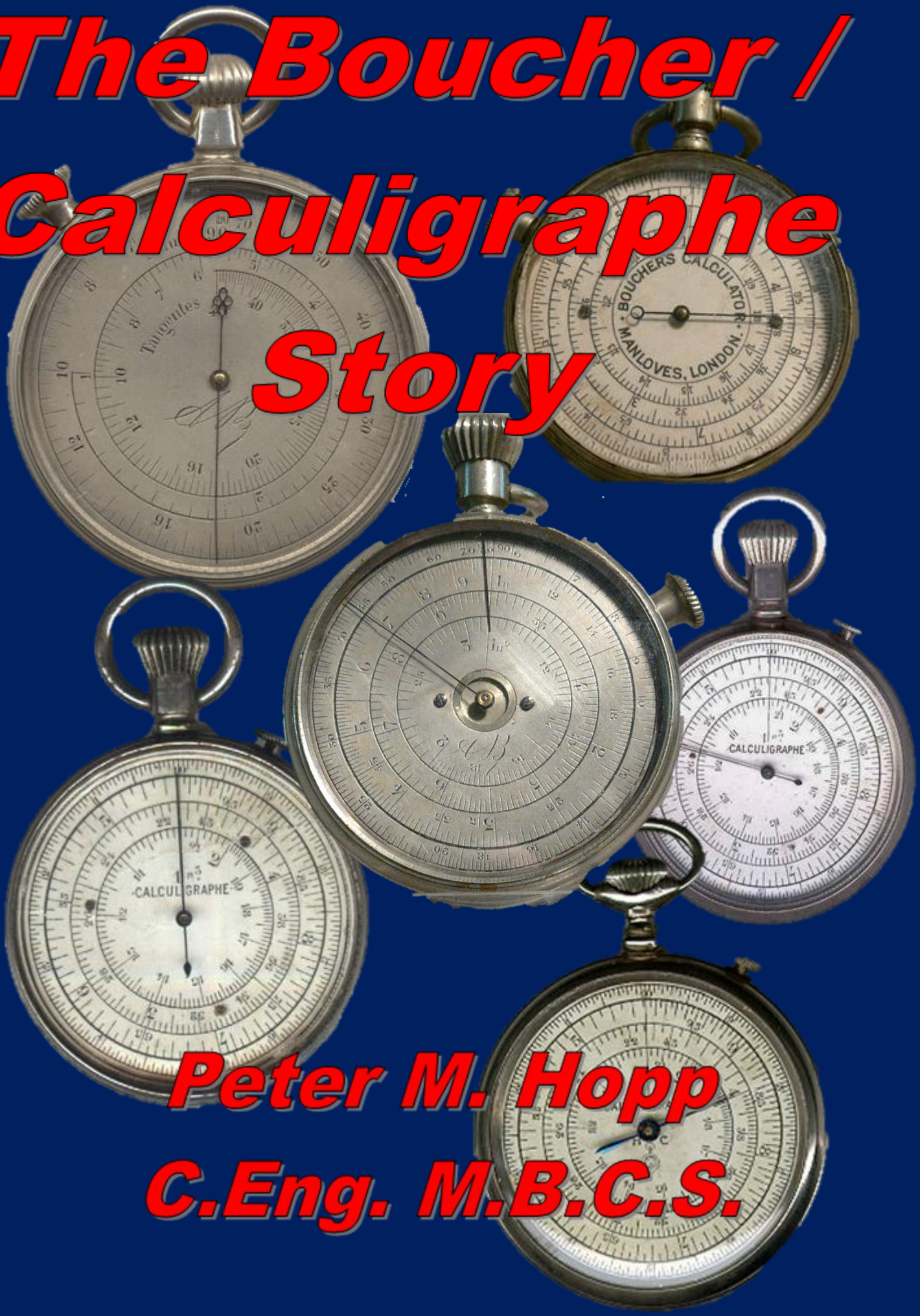
The Boucher / Calculigraphe Story



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Preface

It is only after you have finished writing that you realise what information you are really missing. And so it was that when the manuscript for "Pocket-Watch Slide Rules" was finished the full extent of how little was known about the beginning of the whole story of pocket-watch slide rules and the Dramatis Personae involved became very apparent. This has continued as a source of frustration and on-going research for the many years since then.

Virtually nothing was known about Alexandre Boucher, the inventor and first patentee of the pocket-watch slide rule – and that is still to some extent the case. Likewise virtually nothing was known about Henri Chatelain, the man whose company probably made the greatest number of Boucher type calculators – and that is something that has improved. A vital new name in the Chatelain family has been found and this information is presented here. The chronology of the main designs is now better known after research has allowed some educated guesswork. This too is presented here. The motivation or rationale behind the design of the Calculigraphe by Chatelain after the apparent lack of success of the original Boucher offerings is still only known from a single statement in a magazine article some eighteen years after the initial design is supposed to have taken place. It would be lovely to find some contemporary report on the debate about the acceptability of Boucher's initial design. None has been forthcoming thus far and it is probable that it never will.

Research is delightfully evanescent; one never knows what might suddenly appear! However, what is presented here gives us a much better understanding of the story, and should enable collectors and historians alike to better understand – but probably not completely – the operation of the French pocket-watch slide rule makers of the late 19th century and their world-wide compatriots for perhaps a century afterwards.

This particular work has been "on-the-stocks" for almost ten years, during which I have been hoping for some miracle revelation. Instead there has been a steady trickle of new information which has added considerably to the original which was published in *Pocket-Watch Slide Rules* in 2011. I am now resolved to publish it as it stands in the hope that it will catalyse a new "flood" of information which will finally neatly fill all the holes – I look forward to this flood!

Acknowledgements

My thanks are as always to the ever generous slide rule collecting fraternity who continue to be so generous with their time and information as well as images of items in their collections, particularly Rod Lovett, Peter Fox and Tom Martin; Clay Castleberry; Harold Bailey and his son Tim in the USA; Pierre vander Meulen in Belgium, as well as Willy Robbrecht in Holland for data on Morin.

I must most especially thank Sigismond Kmiecik in France who has helped me so considerably in the search for new information on Chatelain, Boucher and Morin from the CNUM, the Bibliotheque Nationale Francaise (the French National Library) and the French Office of Intellectual Property. He is a true hero! It is a real shame that French national sources have proved so reluctant to release information that would be a real boon to collectors and historians alike. Similarly, Jean-Patrick Donzey, Curator of ***COMPASSIPEDIA;*** The Online Compass Museum[1], has been a real star with information related to the later years of the story – many thanks! My thanks also to Etienne Pommel who gave me the copy of the Chatelain 1907 catalogue which has helped to confirm some "facts" which had previously not appeared to make sense – thank you Etienne! And of course the late Conrad Schure for a number of the photographs.

Finally I would like to thank my various proof-readers who have performed valiantly in sorting out the worst of my excesses, in particular the late Colin Barnes who always brought real value to the task, also now Rod Lovett for his recent efforts, and Suzanne, my sainted daughter – probably still the only person who has read all my books!

[1] www.compassmuseum.com

Introduction

The Boucher and Calculigraphe pocket-watch slide rule types are so strongly inter-twined that it is almost impossible (for the present) to unravel their individual stories and time-lines. This has provided the motivation for what is definitely as interesting as any "whodunnit" mystery as we shall see in the following pages.

It is all the more interesting as Boucher's pocket-watch Calculator is the undisputed seminal design of the genre, and the Calculigraphe has to be one of the most common and iconic workhorses. Not to be definitive about the people or the companies involved has been a major gap in our knowledge. The aim of this work is to document as much as we can and to unravel the mystery as far as possible, so as to bring to light all the information now available, and where possible to make the links and moves between the many protagonists.

This book will attempt the impossible of following a number of parallel paths going forward in a semi-chronological approach on several fronts:

- Boucher calculators
- Boucher calculator makers:
    - Particularly Henri Morin
    - Other French makers such as Secretan,
    - Other Boucher makers, Manloves, Stanley etc.
- Calculigraphe calculators
- Calculigraphe makers:
    - Particularly Henri Chatelain
    - F. Baudet
    - Baudet-Burnat
    - Any other makers – the only possible example known so far is the firm of Queen in the USA
- Boucher and Calculigraphe retailers

By listing what we do know chronologically, I am hoping that it should be possible to see some sort of chronology and to identify the major remaining gaps in the story.

At the start it must be admitted that the title chosen for this booklet is definitely fanciful! The full "story" is only partially unravelled. Even the 'Dramatis Personae' are in some cases still simply names with little background, history or structure to them. If we start by recording what we do know and perhaps even more importantly, what we do not know, we can thus extrapolate to what we are looking for. Let us start at the beginning to set the context.

It is difficult to understand why it took so long for any inventor to take the pocket-watch format (something that had been in existence for several hundred years) and apply a calculator or specifically a circular slide rule to that format. Why it should have happened in France as against any other nation is equally difficult to understand. It could have happened anywhere.

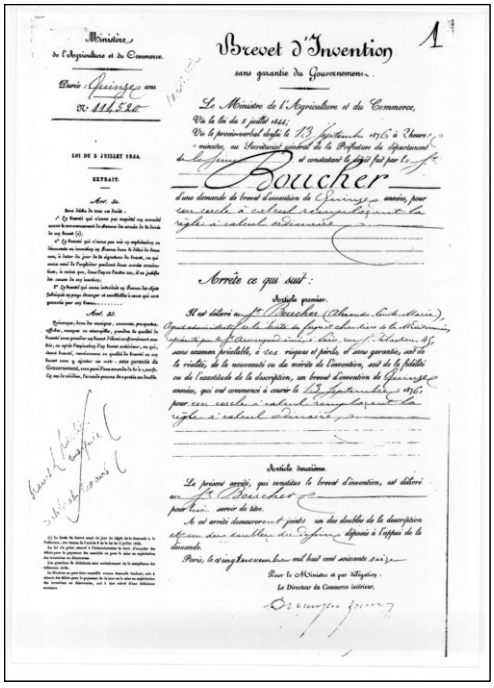
The story must start sometime around the middle of the 1800's with the birthdates of both Alexandre Boucher and Henri Chatelain. We have a possible date for Boucher – born 1841, and we have a possible date for Chatelain – born 1848, see later. So it is sensible to work forward and start with the first date we do know for certain, 1876, 35 years later, and the date of the creation of the pocket-watch slide rule type.

1876/1877

This story starts in 1876 when 35 year old Alexandre Emile Boucher, the inventor and patentee of the first pocket-watch slide rule, delivered his patent for the device to the French Patent Office. From this invention would grow an entirely new genre of slide rule, the pocket-watch slide rule, with later examples made in most countries of the industrial world.

The first patent is in France, number 114,520 dated 13th September 1876, at what looks to be 2 o'clock in the afternoon, on behalf of Alexandre Emile Marie Boucher, Agent administrateur de la Société des forges et chantiers de la Mediterrané …in Paris … for a "cercle à calcul" which would replace the ordinary slide rule (Régle à calcul). This fourteen page document deserves further study! Yet a further document dated 22 September 1877 forms part of the French patent, it is an "addition" – see also later.

Very shortly afterwards in November 1876 a similar patent was presented in the United Kingdom, and awarded six months later in May 1877. The illustrations following are of the first page of the French patent, then Figure 1 from within the patent, and subsequently Figures 1, 2 and 3 from the final page of the French patent. These last show the script "AB" signature and "Cercle à calcul Bvté SGDG", markings that feature on the early models of the calculator.


Brevet d'Invention

sans garantie du Gouvernement

Boucher

Figure 2: Front page of the French patent

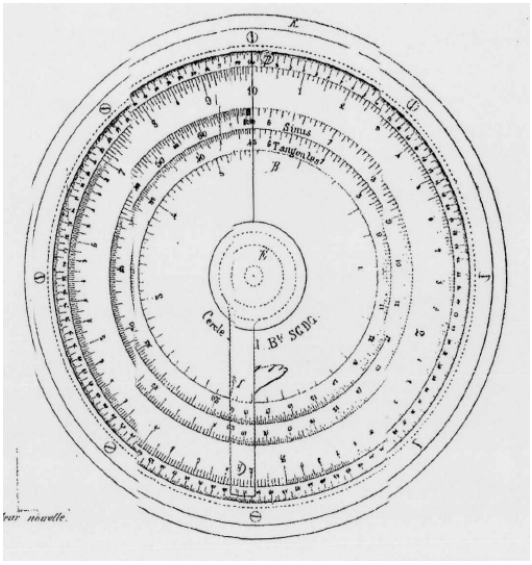


Figure 1: Desk calculator from the French patent

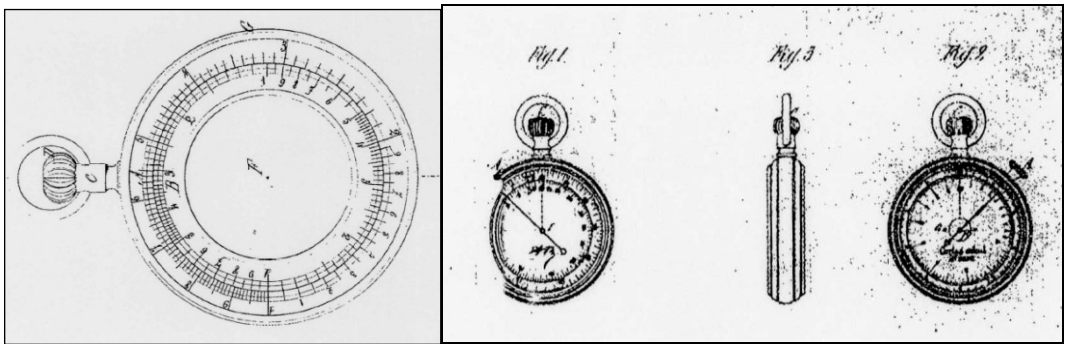
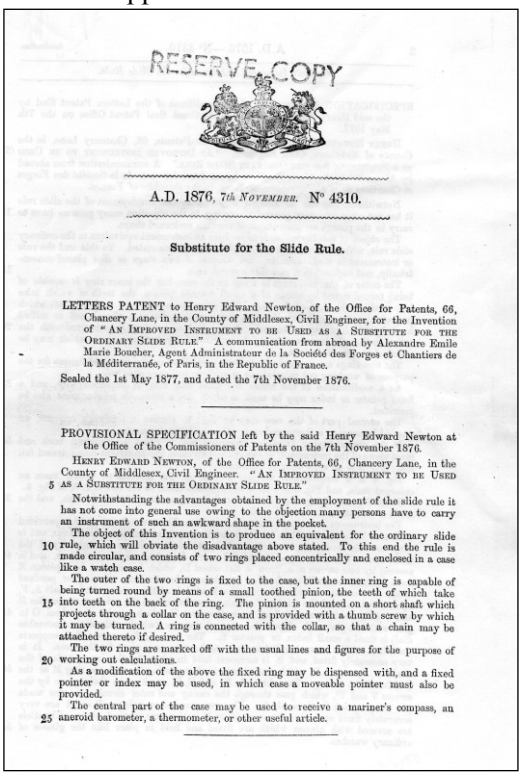


Figure 3: Pocket-watch diagrams from the French patent

Figure 1 within the patent (left in Figure 3 previous page) is found on page 5 of the patent and is dated 13 Sept 1876 in line with the previous pages. It shows two single cycle logarithmic scales within a pocket-watch case, the outer one of which is fixed, and the inner one rotates under control of the single crown. This is unlike any known Boucher calculator.

Page 6 of the French patent is a "Certificat d'addition a un Brevet d'Invention" – an addition – to the patent of 13 September 1876, this is dated 22 September 1877 at 1.30 p.m. It is this addition a year later that describes the two-sided Boucher calculator with the one fixed and one moving scales that we know and which are controlled via the crown and the secondary side-winder for the pointers. These are illustrated shown on the right in my Fig 3 (previous page) carried on page 14 of the patent, together with the drawings of the desk version shown in my Fig 2.

The English patent, number 4310, dated 7th November 1876; sealed (awarded) 1st May 1877 is somewhat different. It is in the name of Henry Edward Newton as the patent agent for Boucher, who is then listed in the patent with the same description and address in Paris. The patent comprises four type-written pages with two pages of better (and different) diagrams whose origins are nevertheless obviously the same as the French patent. The description is for "An improved instrument to be used as a substitute for the ordinary slide rule". Both patents also include diagrams of a desk model, (a different version shown here in the pictures of the English patent, below) and again as the French diagrams carry the "AB" signature and the "Cercle à calcul Bvté SGDG" appellation for the desk model as well, while the English patent shows a stylised "AB" signature only.



RESERVE COPY

A.D. 1876, 7th NOVEMBER. N° 4310.

Substitute for the Slide Rule.

LETTERS PATENT to Henry Edward Newton, of the Office for Patents, 66, Chancery Lane, in the County of Middlesex, Civil Engineer, for the Invention of "AN IMPROVED INSTRUMENT TO BE USED AS A SUBSTITUTE FOR THE ORDINARY SLIDE RULE." A communication from abroad by Alexandre Emile Marie Boucher, Agent Administrateur de la Société des Forges et Chantiers de la Méditerranée, of Paris, in the Republic of France.

