - English conversion dial is fitted as standard at the back". It is not known what the size of the calculator was; it is possible that it was "Magnum size" to match the Nautical calculator, or one of the smaller sizes to enable the same scales to be reused.

Note: the description of the conversion dials throughout this particular edition of handbook and in most advertising leaflets uses the term English, rather than Imperial.

Circular Slide Rule Described as "... an instrument designed for those who have been accustomed to using the straight Slide Rule, but desire a more portable and accurate instrument where no 'end switching' is necessary. It consists of a dial rotating inside an outer fixed annulus. The back dial gives reciprocals, and cubes and cube roots of numbers; or, alternatively, an English - Metric conversion scale can be fitted. Can also be supplied as a single dial instrument."

The strong implication is that this is a watch-type calculator, however the Junior Calculator which was an unusual circular slide rule, has scales on the reverse called "Circular Slide Rule". It is entirely possible that the scales were reused from the watch-type instrument.

Single Dial, Vest Pocket Calculators These are described as "... able to be supplied fitted with either the front or back dial of the Long scale instrument, or with the front dial of the 'Circular Slide Rule'." These are known as:

Type M.D. - front dial of the type RX.

Type H (SD) - back dial of the type RX.

Type CSR (SD) - Circular Slide Rule Dial.

Type MD is useful for those who wish to perform multiplication and division only.

Both H and CSR have the bracketed (SD) which could imply that the M.D. is a double-sided instrument, despite the generic title of Single Dial

Universal Calculator Fowler's handbook says "This is a single dial instrument in a Bakelite case which is easy to read and capable of solving all arithmetical calculations. It has a 'long scale' extending over 3 circles with a total length of 20" and giving direct readings of Cubes and Cube Roots. Results to 3 or 4 significant figures."

There is some confusion as to whether the calculator case was Bakelite, or the carrying case was Bakelite. Bakelite backs were supplied on some models. Wetton quotes the Universal and Textile designs as following the Jubilee Range (1948), however they are described as early as 1940 in some Fowler Pocketbooks.

"12-10" Calculator Described as "...intended primarily for Architects, Quantity Surveyors, Builders, Timber Merchants and Craftsmen problems, i.e., those who would have problems which involved feet and inches, shillings and pence type problems." Results to 3 or 4 significant figures are possible.

Magnum Calculator "...was intended for office use or for 'those with weak sight'(!)." The long scale is 50", while the normal short scale is 13.5". It permitted all of the scales of the two dial instruments being included in one dial with the scales being more fully graduated. The "Long Scale" is divided into 100 figured dimensions, each of which is further sub-divided by 10. Gives results to 4 and 5 significant figures.

The Fowler Circular Slide Rule/Junior Calculator

This is not a watch-style calculator, but utilizes the same scales in a double-sided circular slide rule where the elements are worked by serrated edges to the scales and/or cursors, the serrated edges performing the same function as the stem winders

in the watch version. The overall diameter is 4.5" pressed tin and Perspex, with scales 3" diameter.

Part Numbers

A Fowler's advertising leaflet Number 7-57 (is it safe to assume this is a 1957 document?) gives part or type numbers as follows, though this is the only place these have been seen:

Fowlers Vest Pocket Calculator	2102
Fowler's Universal Calculator	2103
Fowler's "12-10" Calculator	2105
"Magnum" Long scale calculator	2107
The Fowler Nautical Calculator	2108
Fowler "Jubilee Magnum" Extra Long Scale Calculator	2109

Sizes

The 1946 pocket book describes Fowler calculators made in three sizes as follows:

- Approximately 2" diameter for carrying in the waistcoat pocket, and fitted with either one or two dials.
- The medium size, of which the "12-10" and "Universal" are examples, had single dials approximately 3" in diameter.
- The largest size, the "Magnum" had a single dial approximately 4" in diameter.

The detailed investigation shows that there were variants to all these sizes as shown in Table 1, and that the variants were in each case 1/16" larger. It is not easy to understand why this was necessary, and yet this size increase applied to all three sizes.

Prices

Small Vest Pocket Size, Double Dial	37/6d	
Vest Pocket size, Single dial	31/-	(also 33/-)
"Universal" and "12-10"	37/6d	(also 33/-)
"Magnum" calculators	55/-	(also 49/6d)

Note that there is considerable confusion in the prices quoted within a particular edition of the Pocket Book, also throughout different editions!

Cases

The Waistcoat/Vest pocket and small vest pocket sizes were supplied with a nickel case, the "Universal" and "12-10", and the "Magnum" were supplied in a leather case. In addition there were

1. Bright nickel-plated brass pressing, hinged
2. Cardboard, hinged
3. Cardboard box

4. Leather wallet
5. Leather wallet, felt lined
6. Plastic wallet
7. Moulded brown Bakelite hinged case.

Cursors

The cursors used on the various versions of calculator have also changed over time. There are three main types:

1. Pointer
2. Celluloid disc
3. Celluloid segment
4. Celluloid pointer (parallel sided with marking)

An accurate "history" is available for one example. The calculator was purchased around 1935 by the present owner's father from an itinerant salesman who appeared on the building site he was supervising. This is an unusual way of selling, and contrasts with the sale from various retailers such as Casartelli (Fowler's main retailers) and others. The calculator was seldom used "in anger", and was mainly ornamental, despite indications to the contrary from the battered state of the nickelled box it is in.

The calculator is different from the traditional illustrations of Fowler calculators, and is not immediately identifiable. It is shown as a "Fowler's Calculator" in Table 1. Knobs are shown as 4-4, and there is the stud for a watch-chain loop between the two knobs.

Acknowledgements

My grateful thanks to John Knott, who produced an incredible list of detailed information from the 20 Fowler items in his collection, when I asked for data in support of an idea for an article on Fowler. Colin Barnes added to the information from items in his collection, and produced the drawings which so much improve the article. Tom Martin's incredible color copies were a major help. Without these there would be no article!

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