Sealed the 1st May 1877, and dated the 7th November 1876.

PROVISIONAL SPECIFICATION left by the said Henry Edward Newton at the Office of the Commissioners of Patents on the 7th November 1876.

HENRY EDWARD NEWTON, of the Office for Patents, 66, Chancery Lane, in the County of Middlesex, Civil Engineer. "AN IMPROVED INSTRUMENT TO BE USED AS A SUBSTITUTE FOR THE ORDINARY SLIDE RULE."

Notwithstanding the advantages obtained by the employment of the slide rule it has not come into general use owing to the objection many persons have to carry an instrument of such an awkward shape in the pocket.

The object of this Invention is to produce an equivalent for the ordinary slide rule, which will obviate the disadvantage above stated. To this end the rule is made circular, and consists of two rings placed concentrically and enclosed in a case like a watch case.

The outer of the two rings is fixed to the case, but the inner ring is capable of being turned round by means of a small toothed pinion, the teeth of which take into teeth on the back of the ring. The pinion is mounted on a short shaft which projects through a collar on the case, and is provided with a thumb screw by which it may be turned. A ring is connected with the collar, so that a chain may be attached thereto if desired.

The two rings are marked off with the usual lines and figures for the purpose of working out calculations.

As a modification of the above the fixed ring may be dispensed with, and a fixed pointer or index may be used, in which case a moveable pointer must also be provided.

The central part of the case may be used to receive a mariner's compass, an aneroid barometer, a thermometer, or other useful article.

Figure 4: Front page of the English patent

Note that the English patent describes <u>both</u> styles of calculator, but only the later two-sided version is illustrated, together with a somewhat different desk version shown in my Fig 6. This is a surprise as it makes the English patent description the first complete Boucher design, and not the French one.

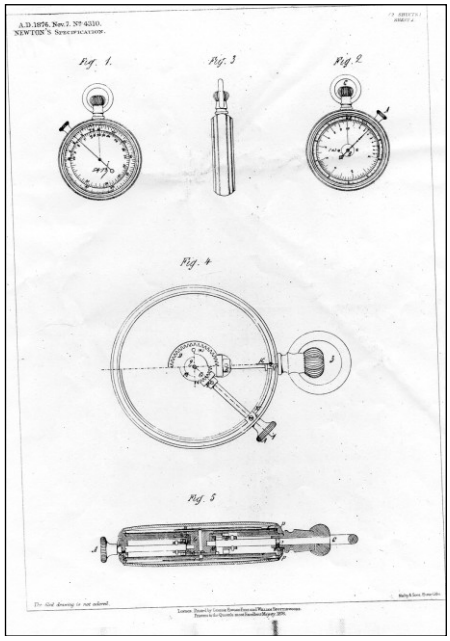


Figure 5: Diagrams of pocket-watch implementations

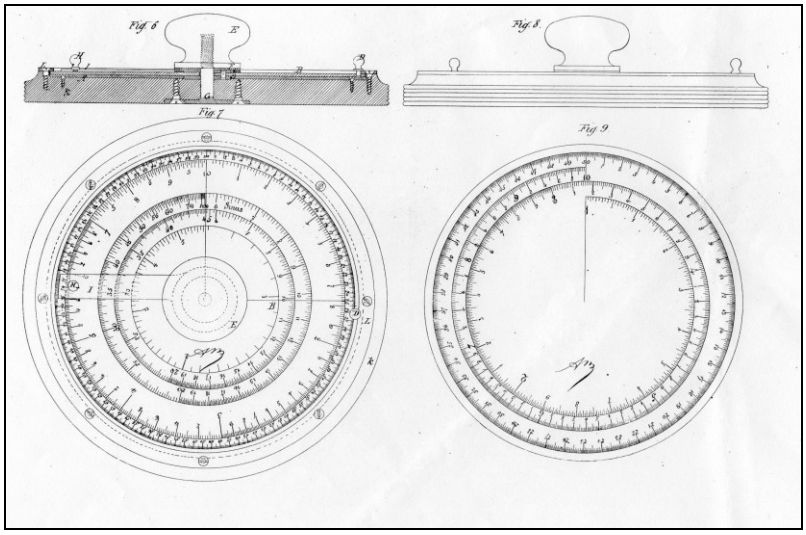


Figure 6: Illustrations of the desk device from the English patent

The Calculators – Boucher
Very Early Boucher Calculators

It is not known who made these earliest Boucher calculators. These are signed "A. BOUCHER. 5 rue du Canal. HÂVRE.", and we do know there are at least two variants, as well as a desk version; all are signed "AB" and carry this rue du Canal, Le Havre address. An example of the earliest version (its collection of scales is the nearest to those shown in the patent illustrations) is in the collection of the Museum of the History of Science in Oxford, and is illustrated below:

Figure 7: Very early Boucher Calculator from the MHS Oxford

Inventory no. 54348 – Old Label Text[2]
BOUCHER'S CIRCULAR LOGARITHMIC CALCULATOR post 1876.

The inventory label says:

> Inscribed with the script initials "A. B." on one side and "Cercle à Calcul / Bté S.G.D.G." and "A. BOUCHER. 5 rue du Canal. HÂVRE." on the other. The instrument has two faces, one for numbers, and the other (spiral) for sines and tangents. The main crown turns the logarithmic scale and the smaller key the large rather elegant pierced pointers on each face. Using the two pointers (one fixed) on the face shown, any interval on

[2] www.mhs.ox.ac.uk

the scales (the outer being uniform, the inner logarithmic) may be recorded, and by the subsequent movement of the scales added to any other part of the scales.

Figure 8: "Very early" Version 1 Boucher calculator

A second example (above) of this "very early model" (Version 1) is owned by a French slide rule collector. I am indebted to him for his permission to publish these pictures, which show a device that is identical in layout, but appears to have engraved metal scales compared to the possibly white card scales of the MHS example. Both examples have the very beautifully perforated ends to the pointers as shown in the patents.

It would seem entirely reasonable that these "very early" examples were produced by whichever unknown instrument maker originally made them for Boucher, for at least the first two years after the patent award, until at least 1878 and possibly later. The winder angle is 40º.

Another example of very early device, featured on eBay during December 2020. This device looks to be a more worn / dirtier version of the one above. They are surprisingly common!

Figure 8a: Another "Very early" Version 1 Boucher calculator

Two examples of a Boucher "desk model" are known. One of them is also illustrated at this point as the signature, address and other markings on the device are the same as those of a "very early" Version 1 pocket-watch device. Note: the pointers are different to those illustrated in the patent.

Figure 9: Early Desk version of Boucher calculator

Courtesy of the Conrad Schure collection

The Boucher desk model is a quite magnificent device, 5″ (127mm) in diameter in a mahogany and brass frame which can be removed from the attractive turned mahogany stand which makes it sit some 7″ (180mm) above the desk. It can be used when it is off the stand, effectively as a very large single sided pocket-watch. It is not the same as illustrated in the patent, where a double sided device is described and drawn.

This single sided desk version has scales which are slightly different to the pocket-watch example. From the innermost to the outermost scale, the first two are trig scales, the second relating to a number of gauge marks applying to metals which are placed around the periphery of the face. The three calculating scales mirror those of the pocket watch design. The two crowns or knobs are on the bottom half of the calculator; the one at 'six o-clock' rotates the entire face, and the second smaller crown rotates the movable cursor, which is very much in line with a number of later designs. The markings on the scale are as on the earliest pocket watch version: 'Cercle à Calcul / Bté S.G.D.G.' and 'A. Boucher. 5, rue du Canal. Hâvre.' This gives the strong indication that these are both early examples, or at least made within the same time frame, and probably by the same maker as the very early pocket-watch device.

The catalogue of the Musée des Arts et Métiers – CNAM, in Paris has two entries that have been carefully followed up:

10481. Cercle de 0m,04 de diamètre, de *Boucher*, construit par *Morin*, avec instruction (1883.) (Entrée, 1885.)
(Ocagne, p. 109.)

10675. Cercle à calcul, de 0m,12 de diamètre, par *Boucher*, du Havre, donné par *J. Audéoud*, en 1885.

Sadly item 10481 has been missing from the CNAM collection for many years, and might have given us a real clue as to the true appearance of a Morin made Boucher. It would have been interesting to compare it with the later Morin version we know. (See 1880). The 4 cm is an unusual

size as most pocket watch devices are 5 or 6 cm diameter. However, item 10675 was photographed by the Museum and the resulting images (far too expensive to include here, though thumbnails are – see below) show that it is a second example of a desk Boucher. The diameter of $0^{m}.12$ should have given us the clue, and the images show a calculator with what appears to be paper scales rather than the silvered brass scales of the item from the Conrad Schure collection (previous page). All other markings and features appear identical. It is unlikely that the donation date (1885) by J Audéod is also that of its manufacture; this also appears to be an example from the very early years of the design, c1876/7.

Figure 10: Second example of a very early desk model Boucher Calculator

An unusual Manlove Alliott & Fryer Boucher Calculator has been found which is identical to the 'Boucher Type 1 "very early" calculator' in scale layout, but has a 60º winder angle similar to the Type 2 calculators shown later. Either this implies that M.A&F were in existence much earlier than previously known, or else the Version 1 calculator continued to be sold for much longer than was previously thought.

Figure 11: Example of a very early Version 1 Boucher Calculator by Manlove Alliot Fryer& Co
Author's collection

This Calculator also has another different feature; the verso fixed scale is screwed in place (see the right hand picture in Figure 11 where the two screws can be seen perpendicular to the hand). “This is unlike the "Boucher made" very early device whose fixed scale is held in place without the benefit of the usual two screws, but probably only the single screw beneath the crown – see Figure 12 below”.

Figure 12: Recto and verso view of another different ‘very early’ Boucher calculator

The obvious implication is that the Manlove Alliott & Fryer version of the very early Boucher illustrated in Figure 11 has a completely different body shell. The body shown in Figure 12 has nowhere to put the fixing screws on the back which are obvious in the earlier picture, and other than the screw hole under the pendant, usually used for a pointer/index, there is no other obvious way of retaining the fixed scale.

It is also entirely possible that the Manlove Alliott & Fryer example in Figure 11 is in a “later” type of early case unlike that shown in Figure 12 and 12a.

Figure 12a: Internal view of the different very early Boucher calculator

And then, out of the blue, comes yet another unexpected example of a "very early" calculator by MA & F which has a 60° winder angle and no obvious retaining crews on the back, but this time just the Nottigham address (there is no Rouen) for Manlove Alliott Fryer& Co. Seen on eBay during 2017.

Figure13: Nottingham MAF& Co calculator

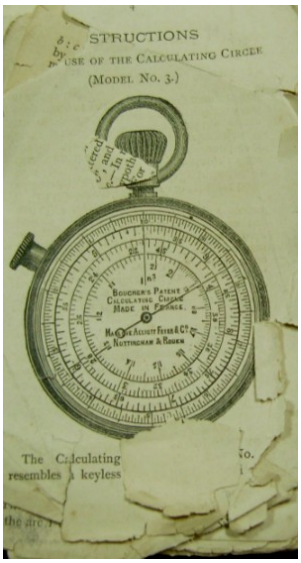
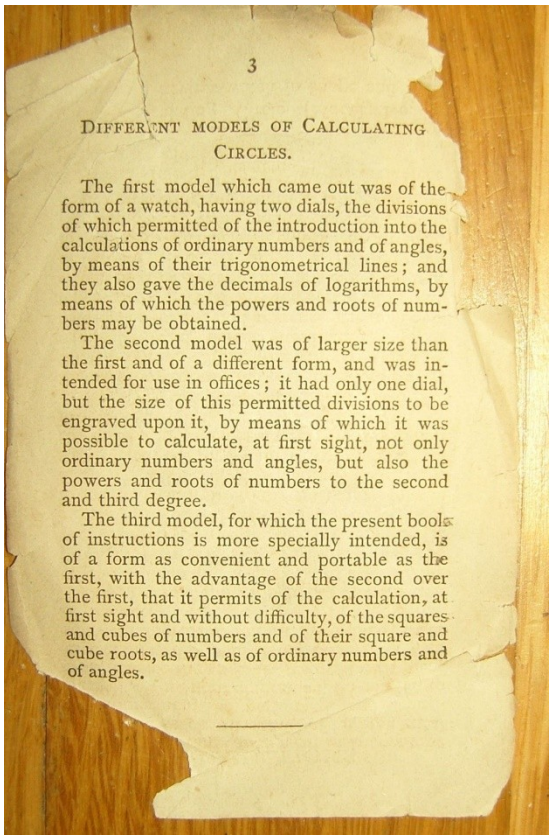


Figure 14a: Front page of instructions

This particular example was further of interest in that the instruction manual (very tattered) that accompanied it, mentions that it is for a "Model No 3" calculator which we had not come across previously. My grateful thanks to the eBay seller who very kindly looked through the instructions and sent me the adjacent page which explains the thinking behind the various types.

From these instructions, I believe that the calculator in Figure 13 and indeed all other calculators with the very simple suite of scales is actually a Model 1. These are the very simple front scale and the Trig scales on the back, while a Model 3 has the more complex three scales as illustrated in Figure 14a.



3

DIFFERENT MODELS OF CALCULATING CIRCLES.

The first model which came out was of the form of a watch, having two dials, the divisions of which permitted of the introduction into the calculations of ordinary numbers and of angles, by means of their trigonometrical lines; and they also gave the decimals of logarithms, by means of which the powers and roots of numbers may be obtained.

The second model was of larger size than the first and of a different form, and was intended for use in offices; it had only one dial, but the size of this permitted divisions to be engraved upon it, by means of which it was possible to calculate, at first sight, not only ordinary numbers and angles, but also the powers and roots of numbers to the second and third degree.

The third model, for which the present book of instructions is more specially intended, is of a form as convenient and portable as the first, with the advantage of the second over the first, that it permits of the calculation, at first sight and without difficulty, of the squares and cubes of numbers and of their square and cube roots, as well as of ordinary numbers and of angles.

Figure 14b: Page from within the instructions

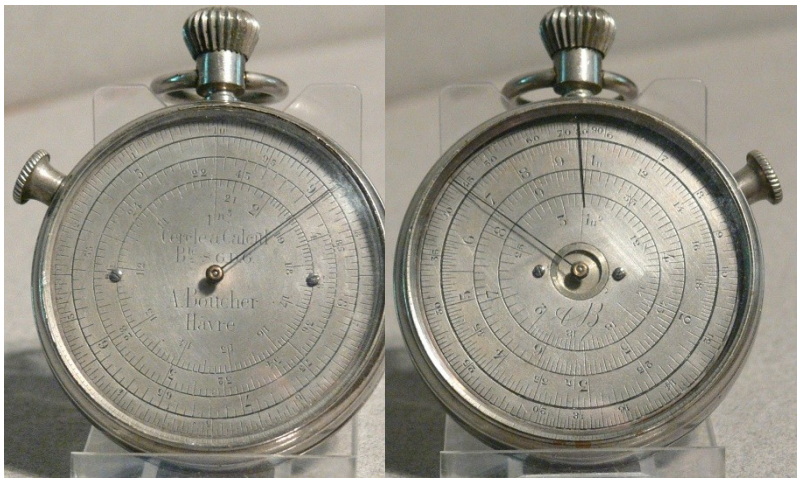
Early Boucher Calculators

Figure 15: Early (Version 2) Boucher Calculator

This “next” version 2 of the Boucher calculator, adjudged as “next” only because it still carries a “Havre” address, is shown above. This version has a more sophisticated suite of scales (Type3) which is more akin to those carried by the Calculigraphe later, but it also still has the “AB” signature. Again we are unable to be definitive as to who the maker was, but the style of the case, the different winder angle and the fonts used are different to the earliest ones and for those reasons more than likely to have come from another maker. Note that it is possible that these are all ‘Type 3’ calculators; however we have not seen a similar suite of scales to the ‘Type 1’ in this “early” format.

Figure 15a: Early (Version 2) Boucher Calculator but with very early pierced hands

The calculator in Figure 15a is unusual in having the "next" scale set, but with the very early delightfully pierced hands, instead of the circular end hands. This “next” type of calculator, with the more usual un-pierced pointers is surprising common and has been seen quite regularly on eBay



Courtesy of the Conrad Schure collection

Figure 16: A second example of an early (Version 2) Boucher calculator

A less care-worn example of the "early" Version 2 Boucher is shown in Figure 16. It would also appear to have come from the same maker as the earlier illustration (Figure 15); it has the cylindrical barrel to the pendant, and the dished "axle" as well as the same shape and knurling to the side winders. There are also two assembly screws on the fixed face, which are not part of the Version 1 (very early) devices. The winder angle is 60° compared to the 40° of most of the Version 1 devices.

These examples are typical of what is a Boucher's calculator. From these it can be seen why the name Boucher has become synonymous with a particular type and style of pocket-watch slide rule with two winders also, incorrectly, with some Calculigraphe types.

These examples, possibly by two different makers, have been placed here in our chronological tale for no better reason than we do not know why they were made (i.e. why was a second version thought appropriate – unless they are a Type 3) or by whom, and because they all carry the "Havre" address, but without a street name and number. As these are next of the earliest implementations of the Boucher calculator it must be assumed that these are the devices that supposedly required "improving". We do not know why. All the known examples signed "AB" and with either form of "Havre" address are delightful devices which work extremely smoothly and efficiently with no obvious frailties.

It is pleasing to be able to show two examples of each of the earliest types. I feel that to do so must show that they were originally made in some reasonable quantities. As some have survived for approaching 150 years, still in excellent condition, it makes it much more difficult to understand why an "improved" version had to be made by Henri Chatelain.

Subsequently there have been several other examples of both types sold via eBay and other on-line auction houses. They are rare, but not exceedingly so.

Note - I have had some difficulty finding suitable words to describe chronological types and scale sets, so we now have:

- Version 1, "Very early" and Version 2, "Early" calculators with
- Model 1 , very simple single pair of scales, and Model 3, more sophisticated 3- scale calculators.

Alexandre Emile Boucher,

I have chosen to put what little we know of Alexandre Emile Marie Boucher here as 1976/7 is the earliest date we have for a known event relating to him, his French patent.

Very little is known of Boucher. However, we have been able to give him a probable birthdate and a date of dying, and some other dates of notable occasions. We still know very little about his family, either earlier or later.

He was born Nantes on the 17th May 1841, and
He died on the 4th February 1918 in Lorient,

The 1876 patent describes him as 'Agent administrateur de la Société des Forges et Chantiers de la Mediterrané …' Office director of the Company of the Blacksmiths and Shipyard of the Mediterranean … in Paris, or at least with offices in Paris. He appears to have worked for them between 1872 and 1880 in Le Hâvre. The earliest calculators have him living in 5 rue du Canal, Hâvre, which is contemporaneous with the dates we have.

From 1881 to 1896 he was a Sous Director for a Société Anonyme in St Petersburg, Russia. On the 4th September 1897 he was awarded the Legion d'Honeur, while still in Russia, apparently for his work there.

A more recently discovered American patent, US 538,765 filed in 1894 and awarded 7 May 1895 for a "Steam-moved stop and reducing valve" (this is 18 years after the calculator patent) has him still as resident in Hâvre, where the original calculators show him resident. This was filed during his time in Russia, which might make it suspect.

Also found is French patent 300,281, of 1900, to A. Boucher of Bordeaux, for ticketing on Railway and Tramways and amended two years later; and a Swiss patent 37,646 of 1907 in the name of A. Boucher of Prilly in the Vaud, Switzerland for clarification of liquids. While they both carry the name A. Boucher, in all probability they are not likely to refer to the same man who invented the pocket-watch slide rule. While it is possible that this is still the Boucher we know, it has yet to be proved.

1878

According to Cajori (see below) the Calculigraphe, an improved Boucher calculator, had its genesis in 1878 and was made by Chatelain in Paris – and others. This is remarkably soon after the initial Boucher patent, and while Boucher was still living in Le Havre. It was apparently developed as a result of the Boucher device *"failing to find favour with the buying public"* – or so states an article in *La Science*, 1894.

However, in direct contrast, an article in *La Nature*, 6^{e} année, 8 juin Paris, 1878, is particularly interesting in a number of other ways. Firstly, the illustrations it contains confirm that the "very early" design of the Boucher calculator is indeed the one with the simple scale layout, and thus this was in all likelihood available for at least the first two years after the patent. As a matter of detail it also shows that the delightful pierced ends to the pointers were a feature as both the illustrations in the patent as well as those in the article show. Secondly, in the same year as Henri Chatelain is supposed to have started his business manufacturing Calculigraphe calculators as an "improved" design of Boucher as stated in *La Science* 1894, we have the *La Nature* article which gives absolutely no indication that the Boucher calculator was anything but a highly regarded success and was destined to continue as such.

Cajori[3] notes in his list of slide rule inventions, against No 77:

> Boucher Calculator. [Pickworth, Charles N., *The Slide Rule; A Practical Manual*, 10th ed. Manchester, London, New York, 1906, p.93. Manufactured by W.F. Stanley & Co., Holborn, London. It is a circular side rule with two dials. Is made by H. Chatelain in Paris in improved form; by Messrs. Manlove Alliott, Fryer and Co of Nottingham; by J.F. Steward, Strand, London; also by Keuffel & Esser Co in New York. See also *La Nature*, 6^{e} année, 8 juin Paris, 1878, pp. 31 32. See Fig. 12.]

This entry in Cajori gives the simultaneous start to a number of items of misleading information, which also mainly point us in the wrong direction as well! So:

- Boucher made, or had made, his own calculators presumably from the original 1876 patent date.
- Chatelain made an improved Boucher which he called a Calculigraphe. From exactly when and why, is not accurately known.
- Did Manlove, Alliott & Fryer make or only sell a version of Boucher Calculator? From when? Why? They were obviously "early users"!
- Stanley may have sold a version of Boucher or Calculigraphe, it is not known which, before starting to make their own vastly improved versions of Boucher from about 1890.[4]
- No example of Boucher or Calculigraphe marked as made by or sold by J.F. Steward is known, despite the Pickworth statement.
- K&E sold a Calculigraphe in the USA, from 1895 to 1899. It is unlikely they made them[5].
- *La Nature* 1878 is an interesting and very relevant article, as is *La Science Illustrée* 1894. They are shown in full in the Appendices.

- We have only recently discovered further details and dates relating to Henri Chatelain of Paris.
- We now also now know of Fritz-Gustave Chatelain of Neuchâtel in Switzerland.

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[3] Florian Cajori – "History of the Logarithmic Slide Rule" Astragal reprint 1994, originally published in 1910; p86, Fig 12 is the K&E marked "Boucher Calculator" (Calculigraphe).

[4] W.F. Stanley – "Surveying and Levelling Instruments" 1890 mentions that Boucher's are "… now made in London of sound work and accurate centring."

[5] Mr Gerd Keuffel, grandson of the founder, in the USA during IM 2011 told me that his ancestors bought their Calculigraphes from France.

- We know that there are virtually identical FC and HC Calculigraphes but we do not know why. They are the "standard" Calculigraphe and one of the main threads of this booklet.
- There is also an AF Calculigraphe. This is not covered in this booklet as it is so very different in format and quality to the HC and FC standard types.
- There are other new Calculigraphe variants by HC and FC and the French maker H. Morin of Paris.

An initial study of some three dozen examples of standard Calculigraphes has shown thirteen different sets of variants and markings. This has since been extended to over one hundred examples studied, and we have subsequently discovered a fourteenth and fifteenth type and several variants. It is hoped this may yet make it possible to identify the age and the maker, if there are indeed different makers. The 'fat' and 'thin' differentiation identifies the two major calculator variants known. The variants have been arranged into general 'families' with an identifying Type No, i.e. Calculigraphe, Calculigraphe HC, Calculigraphe FC and so on, and are dealt with later in this book.

A number of interesting points can be noted although whether they are significant remains to be seen. For example, we have yet to see a 'thin' FC Calculigraphe, and most detail marking variants are common in sets between 'fat' and 'thin' examples.

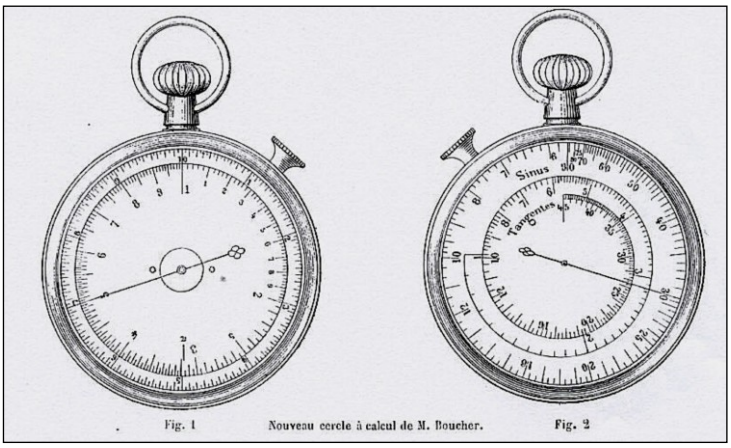

Figure 17 : Illustrations taken from the article in La Nature 1878

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Figure 18: D'Ocagne Fig 38

The *La Nature* 1878 article is also quoted by d'Ocagne [8] (1st edition, 1894, 2nd edition 1903) as his source for the short description of the "The arithmetic dial of Boucher [which] has the appearance of a watch with a circular logarithmic scale …." Most confusingly he then illustrates the article with a single dial simple scale Calculigraphe (of which no examples are known) as shown in the La Science article of 1894, which is marked "Calculigraphe" but this time without any Chatelain markings (see left). The more usual two-dial devices are mentioned in a footnote to the article. It is a shame that even d'Ocagne does not differentiate accurately between the Boucher calculator and the Calculigraphe.

Henri Chatelain

What bibliographical knowledge we have of Henri Chatelain is placed here as 1878 is the earliest date we have relating to him, supposedly the date of the first Calculigraphe.

The creator of the Calculigraphe was Henri Chatelain, an instrument maker of Paris, France in the late 19th and early 20th centuries. A possible candidate was born on 2nd July 1848 and died on the 1st June 1921 in Tramelan-Dessus, Berne, Switzerland. We know from Cajori (1910) that Henri Chatelain was the creator and also definitely from the *Science Illustrée* article of 1894. From a catalogue also dated 1894 in the BnF, Paris, we now know that he had workshops and a shop in the rue de Belzunce in Paris, and also a workshop of some sort in Neuchâtel (formerly spelled Neufchâtel) in Switzerland. Why is not known and his working dates in Paris are possibly only incompletely known. In Henri Chatelain terms we only have the one date (1894) for the Swiss address. A reverse relationship is described later. It would seem that he designed or created the Calculigraphe only a short time after Boucher was awarded his patent, though what that creation date actually is remains uncertain, and other dates have been quoted elsewhere. There is little extra information relating to Chatelain. What little new information we have gleaned actually does not clarify things. We will come to this shortly. The Calculigraphe is said to be an improved Boucher Calculator, though exactly what the improvements are, or why, is not known and never described.

The article in *La Nature* 1878 was written two years after Boucher was awarded his patent. The article very positively reviews a *'Nouveau Cercle a Calcul'* and is illustrated with diagrams of what is definitely identifiable as an early Boucher calculator, with second winder, not a clutch button, but possibly tellingly, is not signed AB (see previous page).

The name "Chatelain" is in fact surprisingly common in France and elsewhere. There have been many instrument makers of that name, particularly clock and watch makers in Switzerland, a preacher in England, as well as a very well-known cartographer in Paris, and likewise a pharmacist in Paris. Thus any genealogical search is at best very difficult. There have also been any number of random mentions of the name, some are included here as they are undated and thus have no more specific position within this chronological story. These are shown below as a hopeful catalyst that may produce other data.

In amongst a few possible relevant genealogical items of information we have included François Charles Chatelain, a clock/watchmaker in Paris between 1784 – 1804, whose age from the dates shown would imply that he may be the grand-father of Henri – however this is completely unconfirmed. We also have a François Auguste Chatelain born 15 July 1803 in Brenet Switzerland, died 15 Jan 1884 in Tramelan-Dessus in Berne who married Uranie Robert (1808 – 1878). They had eight children; the 7th was Henri Chatelain (1848 – 1921). This Henri married Uline Aline Chatelain (1855 – 1903) and they also had seven children. The 5th of these children was also Henri Robert Chatelain, but whether this was another instrument maker is not known. From an 1886 reference we know his unnamed father was also an instrument maker. These dates for Henri (Snr.) make some sense as the H. Chatelain Company was taken over by F. Baudet who retained the Chatelain name in 1921. See later.

Francois Charles Chatelain (clockmaker/watchmaker; French; Male; 1784 – 1804; active)

Address

Paris

Biography

Watchmaker

Also Known As

Chatelain, Francois Charles

H Chatelain (maker/artist; scientific instrument maker; 1910; active)

Address

Paris

Biography

Maker of slide rule

Also Known As

Chatelain, H

As an example of the commonness of the Chatelain name we have a quote from Samuel Smiles: *"The Huguenots: their Settlements, Churches and Industries in England and Ireland"* which is included here for amusement, and where yet another Henri Chatelain is mentioned. It is extremely unlikely that this is the same man, and indeed whether they were related in any way is also unknown and unlikely.

The Reverend Henri Chatelain, minister of the French church in St. Martin's Lane ;*

* Henri Chatelain was the great-grandson of Simon Chatelain, the famous Protestant manufacturer of gold and silver lace. This lace was a much-prized article. It procured for the steadfast Huguenot the toleration of his religion, in which he was zealous from the fifteenth year of his age to the eighty-fifth, which was his last. He died in ICTo [intestate?], leaving more than eighty descendants, who all paid fines for openly attending his funeral. – Agnew – French Protestant Exiles, 237.

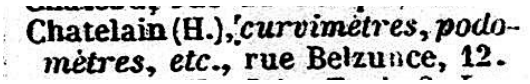
While we have many mentions of the name 'Chatelain', we can do much better by using Trade Directories of that time which give an interesting and unique view of French mathematical instrument makers, particularly slide rule makers, starting from 1885 onwards, and thereafter the most interesting fate of "Maison H. Chatelain" specifically.

We have been unable to find any family relationship with Fritz Gustave Chatelain (the Swiss side of the family?) anywhere. The only dates for any possibly relevant Fritz Chatelain are: born 18th July 1859, died 1st May 1921 with a father Ulyses Chatelain and his wife Adele Jennart which could be contemporaneous to Henri, but with a so far unknown relationship.

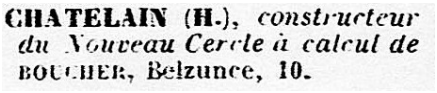
Trade Directories

The well-established French trade directories (known from 1857 as Didot-Bottin and other names even earlier), which are similar to Kelly's and other UK trade directories, are so vital to historians studying the "trades". These show some very interesting statistics for French instrument makers, particularly those active in Paris at the time in which we are interested. The entries for H. Chatelain starting from 1885 are as follows:

- In 1885 there was no Henri Chatelain, instrument maker, to be found in Paris. This is most unexpected as of course we believe that he had started making Calculigraphes in 1878, at least seven years previously, and should probably have been in existence before that. This is also surprising as we have two other catalogues showing that Chatelain was "Maison Fondée en 1884"


Chatelain (H.), *curvimètres, podomètres, etc.*, rue Belzunce, 12.

- The Didot-Bottin of 1887 (left) contains the first reference to H. Chatelain as a maker of Curvimetres and Podometres at Rue de Belzunce, No 12.

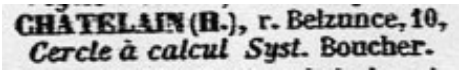

CHATELAIN (H.), *constructeur du Nouveau Cercle à calcul de* BOUCHER, Belzunce, 10.

- By 1892 under a heading of Regles à Calcul we find Chatelain as the constructor of "new" Boucher calculators, at the new neighbouring address, Rue de Belzunce 10.


CHATELAIN (H.), Belzunce, 10, *podomètres, Curvimètres, Vélocimètres. Cercles à calcul.*

- The Didot-Bottin of 1893 contains the modified Chatelain advert under "precision instrument makers", and also mentions Cercles à calcul generically for the first time.

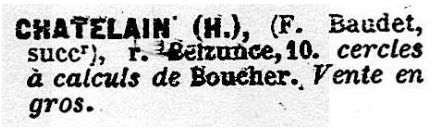
- Note the range of instruments shown as being available from Chatelain. Also that his address continues at Rue Belzunce 10, the same as the 1894 catalogue, and continues at this address in later entries until the business moves in 1930 or thereabouts.


CHATELAIN (H.), r. Belzunce, 10, *Cercle à calcul Syst.* Boucher.

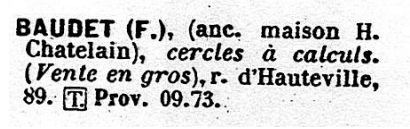
- By 1898 the appellation "slide rule maker" had started to be used, and Chatelain features here with but a single entry, unsurprisingly that of maker of System Boucher devices.

- In 1903 Chatelain has the same entry as 1898 and is now one of six makers listed in this section of the trade catalogue.

- In 1909 Chatelain is still only one of six makers of "Règles et Cercles à Calculs" in Paris – according to the Didot-Bottin entries.


CHATELAIN (H.), (F. Baudet, succr), r. Belzunce, 10. *cercles à calculs de* Boucher. *Vente en gros.*

- In 1922 we find the final reference to Chatelain who has now been succeeded by F. Baudet (of whom we know very little) and he is now only selling to the trade (in quantity – Vente en gros)


BAUDET (F.), (anc. maison H. Chatelain), *cercles à calculs.* (*Vente en gros*), r. d'Hauteville, 89. T Prov. 09.73.

- The Didot-Bottin entry of 1940 for Baudet is shown on the left. This is the final reference to both Chatelain and Baudet, and Chatelain has very definitely been subsumed into Baudet, at the new address: 89 rue d'Hauteville.

In the “Revue de L’exposition Universelle de 1878” carried by the magazine “Le Constructeur” of Paris, there is a reasonably long article by the “Universal Engineer” titled “Le Cercle a Calcul” de m. Boucher, du Havre, the first two and the last three paragraphs are shown below, together with a translation.

French	English
Parmi les instrumentes scientifiques de toute nature que nous avons remarque et examines a l'exposition universelle se trouve le cercle a calcul de M. Boucher. Nous nous faisons un plaisir d'en donner une succinte description. Ce petit instrument a la forme et la dimension d’une montre a remontoir; son mode d’emploi est d'une simplicite qui le met a la porte de tous; il sert ä effectuer toutes les operations d'arithmetique et de trigonometrie avec une grande rapidite et une pröcision generalement süffisante dans les cas orrdinaires de la pratique. ---------- Un cercle a Calcul de 0,12 de diametre est egalement expose; cet Instrument est specialement destine ä etre employe dans les bureaux ; les resultats qu'il donne sont encore plus approches de l'exactitude absolue necessaire dans certains cas; il donne aussi instantement les carres, cubes, racines carrees et racines cubiques. Un cercle d calcul de poche intermediare de 0.08 est en construction et il donnera les memes resultats que celui pour cabinet M. Boucher a obtenu une medaille de bronze ; si le grand cercle pour cabinet eüt ete expose au momeut de l'examen du jury, il est probable que cet instrument aurait eu une recompense plus elevee. (L'Ingenieur universel}.	Among scientific instruments of all kinds that we have noticed and examined in the Exposition Universal is the Calculating Circle of Mr. Boucher. We are happy to give a brief description. This small instrument has the shape and the size of a pocket watch with winder; its method of use is of a simplicity that puts it at the door of all; it serves to perform all arithmetic operations and trigonometry with great rapidity and usually sufficient precision for most practical cases. ---------- A Calculating circle of diameter 0.12 [m] is also exhibited; this instrument is specially designed for use in offices, and the results it gives are even closer to the absolute accuracy required in some cases; it also gives instantly the squares, cubes, square roots and cube roots. An intermediate pocket circle of calculation of 0.08 [m] is under construction and will give the same results as for the desk version. Mr. Boucher won a bronze medal, and if the desk version of the calculating circle firm had been exposed to a moment of the jury’s consideration, it is likely that this instrument would have had a higher reward. (Universal Engineer}.

This article gives us some tantalising new snippets of information:

- The 120 mm desk version was obviously heavily promoted in many exhibitions and appears to have been a popular option.
- The ‘standard’ pocket watch version – though what size is not stated, was available and exhibited.
- They mention an “intermediate sized” 8 cm (>3″) diameter version as “under construction”, an example has yet to be seen.
- Boucher won a Bronze medal – this is the first mention of any award for his calculator and opens up further avenues of exploration. (So far fruitless!)
- It is strange that Boucher’s bronze medal is not mentioned elsewhere at all in the following years.

1879

Fritz-Gustave Chatelain

A UK provisional patent, No 2130 of 28 May 1879, by a Eugene Colin, relating to an invention by Fritz Chatelain of Neuchâtel in Switzerland, was a form of Rosetta Stone which opened a virtual cornucopia of new threads to follow, and has provided us with a probable explanation for FC Calculigraphes.

We have so far been unable to find any family link between Henri Chatelain in Paris and Fritz-Gustave in Switzerland. However, the discovery that Henri had a workshop in Neuchâtel in Switzerland (catalogue 1894) and the existence of the instrument maker Fritz would seem an obvious link. Is this perhaps too obvious? I don't think so.

When Fritz Chatelain opened for business is not known since there are no dates given on any of his adverts stating when the firm was founded. The 1879 date for the provisional patent is the earliest patent date found, and the earliest advert for Fritz Chatelain in Neuchâtel in Switzerland is a year later in 1880. However, we have subsequently found that in 1878 Fritz Chatelain and his Curvimeter were mentioned in the general Swiss military newspaper.[6]

The Swiss Chatelain organisation continued to advertise and won awards through to about 1900, and the final Fritz Chatelain patent we have found is dated 1909. According to an announcement in the "Horlogere Suisse" Bulletin in 1900, he ceded some patents to another instrument company, but there are some doubts about which these patents were, and why it was done. A trade mark of the well-known castle with FC initials was first registered in 1881, and again with a slight change in 1896. These might indicate when his business started seriously in Switzerland.


FRITZ CHATELAIN
Sablons 14, Neuchâtel, (Suisse).
OFFICE INDUSTRIEL SUISSE
pour l'obtention des brevets d'invention, le dépôt des marques, modèles et dessins de fabrique en tous pays. (H. 164 N.)
Prix des bureaux étrangers. — Renseignements gratis.

Figure 19: First Advert for Fritz Chatelain 1880

In the same way as with the French Didot-Bottin documents in France, we have been able to trace some of Fritz Chatelain's history via the "Feuille d'Avis de Neufchâtel" – a daily paper which carried adverts as well as local news. Similarly, entries in the Swiss "La Fédération Horlogere Suisse" Bulletins have also produced much of relevant interest, including a description of Maison Fritz Chatelain, fabrique d'instruments de Precision de Neuchâtel in one of their 1896 editions[7]. (See later under 1896).

Some major milestones for Fritz Chatelain in Neuchâtel are described below:

- 1879 – UK Provisional patent application
- 1880 – First advert for Fritz Chatelain as an "Office Industriel Suisse"
- 1881 – First registration of the well-known "Castle" trademark / logo
- 1883 – Around this time he moved from Faubourg de Sablons 14 to Rue d'Hopital 6
- 1885 – Committee member of Neuchâtel Industrial and Commercial Association

[6] Der_Curvimeter, _Allgemeine_schweizerische_Militärzeitung_1878.
[7] *La Fédération Horlogere Suisse* Jeudi 20 Août 1896. Dixième Année. — No 67. page 348.

- 1893 – Chicago World Fair: exhibited pedometers
- 1896 – Awarded silver medal in a Swiss exhibition
- 1897 – Brussels International Exhibition; F.Chatelain is an alternate juror
- 1900 – Chatelain cedes two pedometer patents to another company
- 1909 – Final horological patent

A. Chatelain, R. Chatelain and Cie, and Numa Chatelain are all 'Chatelains' who have advertised at various times in Switzerland after Fritz Chatelain stopped advertising. However what, if any, relationship these may have had with Fritz is completely unknown. Whether they were part of an extended Chatelain family with similar business interests is not known.

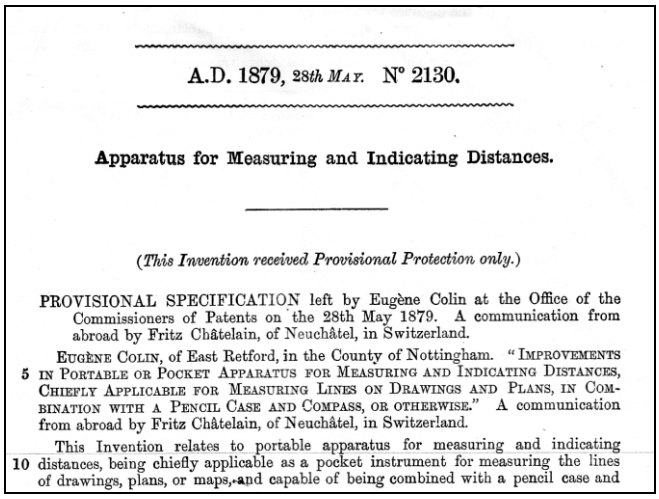
A fascinating web site: "Saicourt vers 1890" [8] describes Fritz Chatelain's home village of Saicourt with a population of some five hundred people. Saicourt is some distance from Neuchâtel where he had his business. From this we gather that Fritz Chatelain had four children, two girls and two boys, Paul who immigrated to America, and Fernand who remained in Switzerland. There were children to these two sons at a late age, but whether they carried on the business is not known. Other persons with the Chatelain name also lived in this village. Again any family relationships have not been established, and neither has any link to Henri in Paris. However their product lines were so very similar as to make it highly probable that they were linked in some way but, most frustratingly, there has never been mention of any Cercles à Calculs being part of Fritz Chatelain's product line in Neuchâtel – other than the existence of devices carrying his logo.

We can speculate that Henri in Paris designed and made the Calculigraphe in its various forms, and they were marked and labelled accordingly; 'FC' for those that would be sold in Switzerland, and 'HC' for those that would be sold in France. That no example of standard Calculigraphe has been found marked 'made in Switzerland' confirms this supposition. That some models were marked 'made in France' or carried similar markings to indicate manufacture in France, is further confirmation. This form of the marking probably indicated that they were made to be sold in English speaking countries such as the UK and the USA.

[8] www.istanbulguide.net/saicourt1890.htm

Patents

A UK patent application, for a Provisional UK patent No. 2130 of 28th May 1879, in the name of Colin E [probably a UK patent agent] on behalf of F. Chatelain in Neuchâtel for a "combined pencil holder, Wealemefna, magnetic compass & seal" is the earliest patent so far discovered. This is a typical Chatelain product, a Wealemefna being a form of small map measurer. It was not awarded. Chatelain F turns out to be an extremely important Swiss watch maker / instrument maker who was a significant patentee of many different instruments as well as horological devices, through to 1909.



A.D. 1879, 28th MAY. N° 2130.

Apparatus for Measuring and Indicating Distances.

(*This Invention received Provisional Protection only.*)

PROVISIONAL SPECIFICATION left by Eugène Colin at the Office of the Commissioners of Patents on the 28th May 1879. A communication from abroad by Fritz Châtelain, of Neuchâtel, in Switzerland.

EUGÈNE COLIN, of East Retford, in the County of Nottingham. "IMPROVEMENTS IN PORTABLE OR POCKET APPARATUS FOR MEASURING AND INDICATING DISTANCES, CHIEFLY APPLICABLE FOR MEASURING LINES ON DRAWINGS AND PLANS, IN COMBINATION WITH A PENCIL CASE AND COMPASS, OR OTHERWISE." A communication from abroad by Fritz Châtelain, of Neuchâtel, in Switzerland.

This Invention relates to portable apparatus for measuring and indicating distances, being chiefly applicable as a pocket instrument for measuring the lines of drawings, plans, or maps, and capable of being combined with a pencil case and

Figure 20: 1879 Fritz Chatelain UK Patent for Wealemefna

It seems sensible to deal with all patents at this point, though no Chatelain patents have been found relating to any form of slide rule, circular or rectilinear.

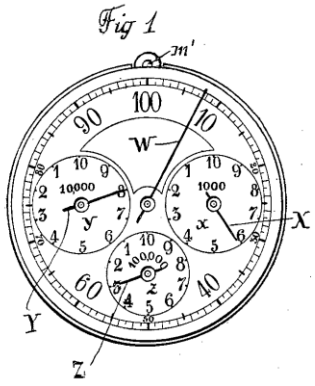


Figure 21: Diagram from Swiss patent 1898

A Swiss patent CH15675A from 10 January 1898 for a Pedometer with four dials, (Figure 1 from the patent is at left) appears to have been the basis for many subsequent designs of pedometer marked both HC and FC which have been seen to date. Another patent CH18455A of 6 February 1899 is for another pedometer. These two are taken as a representative sample of just a few of the patents awarded to Henri Chatelain, and also the many patents awarded to Fritz Chatelain as listed later.

Other H. Chatelain patents in both Switzerland and France from 1898 onwards are not specifically related to this type of instrument, but show that he was patenting up to about 1922, when he may have died (probably) or retired. It is not known which for certain, but is when the business was taken over by F. Baudet in Rue de Belzunce 10, Paris (Chatelain's original address) and where Baudet stayed until at least 1930, when he moved to 89 Rue d'Hauteville, Paris from where they both disappeared from view in about 1942.

Boucher & Chatelain worldwide patents			
Patent No	**Date**	**Patentee**	**Subject**
FR 114,520	13 Sept 1876	A. Boucher	Boucher's calculator
UK 4,310	7 Nov 1876	A. Boucher	Boucher's calculator
UK 2,130	28 May 1879	Fritz Chatelain	Wealemefna
CH 968	31 May 1889	Fritz Chatelain	Pedometer
CH 1,323	27 Aug 1889	Fritz Chatelain	Pedometer
CH 2,955	3 Nov 1890	Fritz Chatelain	Pedometer
CH 3,095	3 Jan 1891	Fritz Chatelain	Cyclometre
CH 4,867/152	2 Sept 1893	Fritz Chatelain	Podometre avec reglage …
CH 5,871	24 Jan 1893	Fritz Chatelain	Cyclometre perfectionne
CH 6,424	20 March 1893	Fritz Chatelain	Stop watch
CH 7,537	30 October 1893	Fritz Chatelain	Remontoir simplex
CH 9,444	28 Nov 1894	Fritz Chatelain	Montre bijou remontoir
US 538,765	7 May 1895	A. Boucher	Steam-moved stop & reducing ..
CH 12,415	4 July 1896	Fritz Chatelain	Purse with watch
CH 15,676	15 July 1898	Henri Chatelain	Pedometer with 4 dials
CH 18,455	6 Feb 1899	Henri Chatelain	Pedometer with 3 dials
CH 19,732	19 June 1899	Fritz Chatelain	Tramway electrics
FR 300,281	11 April 1902	A. Boucher	Tickets for trains
FR 354,144	9 May 1905	Henri Chatelain	Chain for motor drive
CH 47,454	19 June 1909	Fritz Chatelain	Major watch manufacture
FR 545,283	28 December 1921	Clovis George Henri Chatelain #	Bicycle suspension
CH 197,637	25 June 1937	Henri Chatellain-Boilat #	Watch manufacture
CH 247,047	17 April 1945	Henri Chatelain #	Watch oiler
DRGM 100,237		Fritz Chatelain (HC?)	Contemporary with CH 15,676

Table 1: Boucher & Chatelain worldwide patents

#1 These last three are unlikely to be the Henri Chatelain who first made the Calculigraphe

#2. Two Swiss patents, 396 of 27 June 1892, and 4133 of 8 March 1897 have not been found. A 1900 edition of the "La Fédération Horlogere Suisse" Bulletin has F. Chatelain ceding these patents to Victor Bonhôte in June of that year. Whether there is any deeper significance to that date, i.e. the end of or a change in his business, is not known.

We can only assume that Boucher's French and UK patents were drafted such as to allow no other later patents from anyone else on the subject, and hence only pedometer and similar patents have been found.

Chatelain – an alternative view

Having proved to my satisfaction that there were two individuals who shared the same surname, but were possibly not or maybe only distantly related, I then found a German web site which makes the somewhat unusual suggestion that they were either one and the same person, or else an imaginary French half to the genuine Swiss Fritz Gustave Chatelain – I don't believe it! But see: https://watch-wiki.org/index.php?title=Henri_Chatelain

The following, slightly edited to improve the translation (***with my comments***) are taken from that web site. Italics indicates the sections translated.

Calculigraphe, arithmetic clock or circular slide rule is an improved instrument as a substitute for ordinary slide rules. The French Patent of Calculigraphe No. 114520 ***(no – this is Boucher's patent)*** *was issued on November 20, 1876. In the morning sheet of August 1, 1878, No. 176, p ??? already mentioned [is] the "Cercle a Calcul" by A. Boucher, Le Havre.*

*Scales: L, cubic roots (front); S, C, square roots (back) Turn the scale of the back with the knob; in addition, pressing the small button on the side turns on ??? both sides of the hands.(**I think this is a poor description of how a Calculigraphe works)***

Henri Chatelain was possibly from Switzerland, Fritz-Gustave Chatelain was definitely a Swiss. The company Fritz Chatelain was listed in Neuchâtel in 1881 and received the third prize at the National Exhibition in La Chaux-de-Fonds for watches. At the World Fair in Chicago in 1893, the company was also represented. At the National Exhibition in Geneva in 1896, the company received a silver medal, Groupe No.1, Section II.

*The company Henri Chatelain was based in Paris; the company was located on Rue de Belzunce 10. The product range included Podomètre (pedometer or pedometer, travel meter), Calculigraphe (calculator clock with logarithmic disc) by A. Boucher from Le Havre, and Curvimètre (Kurvimeter). According to some sources, the company was founded around 1876 or 1878, and the Calculigraphe was then produced. Henri Chatelain was then active until 1898. (**Not sure where this date comes from**) Subsequently, the company of Fritz Gustave Chatelain (1850 - 1914?) The manufacturer of the manufacturer until about 1930. (**??**) But a catalog of the company Henri Chatelain mentioned as the founding year 1884. Of Henri Chatelain there is little to be found in the archives. Possible the company name was fictional, and designed by Fritz-Gustave Chatelain. In 1878 the Curvimeter of Fritz Chatelain was mentioned in the general Swiss military newspaper. On the 14th of March 1881 the company Fritz Chatelain was registered in Neuchâtel. Perhaps the name Henri Chatelain was chosen as a tribute to the French cartographer Henri Chatelain (1684-1743). (**Fanciful – where is the evidence?)***

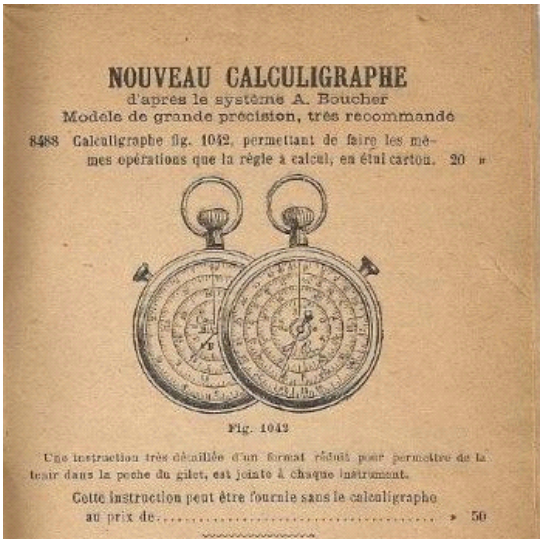
The only slightly recognizable argument in favour of this very alternative view, is that truly very little has been found about Henri Chatelain, the man, though there is more – albeit not very consistent – information about the company. There are a few patents for Henri, far more for Fritz. I don't know whether a patent can be taken out for a Nom-de-Plume or whether there must be a real person who can be awarded a patent.

1880

The instrument making firm of Henri Morin was founded in Paris in 1880 as the "Ateliers H. Morin", four years after Boucher's patent, and hence it is reasonable to assume it was not Morin who made the very earliest (Version 1) Boucher calculators. From its earliest years Morin advertised the availability of Boucher Calculators in its catalogues. For this one year only, the Boucher illustrated in the catalogue is different to those which were subsequently illustrated until at least 1936 – and possibly later.

Picture from early catalogue (1880,81,2,3) would be great!
Morin addresses:
1880 – 1907: 3 Rue Boursalt,Paris
1908 – 1054: 11 Rue Dulong, ParisXVII

The earliest Morin made Boucher calculator is described under the heading "Cercle à calcul Boucher" and is illustrated with a device that carries the now well-known script "AB" signature on the fixed scale, while the movable scale carries the appellation "Cercle à calcul Bvté SGDG" being the normal statement of patent and function.



NOUVEAU CALCULIGRAPHE

d'après le système A. Boucher

Modèle de grande précision, très recommandé

8488 Calculigraphe fig. 1042, permettant de faire les mêmes opérations que la règle à calcul, en étui carton. 20 »

Fig. 1042

Une instruction très détaillée d'un format réduit pour permettre de la tenir dans la poche du gilet, est jointe à chaque instrument.

Cette instruction peut être fournie sans le calculigraphe au prix de..... » 50

Figure 22: Part page from the Morin 1910 catalogue

Later Morin catalogues (such as the example above from 1910) start to call their Boucher offering a "Nouveau Calculigraphe". All examples of Morin catalogue carry part number 8488 and are illustrated with Fig 1042 and show a device that with very little imagination is that which has been called an "early" rather than the "very early" Boucher calculator, i.e. with the "Cercle à Calcul / Bté S.G.D.G." on the reverse and an "AB" signature. But what other appellation (if any) cannot be ascertained from the poor pictures used in the catalogues. We now need an identified example of a Morin made Boucher calculator to be definitive. Sadly the example in the CNUM in Paris (item 10481; Cercle de 0^{m},04 de diamètre, de *Boucher*, construit par *Morin*, avec instruction (1883) Entre , 1885), - appears to have been "lost" since about 1910. There is also a reference to "Ocagne p109", which we have covered on Pg 23 under the 1878 *La Nature* article. Sadly the instructions also appear to have been lost.

The dimension quoted for the Morin device (4cm) is only appropriate for any Boucher device with some imagination. This, at approximately 1½″ is considerably smaller in diameter than any known examples of either Boucher or Calculigraphe, and neither does it match any catalogue item.

A table of the basic contents of Morin catalogues (courtesy of much study by Sigismond Kmiecik at the BnF) is appended below and shows the evolution of the Boucher calculator's description, their prices, and their main features over the surprisingly long period of time (60 years) from 1880 to 1940:

FC advert from the "Feuille d'Avis de Neuchâtel" dated 1st May 1880, repeated below, is the earliest reference to Fritz Chatelain we have found, other than the earlier dated UK provisional patent.


FRITZ CHATELAIN
Sablons 14, Neuchâtel, (Suisse).
OFFICE INDUSTRIEL SUISSE
pour l'obtention des brevets d'invention, le dépôt des marques, modèles et dessins de fabrique en tous pays. (H. 164 N.)
Prix des bureaux étrangers. — Renseignements gratis.

Figure 23: Fritz Chatelain's 1880 advert:

***Morin catalogues and Boucher calculator descriptions*:**							
Edition	**Item Title**	**Face 1 (Fixed)**		**Face II (Movable)**		**Price etc**	**Notes**
		Text on dial	***Scales***	***Text on dial***	***Scales***		
1880	Cercle à calcul Boucher	AB (Script font)	Outer scale Sin (circular)	Cercle à calcul Bvte SGDG	Index on top rim Two circular number scales		Face II: described as cadran arithmétique Face I: described as cadran trigonométrique Winder left side face I
1881	Cercle à calcul Boucher	Same as 1880	4 Circular scales: 3 inner circles cubes, Outer scale mantissa	Same as 1880& initials AB (boldface)	Index on top rim 4 circular scales From outer rim to centre: Sin, Number, Squares (2)		Winder right side face I
1882	Cercle à calcul Boucher	Same as 1880	Same as 1881	Same as 1881	Same as 1881		Same as 1881
1883	Cercle à calcul Boucher	Same as 1880	Same as 1881	Same as 1881	Same as 1881		Same as 1881
1910/11	Nouveau Calculigraphe d'apres la Systeme A Boucher	Same as 1880	Same as 1881	Same as 1881	Same as 1881	20 FFr.	See Figure p31
1914	Systeme Boucher						See Figure p29
1925/6	Calculigraphe Boucher	Same as 1880	Same as 1881	Same as 1881	Same as 1881	45 FFr	See Figure p30
C1927?	Calculigraphe Boucher	Same as 1880	Same as 1881	Same as 1881	Same as 1881	69.30 FFr.	Same as 1881 See Figure p30
1930	Calculigraphe Boucher	Same as 1880	Same as 1881	Same as 1881	Same as 1881	89 FFr.	Same as 1881 See Figure p30
1931	Calculigraphe Boucher	Same as 1880	Same as 1881	Same as 1881	Same as 1881	No price.	Same as 1881 See Figure p30
1936	Calculigraphe Boucher	Same as 1880	Same as 1881	Same as 1881	Same as 1881	No price.	Same as 1881 See Figure p30
1940	Calculigraphe Boucher						

Table 2: Morin catalogues and Boucher calculator descriptions

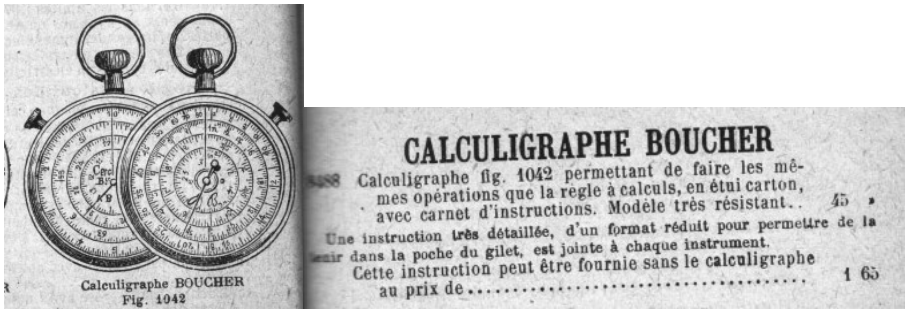


Figure 24: Morin 1925/26 catalogue entry

Figure 25: Henri Morin manufactured Boucher Calculator

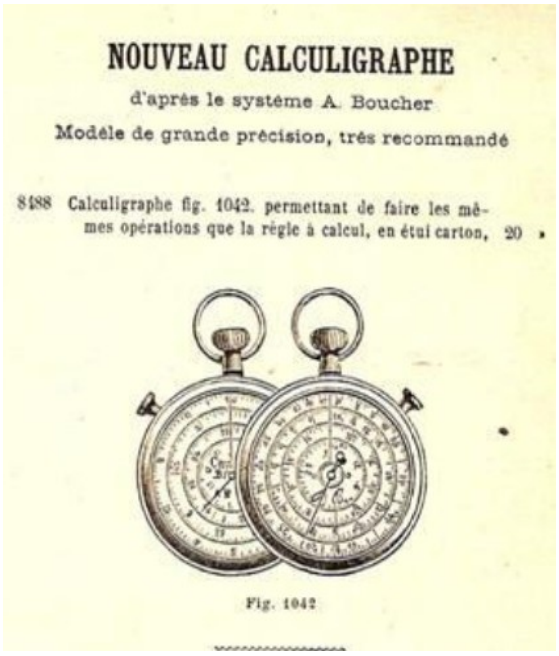


Figure 26: 1911 Morin Catalogue

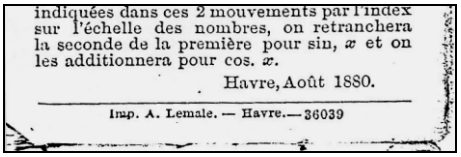
Note that the Morin manufactured Boucher calculator illustrated in Fig 25 was sold on eBay during 2017. It carries an address: 3 Rue Boursalt, Paris, which is where we know they were based from 1880 to about 1907. This is indeed a "later" design, not the very earliest Boucher, and the scales are not similar to those shown in the diagrams within the catalogues, apart from the script 'AB' signature.

Later Morin were based at 11 Rue Dulong in Paris XVII, from 1908 to about 1954, and went on to buy Secretan and other instrument companies.

Another very early MAF has been seen on eBay during 2017. This does not carry the Rouen appellation on the MAF address, being shown as Nottingham only. Does this make it earlier or later than the previous example which says "Nottingham and Rouen"?

Handbooks

Perhaps coincidentally 1880 is also the date carried in the earliest dated (so far) discovered Calculigraphe instruction booklet. This is written in French. A portion of the final page with an address of "Havre" and the date August 1880 is shown below. This has been catalogued by me (see later) as a "Handbook Type 1".


indiquées dans ces 2 mouvements par l'index sur l'échelle des nombres, on retranchera la seconde de la première pour sin, x et on les additionnera pour cos. x.

Havre, Août 1880.

Imp. A. Lemale. — Havre.— 36039

Figure 27: Imprint / date from early instructions

The publisher: 'Impression A. Lemale' appears to have been well established in the French port of L'Havre from at least 1860 onwards, so is probably contemporaneous with Boucher's invention as well as early Calculigraphes from Henri Chatelain's Paris factory.

This cover and first three pages of the handbook are shown on the following page. It is unusual in that it lists three different models of Calculigraphe (the same as an apparently early Boucher handbook, see p. 18 and p. 38 following) and appears to be the only edition of handbook to do so. All other subsequent editions only describe what is listed as the "Type 3" in this particular edition (bottom of the final page illustrated).

CERCLE A CALCUL

Système Boucher

Perfectionnement apporté

NOTA BENE. — Tournez la couronne pour faire pivoter le cadran mobile autour de son axe.

Tournez la couronne et pressez en même temps sur le bouton placé à côté du pendant pour faire mouvoir les aiguilles.

Le Cercle à calcul est un instrument au moyen duquel on résout toutes les opérations d'arithmétique et par suite toutes les formules numériques à quelques sciences qu'elles appartiennent, avec une facilité et une rapidité extraordinaire, en même temps qu'avec une approximation suffisante dans les cas ordinaires de la pratique.

La base du Cercle à calcul est cette propriété des logarithmes que : la somme des logarithmes de 2 nombres est égale au logarithme de leur produit et inversement que : si du logarithme d'un nombre on retranche le logarithme d'un autre nombre, on obtient le logarithme du quotient de la division du premier par le second.

Mais il n'est pas indispensable de connaître la théorie des logarithmes pour se servir du cercle à calcul qui pourra être employé utilement par toute personne assez intelligente pour lire sur une circonférence les nombres qu'on y a représentés par des divisions dont quelques-unes sont chiffrées, de même qu'elle lit sur un mètre divisé en millimètres le nombre de ces millimètres mesurant la longueur d'une ligne donnée quelconque.

Nota. — Dans ce qui suit la circonférence est désignée sous le nom de cercle.

DIFFÉRENTS MODÈLES DES CERCLES

Le premier modèle paru, a la forme d'une montre portant 2 cadrans dont les divisions permettent d'introduire dans les calculs les nombres ordinaires et les angles au moyen de leurs lignes trigonométriques, elles donnent également les décimales des logarithmes au moyen desquelles on obtient les puissances et les racines des nombres à un degré quelconque.

Le deuxième modèle paru est d'un volume plus grand que le premier, d'une forme différente, il est destiné à servir dans les bureaux. Il ne porte qu'un cadran, mais la dimension de celui-ci a permis d'y tracer des divisions au moyen desquelles on peut introduire dans les calculs, à première lecture non seulement les nombres ordinaires et les angles, mais aussi les puissances et les racines des nombres au 2e et au 3e degrès.

Le troisième modèle, pour lequel la présente instruction est plus spécialement rédigée, a la forme si commode et si portative du premier avec l'avantage du deuxième sur le premier de permettre d'introduire dans les calculs, à première lecture et sans tâtonnement, en dehors des nombres ordinaires et des angles, les carrés et les cubes des nombres, ainsi que leurs racines carrées et leurs racines cubiques.

INSTRUCTION

Pour l'emploi du Cercle à Calcul, modèle n° 3

Description du Cercle

Le Cercle à Calcul, modèle n° 3 a la forme d'une montre à remontoir de 5 centimètres de diamètre.

Il porte 2 cadrans recouverts par des glaces, l'un de ces cadrans est mobile et l'autre est fixe.

On fait pivoter le cadran mobile autour

Figure 28: Cover and first three pages of 1880 dated Calculigraphe instructions

The very early Manlove Alliott and Fryer example of Boucher calculator shown earlier, (Fig 13) with the Nottingham only address, came with a set of very tattered instructions, which are repeated in greater detail here.

Figure 29: Instructions for MAF Calculator

The reference to a "Type 3 Calculator was fascinating, the whole page is transposed here below:

Different models of calculating circles.
The first model which came out was of the form of a watch, having two dials, the divisions of which permitted of the introduction into the calculations of ordinary numbers and of angles, by means of their trigonometrical lines; and they also gave the decimals of logarithms, by means of which the powers and roots of numbers may be obtained.
The second model was of larger size than the first and of a different form, and was intended for use in offices; it had only one dial, but the size of this permitted divisions to be engraved upon it, by means of which it was possible to calculate, at first sight, not only ordinary numbers and angles, but also the powers and roots of numbers to the second and third degree.
The third model, for which the present book of instructions is more specially intended, is of a form as convenient and portable as the first, with the advantage of the second over the first, that it permits of the calculation, at first sight and without difficulty, of the squares and cubes of numbers and of their square and cube roots, as well as of ordinary numbers and of angles.

"Bostwick Bazaar", who was selling the device on eBay very kindly searched the instructions to try and find whether there was any date, responded to my query as follows: "Just returned and have gone through the pages of the manual (carefully!). There are no obvious date codes that I could find, only thing of note was I did find page 1 (in the middle) and it has the following:

This pamphlet is suitable size for inserting in a Molesworth Pocket Book

Boucher's Patent Calculating Circle
Price 28/-
Patented in Great Britain and Abroad
Sole wholesale agents for Great Britain & the Colonies

MANLOVE, ALLIOTT, FRYER & Co
Engineers
Bloomsgrove Works
Nottingham

1883

A passing reference in a regular newsletter from the Zurich observatory published in 1883 within an item by a Professor Wolf of the Zurich observatory in his “Astronomische Mitteilungen” (Astronomical Announcements) of 1883 is shown below.

Zum Schluss führe ich das raisonnirende Verzeichniss der Sammlungen der Züricher Sternwarte von Nr. 268-276 fort. Das über den von A. Boucher in Havre construirten »Cercle à calcul« Gesagte dürfte vielleicht allgemeines Interesse beanspruchen.	Finally, I mention, the catalogue of the collections of the Zurich Observatory, items No. 268 to 276. There, A. Boucher of Havre has Constructed a "Cercle à Calcul" which is of general interest.

Item 275 in the collection is a Boucher calculator, and the entry includes a fairly lengthy review of the Boucher “Cercle à Calcul” bought by the observatory in 1883, some seven years after Boucher patented his calculator. It is reviewed reasonably positively by Professor Dr. Rudolf Wolf, but the review is noticeable by being that for a new and slightly unusual device in comparison with what the reviewer was used to. Sadly there is nothing else to say where the device was purchased from, and the reference to Boucher from “Havre” implies that this could be either an “earliest” or “later” Boucher calculator, or one which was made and sold by Morin of Paris, as they all carry the “Havre” address.

1885

"Manloves" obviously had a relationship with Boucher as detailed by Cajori. The chronology is difficult to determine as the company changed names at various times, (see Appendix E) not always obviously "in-step" with the contemporary calculator style. An example of a Boucher's calculator marked Manlove Alliott & Co Ltd. was sold on eBay in 2011and is shown below. This is catalogued here under 1885 as that is the final year before the company became Manlove Alliott & Fryer Limited. However, the style of this Boucher appears to be much later, being much more similar to the "Stanley Boucher" and the even later "Manlove's" devices illustrated later under 1890 and 1892 respectively.

Figure 30: Manlove Alliott & Co Limited Boucher Calculator

Figure 31: A second example of Manlove Alliott & Co Limited Boucher Calculator

The "Hopp Theory of pocket watch slide rule manufacturers" which is based on manufacturers only making design changes when absolutely necessary, and thus a feature such as the angle of the second winder remaining constant for each manufacturer, was promulgated as an Appendix in my book *"Pocket Watch Slide Rules."* (2011). A change to winder angle would suggest that this must have been made by a totally different manufacturer as the winder angle for this manufacturer appears to be virtually perpendicular to the crown. This is not the case with any of the other "Boucher" devices, such as the Manlove's device with a 65° angle, which is the same as the Type 2 Boucher devices. The pictures of a second example seen on eBay in 2015 make it appear that the angle of the winder is actually greater than 90° but that is probably a simple optical illusion.

The necessary comparison with other "Manlove's" device can be made by looking at the three examples shown later under the 1892 date.

1886

Geographical Society of Paris

During many internet searches where various arbitrary mentions of the word Chatelain have been found, (some documented earlier) one of the most interesting is from the *Proceedings of the Royal Geographical Society and Monthly Record of Geography*. These were published under the authority of the council, and edited by the "Assistant Secretary", at 1, Savile Row, London. In the new monthly series, Vol. VIII., 1886, was published in London by Edward Stanford, 55, Charing Cross:

> A report from 1886 of a meeting of the Geographical Society of Paris.– December 4th, 1885 : M[onsieur]. Alph[onse]. Milne-Edwards in the Chair. – The Minister of Public Instruction presented to the Society some of the papers which were in the possession of the late M. Huber at the time of his assassination in Arabia. M[onsieur]. H. Chatelain presented a curvimetre, made by his father. By means of this instrument, it is possible to obtain instantly and with great accuracy the measurement of distances on geographical maps and plans without reference to the scale. It makes no difference whether the distances are represented by straight, curved, or broken lines.

This report gives two insights:
- Both H. Chatelain and his father were mathematical instrument makers
- and we already know that H. Chatelain made Curvimetres,

In all likelihood this is a perfectly relevant mention of the man and his un-named father, who we are trying to further investigate. Sadly it adds little to the sum of our knowledge of the family or the company, other than they were members of the Geographical Society of Paris.

Manlove Alliott & Fryer

The confusion with various "Manloves" company names and their incarnation as different commercial entities and style of calculator has already been mentioned. It is believed that the firm of Manlove Alliott & Fryer were formed in 1886, and incorporated as a limited company in 1897, when Manlove & Alliott (who were formed much earlier in 1837) were joined by Albert Fryer with his patented "Destructor" incineration system. "Manloves" were also known as agents for Boucher calculators (see Cajori 1878) but exactly what this relationship was has not been discovered.

A very much earlier format of calculator bearing the Manlove Alliott & Fryer names is shown under 1876/7 as it mirrors the design of Boucher calculator of that date. This is, however, confusing as Manlove Alliott & Fryer were not formed until 1886. The only sensible explanation is that this style of calculator was manufactured for a number of years.

These calculators also carry an address label which states "Nottingham and Rouen", and the calculators also carry the script "AB" signature, which is typical of early and very early calculators. Several examples of these calculators are known.

Another Very Early MAF Boucher has been added as Figure 11 in the original section under 1876/77 but this too is very confusing as it does not sensibly exist there for the same reason as the Boucher example covered in the previous paragraph. See also Appendix E for a Manlove's chronology.

Figure 32: A Type 2 Manlove Alliott & Fryer Boucher Calculator

At least three examples of what appears to be an "Early" (Version 2) Boucher calculator which are marked Manlove, Alliott & Fryer are known (Figs 32, 33 and 33a). These are complete with the "AB" signature on the reverse which implies that these calculators, made by an unknown manufacturer, were still being made at least ten years after the patent and at least eight years after Chatelain was supposedly making the "improved" version – the Calculigraphe. We do not know what the business in Rouen included, or when the firm began their French connection. The second winder is at 60° on both. The third device has different hands, which may be replacements,

Figure 33: Manlove Alliott & Fryer calculator sold on eBay in 2004

Figure 33a: Manlove Alliott & Fryer calculator sold on eBay in 2020

1890

Another parallel path in our story begins in 1890 when we find the first mention of a Boucher calculator apparently made by W.F. Stanley in England.

The history of Stanley-made Boucher calculators is equally as difficult to decipher as we have found with the other manufacturers. There are a number of statements in Stanley published books and catalogues that implied that they were manufactured by the English firm, and also other statements which implied that the earliest examples were poorly made French devices. An advertising "Flyer" from 1890 starts the story: W.F. Stanley's ***Surveying and Levelling Instruments*** of 1890 quotes:

> ***Boucher calculator,*** 'the invention of M. Alex. E. M. Boucher, engineer of Paris'. [With a footnote relating to the 1876 UK Patent] '... This instrument was formerly made in France for this country [UK] in a very slovenly manner. It is now made in London of sound work and accurate centring [sic]. Manloves [sic] are the patentees' agents, but the instrument can be had of any opticians'. There follows a description of its use taken directly from the patent.

Stanley marketed, and possibly also made, two notably distinct versions of the Boucher calculator. Both Boucher and Stanley-Boucher calculators are mentioned in the 1898 catalogue, so we have to assume they were first marketed sometime between 1890 and 1898 and in all likelihood the Boucher prior to the Stanley-Boucher with its extra 'rev-counter' pointer.

Both models are true Boucher calculators with crown and side winder. They were a successful calculator, but again with no way of confirming who truly made the devices we are unable to connect this thread to any other. The different look and feel of the Stanley devices implies a different maker, and while that maker may indeed have been Stanley themselves, we have no records of where (which factory) or when this started. Whenever, they were made through to 1931 and possibly later.

The statement as to Manlove being the patentees' agents is frustratingly brief and gives us no further clues as to why they should have this role – the Newton clan of patent agents actually presented the original patent – and what their expertise was to be able to claim this is similarly not clear. Is this simply a careless simplification of the name and was the firm in any other incarnation being referred to? This is entirely possible. 'Manlove was formed in 1892, two years after the statement was written. We shall probably never know.

The Stanly-Boucher calculator with its third index hand and "patent" statement is number 196 (p100) in Cajori with a reference to the 1905 Stanly "H" catalogue. This device had probably been in existence for a number of years before that 1905 date; we still need to prove it.

Figure 34: Boucher calculator made by W.F. Stanley

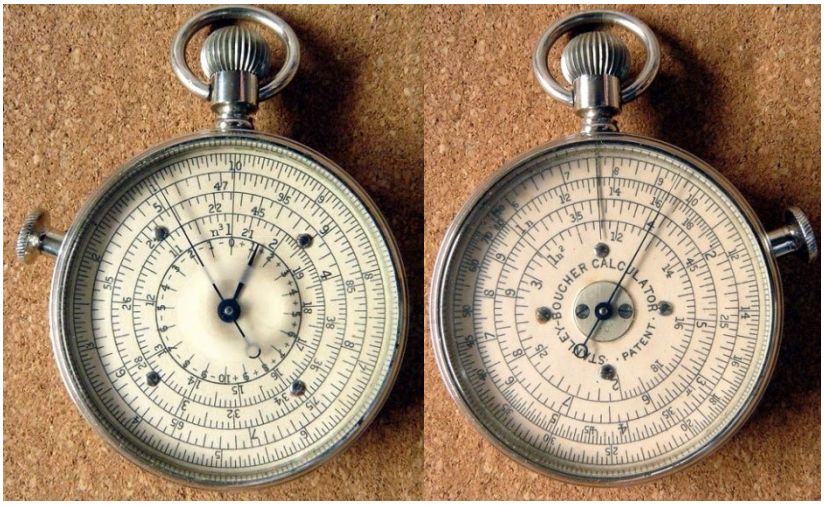


Figure 35: Stanley-Boucher calculator with "rev-counter"

The “Patent” statement on the Stanley-Boucher calculator appears to be a deception as no relevant patent or application has been found relating to this device. That is, unless it is referring to the original Boucher patent of 1876/7. That patent does not refer to a third hand, which might have been the subject of a separate failed patent application. Note that an eleven page Instruction Booklet from Stanley for the Boucher’s Calculators with a Great Turnstile address (before 1926) also has an additional three pages of instructions for the “Patent Stanley-Boucher calculator”.

1892

'Manlove could have been formed anytime from about 1892 although the chronology is by no means certain or immediately logical (see also Appendix E).

Figure 36: Boucher's Calculator marked Manloves London

Figure 37: Second different example of Manlove's Boucher

Courtesy of the Conrad Schure collection

These three pictures of Manlove's Boucher calculators (Figs 36&37) could actually be from three different makers. A comparison of the top left and bottom pictures of the calculator front shows four fixing screws on the top left, and only two on the bottom example. The shape of the pendant is also different in all three examples, as is the knurling on two of the examples. Whether this implies different makers is debatable, the different details are a major change, I think.

Figure 37a: Third different example of Manlove's Boucher – four screws on each side

Authors collection

1894

La Science article

The second French article, originally identified from a French web site,[9] in *La Science Illustrée,* edition No 347 of July 1894, i.e. published some 18 years after Boucher's patent, covers '*les inventions nouvelles'* and starts by mentioning Boucher's invention of 'about 20 years ago' which 'due to imperfections in the manufacturing process did not find favour with the users'. Following which, the article continues: Monsieur Chatelain re-designed it from top to bottom such that the 'calculigraphe' (note the small 'c') is effectively a new device. The illustrations in the article are of a Calculigraphe which we would all recognise, but, most intriguingly, are marked with the well-known castle FC logo! Also in the article is illustrated a single dial Calculigraphe with a simple pair of logarithmic scales, also marked FC, of which no examples are known. This may be the "Premiere Model" mentioned in the 1880 Calculigraphe instruction book.

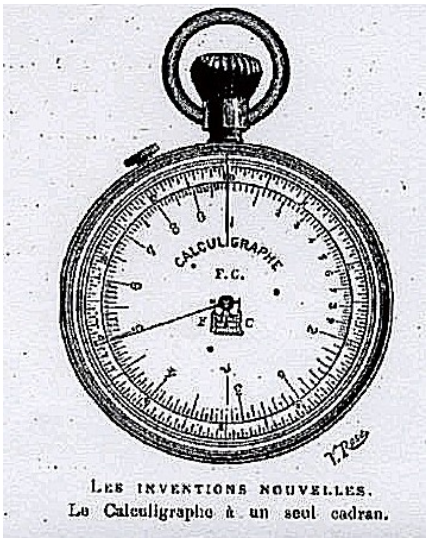


Figure 38: Single dial Calculigraphe from the La Science 1894 article

See also the use of this picture by d'Ocagne, under 1878.

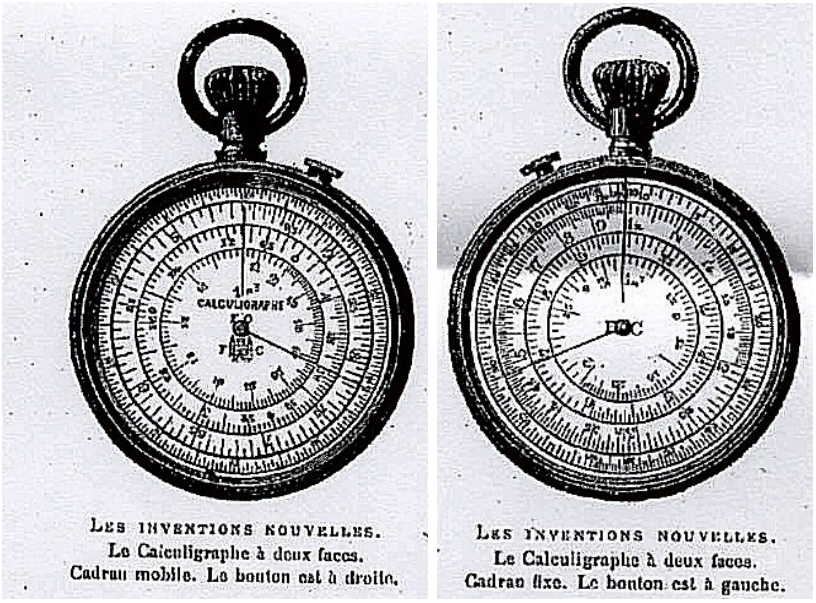


Figure 39: Standard Type 7 Calculigraphe illustrated in the article

[9] https://www.photocalcul.com/Calcul/Regles/Type_Montre/calculigraphe/photo_calculigraphe.html
See also [10]

That in 1894 we should have both the *La Science* article and the Henri Chatelain catalogue (following) using different logos to illustrate the devices in question is indicative of the confusion that is still apparent with respect to both these Chatelain devices.

Chatelain 1894 catalogue

A 16 page catalogue of Henri Chatelain's products dated January 1894 (therefore probably assembled in late 1893) has been discovered in France. Here follows a written reconstruction of the pages by Sigismond Kmiecik who found the catalogue in the Bibliotheque National Francaise (BnF) in Paris, and who has been such a considerable help in trying to get a copy of the document, so far unsuccessfully. A translation of the French is given in blue; Sigismond's very pertinent comments are in italic.

Henri Chatelain – Catalogue Janvier 1894

Deux récompenses à Paris Exposition Universelle 1889 et Chicago 1893
Two awards in Paris 1889 and Chicago [World Fair] 1893
Manufacture instruments de précison
Manufacturer of precision instruments
H. Chatelain
10 rue de Belzunce (quartier St. Vincent de Paul) Paris
Marque de fabrique
Brand

Logo Château

H C

Maison de Vente en Gros et atelier de construction
Wholesale house and workshop building
10 rue de Belzunce, Paris
Maison et usine mécanique avec force motrice
House and factory with mechanical motive power
Neufchatel, Suisse

Page non numérotée

Tampon avec n° (S?) 614 de dépôt légal Seine en 1893
Logo with No. (S?) 614 legal deposit from Seine in 1893
Médailles obtenues pour podomètres uniquement
Medals only won for pedometers
Les lettres **H C** *ressemblent à* **F C**
The letters H C which look like F C
Actuellement au 10 rue de Belzunce Paris 10ème se trouve le restaurant Chez Michel
Now at 10 rue de Belzunce can be found the restaurant Chez Michel

Page 1

Liste numérotée de podomètres avec nouveaux perfectionnements
Numbered list of improvements for new pedometers
Compte Kilomètres, miles, verstes (russes)
In Kilometres, miles, verstes (Russian)

Page 2 – 3

Liste numérotée de :
Numbered list:
Curvimètres à cadran et à manche
Map measurers with dial and handle
avec boussole
with compass
Compteurs de secondes (avec diablotine)
Counters seconds (Diablotine)
Compteurs à pointage
Counters score

Horloges-compteurs pour jurys de courses et observations scientifiques
Time Clocks-meter races for juries and scientific observations

(31 objets différents jusqu'à maintenant - aucune gravure)
(31 different objects to date - no illustrations)
Note : La diablotine n'est plus dans le Robert – c'est une aiguille qui fait un tour de cadran en 1 seconde.
Note: The Diablotine - it's a needle that goes around the dial in one second

Page 4

Instruments divers
Various instruments
Liste numérotée sans gravures
Numbered list without illustrations
N° 32 cercle à calcul simple (système Boucher perfectionné) avec 1 cadran mobile, 1 index, 1 aiguille pour multiplications , divisions, proportions et logarithmes - exactitude garantie, 12F 50
No. 32 calculating circle simple (improved Boucher system) with a mobile dial, an index, a needle for multiplication, division, proportions and logarithms - guaranteed accuracy. 12Fr 50
N° 33 cercle à calcul double avec 1 cadran fixe, 1 cadran mobile, 2 aiguilles ,
1 index, 1 aiguille pour tous les problèmes de mathématiques, algèbre et trigonométrie – exactitude garantie. 15F
Calculating Circle No. 33 with a double fixed dial, a mobile dial, two needles, An index, a needle for all the problems of mathematics, algebra and trigonometry - accuracy guarantee. 15Fr
Additionneur automatique
Automatic adder
Compteur unités
Counter units
Oscillographe enregistreur
Oscillograph recorder
Curvigraphes à bandes graduées
Graduated Curvigraphes tape
Jeu de dés mécanique
Dice shaker
Le jeu de dés mécaniques consiste en une boite cylindrique avec un fond en verre dans laquelle 3 dés son i insérés qui sont lancés (en restant enfermés dans la boîte bien sûr) par un bouton pressoir sur le côté de la boîte . H . Chatelain avait de l'imagination !
The dice shaker is a cylindrical box with a glass bottom in which is inserted the three dice that are shaken (but remaining locked in the box of course) by a push button on the side of the box. H. Chatelain had real imagination!

Page 5 - 6

Gravures de podomètres
Pictures of pedometers

Page 7

Gravures de curvimètres
Pictures of map measurers

Page 8

Gravures de compteurs additionneurs
Pictures of meter adders

Page 9

Gravures de 2 cercles à calculs :
Pictures of two calculating circles
Cercle à calcul simple *(FC lisible sur le cadran – aucune autre mention)*
Calculating Circle simple (*FC visible on the dial - no other mention)*
Cercle à calcul double *(FC +logo château & Calculigraphe lisibles sur le cadran)*
Double calculating circle *(FC + & Castle logo Calculigraphe visible on dial)*

Page 10

Gravure d'une horloge compteur pour pointage *(La pièce la plus volumineuse du catalogue)*
Engraving of a clock counter for tallying (*The most extensive part of the catalogue)*

Le mot calculigraphe remonte donc au plus tôt à Jan 1894 - applicable uniquement aux cercles à calcul à double face.
The word Calculigraphe back then was used no earlier than January 1894 – and was only applicable to double-sided disc calculators

Note: It is quite possible to see something very similar in the Chatelain 1907 catalogue, see Appendix C; or the Baudet 1925 catalogue, Appendix D.

In September of the same year we have the following advert from *"La Federation Horologere Suisse"* for what was probably the "House and factory with mechanical motive power" that was mentioned in the Henri Chatelain catalogue. We also have a list of products produced, where it does not say, but implies that they were Swiss made. Most interestingly, the address given for Fritz Chatelain in Neuchâtel is actually that of Henri Chatelain at his Paris rue de Belzunce 10 address (the early one, later it was No 12.).


Fabrique d'instruments de précision
USINE MÉCANIQUE
F. Chatelain, Neuchâtel
Maison de gros: Paris, 10, Rue de Belzune.
Médaille, Paris 1889. — HORS CONCOURS, Chicago 1893.
Podomètres perfectionnés 16 lig., et 13 lig., brevetés et déposés.
Spécialité de mise à O automatique. — Curvimètres. — Compteurs
Ouvrage soigné et garanti. 2327

Figure 40: 1894 advert for Fritz Chatelain

The two honours gained in exhibitions quoted in this advertisement have been mentioned elsewhere on numerous occasions as Henri Chatelain awards.

1895

A 1st January 1895 advert for Fritz Chatelain in *"La Federation Horologere Suisse"* repeated throughout the rest of the year until the 5th September 1895 editions, carries a more detailed advertisement (below) confirming the relationship with Henri Chatelain in Paris, without mentioning his name, but by reference to Henri Chatelain's rue de Belzunce address. It is also notable that there is no street address in Neuchâtel given for Fritz. With Fritz only using Henri's Paris address, I believe that this must confirm a reciprocal agreement between the two Chatelains. We still do not know whether there was a familial relationship as well.


Maison (de gros): **Paris, 10, Rue de Belzunce.**

Fabrique d'Instruments de Précision

pour la mesure des distances et du temps

Modèles spéciaux déposés et brevetés

USINE MÉCANIQUE

F. Châtelain, Neuchâtel

Podomètres, Compte-pas, Spécialité de mise à O. — **Compteurs,** à secondes fixes, à 1/5 de secondes et toutes autres fractions de secondes. — **Curvimètres** pour tous genres d'échelles et de cartes ou de plans. **Téléphone** 2836

Représentant pour le canton de Neuchâtel : **Rodolphe UHLMANN** rue 21, Daniel JeanRichard, **Chaux-de-Fonds.**

Figure 41: 1895 advert showing works in both France and Switzerland

By 1896 (see next section) Fritz Chatelain had become an apparently independent trader again with his own address in Neuchâtel in Switzerland, and there was no further mention of any Paris address.

1895 was also the year that Keuffel & Esser in the USA started advertising a "Boucher's Calculator" (model 1787½) marked "K&E Co, NY" in their catalogue of this year. That it is actually a Calculigraphe (i.e. it has a push-button clutch rather than a second winder) does cause some confusion; however it is included as yet another short thread which cannot be further amplified until new information comes to light.

It should also be noted that Dietzgen in the USA did exactly the same in advertising the availability of a "Boucher". This also proves to be a Calculigraphe, but in their case this model 1797 was advertised from 1902 (see below), and was supposedly similarly marked "ED Co." The same is true of Stiren in Philadelphia.

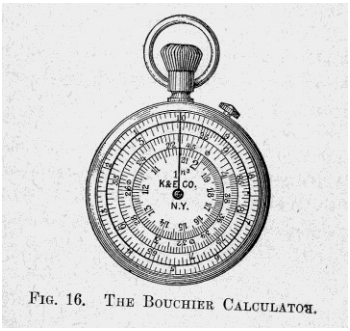


FIG. 16. THE BOUCHIER CALCULATOR.

Figure 42: Illustration for K&E marked Boucher from Halsey [7] 1899

The K&E advertisement for Boucher's calculator was copied by Halsey [7] in 1899 as well as Cajori [3] in 1910, and yet on today's evidence such calculators were never made – it would be very nice if an example were to be found!

Similar mythical devices (i.e. no examples so marked have been found) were advertised by Eugene Dietzgen (ED Co)[10] – Fig 43, and also an apparently identical but unmarked Boucher's calculator was offered by the William E. Stiren Company of Philadelphia in about 1900 – (Fig 44 below).

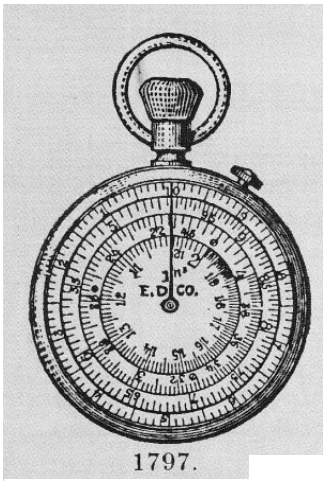


Figure 43: Mythical Boucher marked ED Co

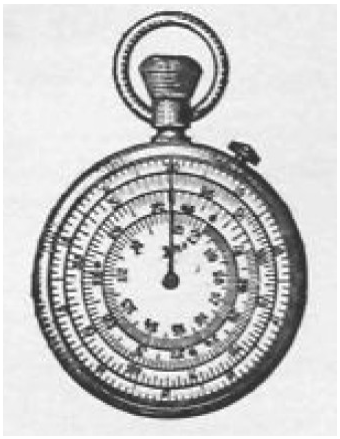
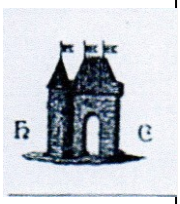


Figure 44: Similar mythical Boucher, unmarked in a Stiren catalogue

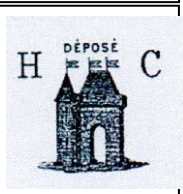
[10] Dietzgen ctalogues various, item 1797 etc Boucher calculator e.g. https://tinyurl.com/4ud3a9bj for 1907 catalogue.

1896

"HC" Opisometer logo



49329



50124

"FC" Castle logo

Figure 45: HC & FC logos various

The French *'Bulletin Officiel de la Propriete Industrielle et Commerciale 1896'* (the Official Bulletin of [French] Industrial and Commercial Property of 1896) provides us with further information which shows that Henri Chatelain was granted a trade mark (No. 49329) on the 23rd January 1896. This used a stylised castle and the lowercase letters 'hc' with serifs, see middle left. A translation from the French of the notice relating to the announcement of the logo is as follows:

49329. – M. p. designer of precision instruments, filed January 23, 1896 at 9 am, at the Registry of the Commercial Court of the Seine, by M. Chatelain (Henri), a manufacturer in Paris. This mark is in variable sizes and colours. It will be shown on labels, packaging, etc.

This logo seems to have caused some confusion as the lowercase letters with serif can look (with a bit of imagination) as if they are an uppercase 'FC'. We then find the grant of a second logo a mere three months later (No. 50124) in late April 1896. The translation of the French statement for 50124 is the same as that for 49329 (above) with the appropriate changes to date. The new logo (middle) uses the same castle, but now with uppercase 'HC', and also has the word 'Déposè' (filed) incorporated.

From this it can certainly be argued that 'FC' and 'HC' is definitely one and the same person, Henri Chatelain, instrument maker, of Paris. However, interestingly (and confusingly) the Calculigraphe article in *'La Science ...'* published in 1894, two years earlier, is illustrated by a completely different 'FC' logo, (bottom left) which is the one that is commonly used to the present date as the FC logo and seen on opisometer, curvimetre and pocket-watch slide rules. This is significantly different. The castle has two peaked towers, each with a flag on some examples, pointing to the left, not the right as per the 1896 HC logos, and with a crenelated tower between the two peaked towers. The body of the castle has a solid front and a door, the 1896 logo has an opening on the right tower which is capped by two flags. This turns out to be Fritz Chatelain's 1881 Swiss logo, see below.

We also still have Henri Chatelain's best known opisometer (top left) logo which has been used on most HC Calculigraphes and is still in use on relatively modern French opisometers with both 'HC' and 'HB' initials (whose significance is now known, see below). This logo was not used on a Calculigraphe instruction leaflet dated 1880, some 14 or 16 years earlier, so it has an unknown start date, but probably was in use well before 1896.

Figure 46: FC Registered logos

Two further logos have been found,[11] which relate to Fritz Chatelain in Switzerland and are included here though one has a very much earlier date (1881) while the second is only three months after Henri Chatelain registered similar 'Castle' trade marks in France. His though are registered as HC, and have never been seen in use on any Chatelain instrument or document.

This first logo is marked as registered "FC" on 4.3.1881 to Fritz Chatelain, Uhrwerke, Gehäuse; Neuchâtel, Schweiz.

[11] www.mikrolisk.de/trademarks

The second, which appears to be identical with the addition of Fritz Chatelain's name, is marked as registered "FC Fritz Chatelain" to the same Neuchâtel address on 18.7.1896.

Here at last we have perhaps a more stylised version of the FC "Castle" trademark which we have regularly seen on curvimetres and other similar devices as well as FC marked Calculigraphes. It is much clearer than the version shown above, and is complete with flags on the top of the towers pointing left. There is also no doubt at all about the use of FC with no chance at all of mistaking it for HC.

The relationship between Fritz and Henri Chatelain is still not known, but we can probably be reasonably certain that they were the Swiss and French halves of "Maison Chatelain" respectively. Whether they were related is not known.

The various Chatelain logos must have more to tell us than is immediately obvious even from this discourse. We have been unable to find a registration in France of either the famous opisometer logo or the better known FC Castle logo. Illustrations of both of these are shown below from much more modern devices, as is the much newer Henri Burnat "HB" opisometer logo – this is the final manifestation of Chatelain and is after Baudet (see page 24) who suceeded Chatelain in 1922, through to 1940 and later when he became Baudet-Burnat.

Figure 47: Modern HC, FC and an example of HB logo

Figure 48: An instrument collecting web site[12] shows this intriguing combined logo for Baudet-Burnat

[12] http://www.tcocd.de/Pictures/Instruments/curvimeter/curvi-hcb01.shtml

Figure 49: Fritz Chatelain advert from 1885

Description of Fritz Chatelain's business – 1896

Translation from the entry in "La Federation Horologere Suisse" August 1896

Description of the Maison Fritz Chatelain watchmaking enterprise, manufacturers of precision instruments in Neuchâtel.
Before talking to us about his organization F. Chatelain wanted to wait for the Jury result of rewards, and the distinction the company has obtained: Silver Medal in Group No 1, Section II, the highest award given in this section shows that this [manufacturing] house has maintained its reputation.
We note in the firm's two windows a nice assortment of 28 pedometers in steel and silver and 10 lines and 13 lines, [**] with a sophisticated special system of automatic zeroing needles, a spring tension hammer to obtain a drop of the latter more or less gently and a system of simple and convenient setting for counting kilométres. Swiss patent 4867/152.[1893]
Two stop watches with dials of 68 marks, functions of stop, start, split, pointing and setting
Automatic Zero. One with 1/5 of a second, ratrappante [***] needle, needle and recording up to 30 minutes, with the other needle second pointing to the ink. [??]
Six varieties of handheld meters (Patent 6424) [1893] with an instantaneous system formatting to Zero and full simultaneous winding movement.
Sr.it: A second counter [Stop Watch] to10 minutes,
»» Phonotélémétriques with divisions,
»» tacho with divisions,
»» With needle pointing to ink,
»»Towers chronography
»»Gas plant.
Ten map measurers, registered design, adopted by military schools in all countries.
Six watches steel and gold rosettes, patented model.
All the instruments are home manufactured in their factory which is mechanically driven by eletricity and its large staff allows it to respond quickly to the many orders received.

This is an impressive list by any standards and on the face of it appears to repeat much of the product line shown in the Henri Chatelain catalogue of 1894. It would be very nice to see the catalogue in order to correctly identify and compare the items for proper translation.

[**] There are 12 *lignes* to one French inch (*pouce*). The standardized conversion for a ligne is 2.2558291 mm (1 mm = 0.443296 *ligne*), and it is abbreviated with the letter L or represented by the triple prime. One ligne is the equivalent of 0.0888 international inch.
This is comparable in size to the British measurement called "line" (one-twelfth of an English inch), used prior to 1824.

[***] Ratrapante is a fly-back needle on a stop-watch .

1900

Unusually, Chatelain appears to have only received Exposition Honours for his various designs of pedometer, the most commonly noted being the "Exposition Universelle" in Paris in 1900 with two awards, as shown on various examples of instruction leaflet / advertisement illustrated here. According to the 1894 catalogue, awards were also made in the Paris "Exposition Universelle" of 1889 and the 1893 Chicago World Fair. The description of Maison Fritz Chatelain in *"La Federation Horologere Suisse"* of August 1896 also mentions the award of a silver medal in the exposition in Geneva of that year, but only a group number and section are quoted which would have been fully understandable to the cognoscenti readership of that journal, but means little to us so many years later.

Example 1: Chatelain's award of a medal in 1900 as shown on an example below:

DÉPOSÉ H C followed by a trademark/sign (opisometer)

Figure 50: Various Pedometers

Information from the leaflet:

HIGHEST REWARD ACCORDED
TO
PEDOMETERS
WITH
AUTOMATIC FLY BACK ACTION
Médaille de Bronze
Exposition Universelle
PARIS 1900

Taken from a second (different) pedometer example with decimal registering dials sold on eBay is an English instruction sheet dated 1900 at the earliest, and which also uses the opisometer logo for Henri Chatelain:

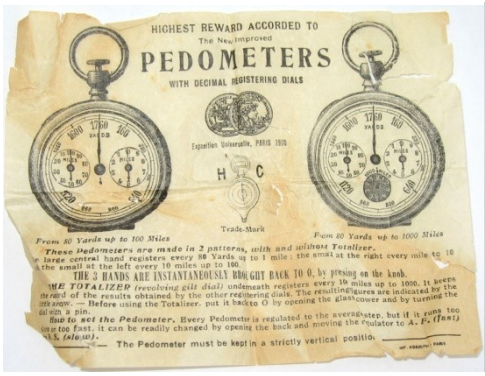


Figure 51: Pedometers & Instructions

Chatelain awards			
Expo	**Award**	**Comment**	**Source**
Paris 1889			1894 HC Catalogue FC adverts various
Chicago World Fair 1893			1894 HC Catalogue FC adverts various
Paris Universal Expo 1900	Bronze medal	New Improved pedometers with decimal registering dials	Advert / instruction leaflet
Paris Universal Expo 1900	Bronze medal	New Improved pedometers with automatic fly-back action	Advert / instruction leaflet
Swiss National Expo Geneva 1896	Silver medal	Group No 1, Section II	La Fedearation Horlogerie Aug 1896

Table 3: Henri and Fritz Chatelain awards

Further examples of HC Instruments are shown below. The choice was extensive.

Figure 51a: Further examples of Chatelain Instruments

1907

Chatelain 1907 cataolgue

The 1907 catalogue we now have is interesting for confirming some information that had previously been disbelieved – or at least not appeared sensible – and also showed that Chatelain's product range was amazingly unchanged through the years – especially when compared to the later (1925) Baudet catalogue

Figure 52: Cover page Chatelain 1907 catalogue

The front page tells us that this was the third edition of a catalogue for the company founded in 1884, – not a very often changed marketing item. Three editions in twenty three years is incredibly stable. We can only assume that the 1897 catalogue may have been a second edition, assuming that the first edition would have been in the founding year.

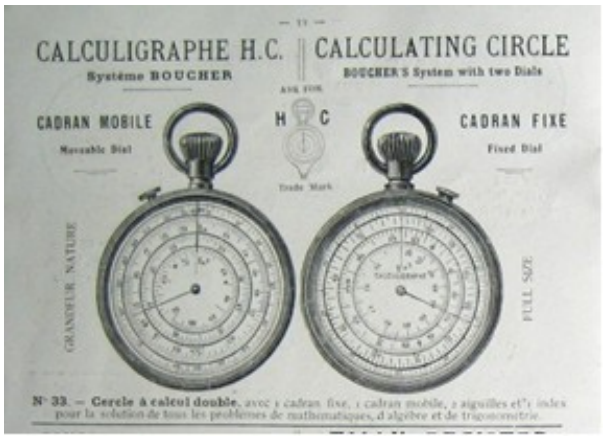


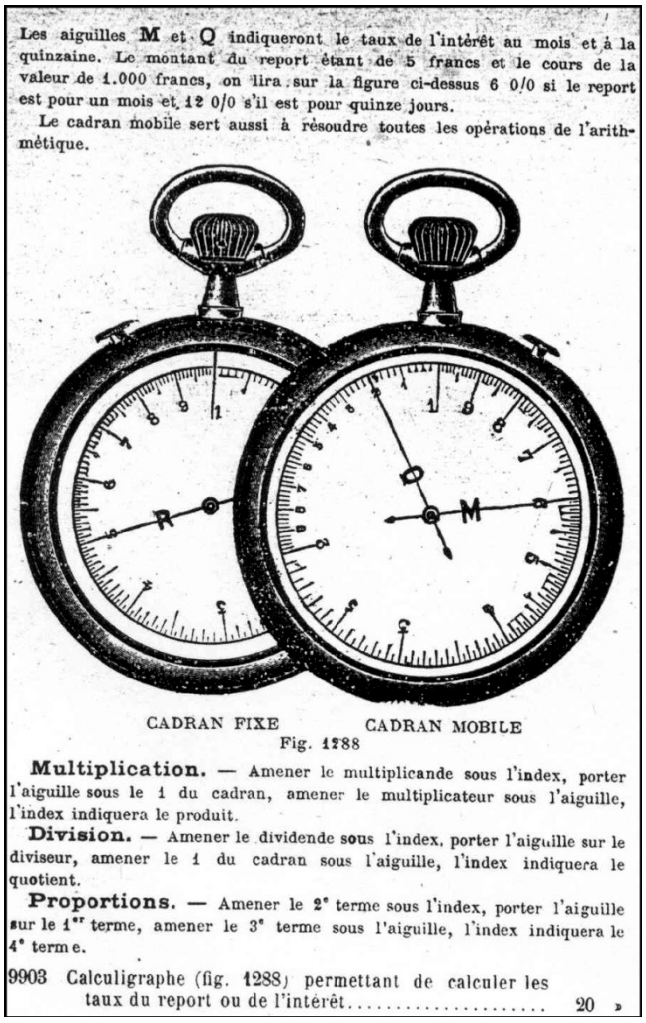
Figure 53: Calculigraphe entry, page 11

The Calculigraphe entry is identical to that shown in the 1925 Baudet catalogue. It is item 33, and the illustrations and description are identical. A price list for this 3rd edition of 1907 shows two versions, item 33 a Calculigraphe with instruction leaflet at 12 Francs, and item 33M, a Calculigraphe with metal dials at 16 Francs – not shown within the catalogue entry itself.

All the pages for this catalogue are shown in miniature in Appendix C

1910

The French maker Morin advertised a two dial, 'Calculigraphe pour Reports de Bourse' with simple scales, for the first time in their 1910 catalogue (see below), and repeated in the 1914 catalogue. This is different to the standard ones which feature here, and of which no examples are known. These are included for completeness; a catalogue excerpt is shown below.



Les aiguilles **M** et **Q** indiqueront le taux de l'intérêt au mois et à la quinzaine. Le montant du report étant de 5 francs et le cours de la valeur de 1.000 francs, on lira sur la figure ci-dessus 6 0/0 si le report est pour un mois et 12 0/0 s'il est pour quinze jours.

Le cadran mobile sert aussi à résoudre toutes les opérations de l'arithmétique.

CADRAN FIXE CADRAN MOBILE

Fig. 1288

Multiplication. — Amener le multiplicande sous l'index, porter l'aiguille sous le 1 du cadran, amener le multiplicateur sous l'aiguille, l'index indiquera le produit.

Division. — Amener le dividende sous l'index, porter l'aiguille sur le diviseur, amener le 1 du cadran sous l'aiguille, l'index indiquera le quotient.

Proportions. — Amener le 2e terme sous l'index, porter l'aiguille sur le 1er terme, amener le 3e terme sous l'aiguille, l'index indiquera le 4e terme.

9903 Calculigraphe (fig. 1288) permettant de calculer les taux du report ou de l'intérêt..... 20 »

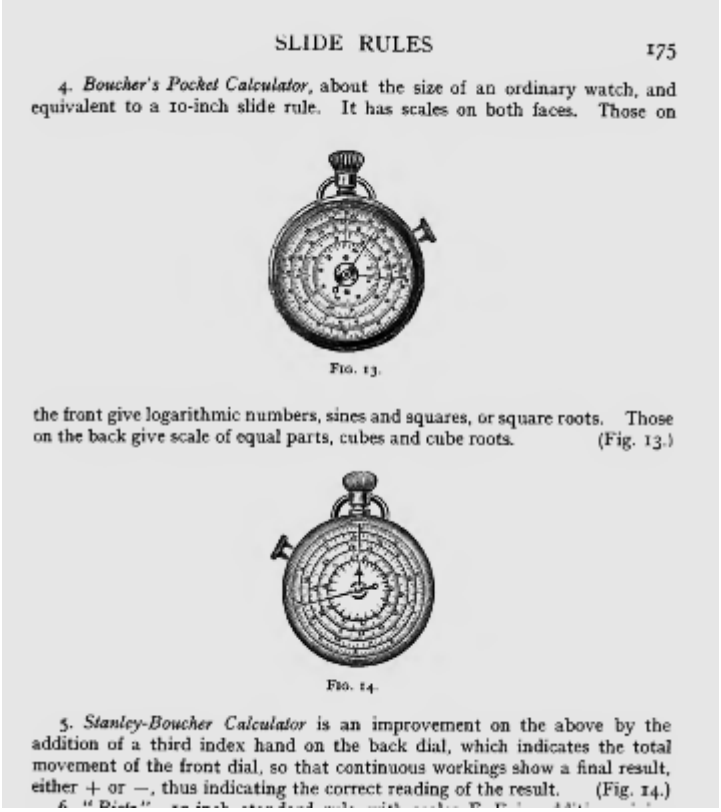
Figure 54: Calculigraphe "pour les reports de Bourse" - Morin 1910

The shapely extended pendant in the illustration above is very distinctive and could well prove to be a valuable identifying feature of Morin made Calculigraphes. One Calculigraphe with a similar pendant is known and is shown as an "anomalous device" in the Calculigraphe section (page 71) and may yet be proven to have been made by Morin. However more examples, hopefully with some form of attribution, are required before we can be certain.

Thus far, the Boucher devices sold by Morin (Fig 25, page 35 and see catalogue snips, page 35) do not have a pendant of this shape.

1914

The “Tercentenary Exhibition of Napier Relics” also known as of “Modern Instruments and Methods of Calculation; A Handbook of the Napier Tercentenary Exhibition” edited by E.M Horsburgh; published in 1914 (page 175) mentions both Boucher and Stanley-Boucher calculators as having been part of the exhibition of slide rules.



SLIDE RULES 175

4. *Boucher's Pocket Calculator*, about the size of an ordinary watch, and equivalent to a 10-inch slide rule. It has scales on both faces. Those on

FIG. 13.

the front give logarithmic numbers, sines and squares, or square roots. Those on the back give scale of equal parts, cubes and cube roots. (Fig. 13.)

FIG. 14.

5. *Stanley-Boucher Calculator* is an improvement on the above by the addition of a third index hand on the back dial, which indicates the total movement of the front dial, so that continuous workings show a final result, either + or −, thus indicating the correct reading of the result. (Fig. 14.)

Figure 55: Entry in Horsburgh, 1914

1922

This is the year when it is believed that Chatelain was succeeded by F. Baudet whose background in instrument making remains completely unknown. However, Baudet does appear to have continued the Chatelain business in all its aspects. The company continued at the 10 rue Balzunce address and remained there until about 1930. By 1940 Baudet had definitely moved to 89 rue d'Hauteville in Paris, this being the last mentioned address for both Baudet and Chatelain, though Chatelain probably was never there, only the company that carried his name.

This date for the takeover might well be correct as it is a date following the death of Henri Chatelain (01.06.1921) and thus the company might have been sold by the family. Interestingly, and incredibly coincidentally, Fritz Chatelain also died in 1921 (01.05.1921) – exactly one month prior to Henri's death

After WW2, Henri Burnat appears, and at some stage the relationship with F. Baudet turns into Baudet-Burnat.

Why Chatelain needed a successor is still not really known. However, having discovered that both Henri and Fritz probably died within months of each other in 1921 then in all probability there was no one to take over the business and so we must speculate that new owners of the business were required.

1925

Below is the front cover of a Baudet General catalogue dated 1925, which still contains one model of "Cercles a Calculs" as a product and emphasises that Baudet succeeded Chatelain. There are two other interesting facts. Firstly it states "Maison Fondée en 1884" which we can assume is supposedly the date for Chatelain's start. This makes absolutely no sense as we already know that Chatelain started making Caluligraphes six years earlier in 1878 and from the Didot-Bottin Trade catalogues that he was in existence at a different date. And then we note this catalogue is the 4th edition which allows us to guess that Baudet succeeded Chatelain in 1921/22.

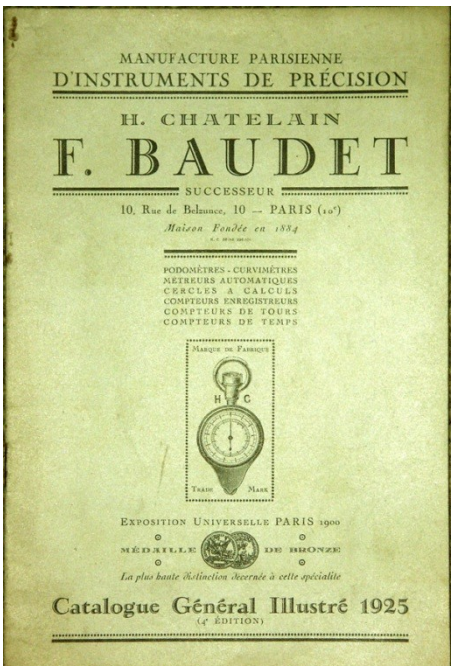


Figure 56: Baudet 1925 catalogue cover

The fourteen pages of the catalogue are, p1: Cover; p2: Index; p3: Compte Pas; p4: Improved Compte Pas; p5: Podometre; p6: New Improved Pedometers; p7: Pedometers with Russian measures, p8: Curvimetres; p9: English map measures, Rotameters; p10: Curvimetres in Russian; p11: Calculigraphes (shown below) and Tallys; p12: Tachometers; p13: Stop watches; p14: List of scales. Sadly there is no obvious difference between a Baudet "made" Calculigraphe and any earlier Chatelain made device! The Baudet device is marked as a "Type 1" Calculigraphe (in my taxonomy), being fat and having only the very simplest of markings, without opisometer or "France" anywhere on the picture for item 33, still showing "Système Boucher"..

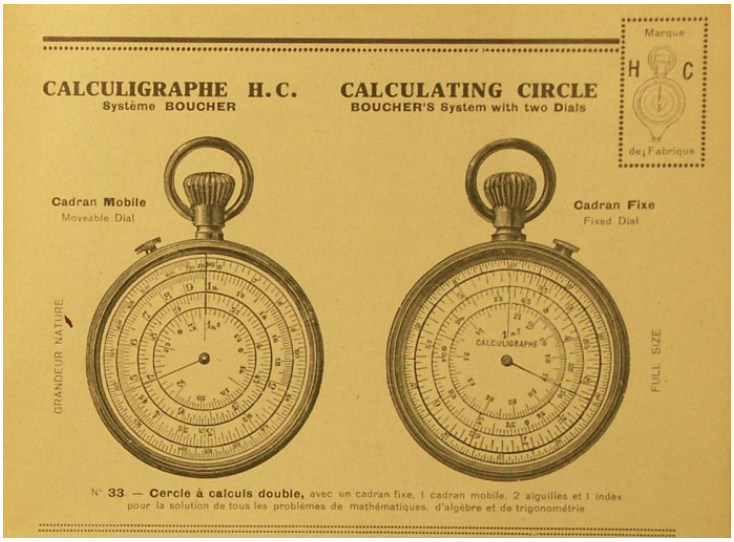


Figure 57: Calculigraphe advert from page 11

The complete Baudet catalogue is included in miniature as Appendix D**.**

1940

Following the apparent demise of Baudet sometime around 1940, we then find the following intriguing reference to yet another company that arose phoenix like from the Chatelain ashes, this time from a Chatelain company with a creation date of 1905 – for which again there is no obvious explanation.

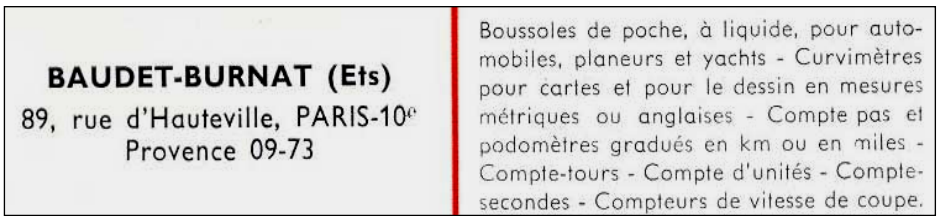


Figure 58: Baudet-Burnat advert c1980

The above advert from the c1980 Yearbook of the Syndicat Général de l'Optique et Instruments de Précision (SGOIP) shows a later manifestation of Baudet, this time called Baudet-Burnat, still at the 89 rue d'Hautville, 75010 Paris address. This particular company[13] has a registration No. 582.007.837 in the Trade registers, and was apparently founded in 1958, and "struck out" or "expired" (ceased trading?) on June 4, 1998. Elsewhere we find that the company Baudet-Burnat was re set-up in 1947 by Henri Burnat from the original company set up in 1905 by M[14]. Chatelain. Products (among others) include: pocket compasses for vehicles and marine use, shock-absorbed in liquid and for underwater use.

Figure 59: HB Logo

Baudet-Burnat was a known French manufacturer of instruments for hikers (altimeters, pedometers, etc.). Henri Burnat filed several patents (the EPO shows 19 between 1939 and 1994) including one for a new system to attach capsules in compass casings. At long last we now have an explanation for the so far unexplained "HB" Opisometer logo. Whether this takes anything from the original Chatelain logo is not known but Burnat's logo featured an opisometer together with his initials H(enri), B(urnat) and Paris. An advert for compasses from a c1977 or 1978 issue of the French climber's association Club Alpin Français (C.A.F.) magazine is shown below, and uses the 89 rue d'Hauteville address and "HB" logo. A second advert for an in-car compass (which I am sure we all possessed something similar at some stage) is also shown. This uses the HC and HB plus opisometer trade mark for Burnat.

It is very pleasing to be able to understand the background to Trademarks which have become commonplace, often without a full understanding. Now at least we have some dates to work with.

[13] https://www.compassmuseum.com/diverstext/profiles_f.htm#BAUDET

[14] I believe that this is for 'Monsieur' Chatelain, not a different person with forename starting with 'M'.

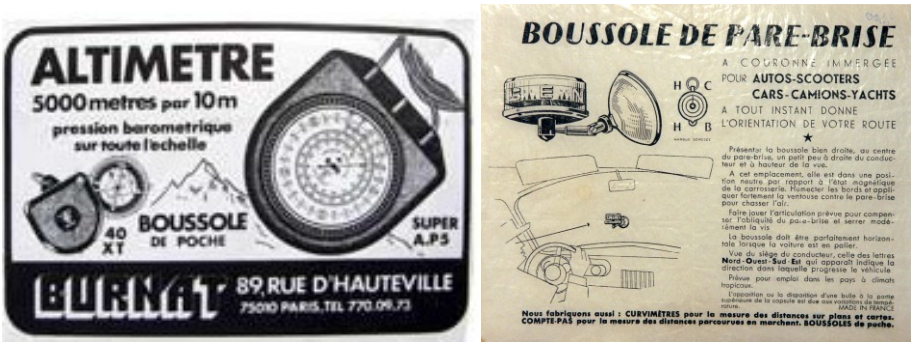


Figure 60: HB / HC Logo

The company information (in French) for Henri Burnat's original company and a translation into English is shown below. It makes for fascinating reading. There is no obvious link to Henri Chatelain in the 1905 date.

Annuaire du S.G.O.I.P. (Syndicat Général de l'Optique et de Instruments de Précision) de 1979 : Ets BURNAT Fabrique d'instruments de précision. Société à Responsabilité Limitée Capital 20 000 F 89 rue d'Hauteville 75010 Paris Sirène : 58200 78 37 000 13 La Société BURNAT est issue de la reprise en 1947 par M. BURNAT de la société créée en 1905 par M. CHATELAIN. Elle est spécialisée dans la fabrication de quatre produits principaux : CURVIMETRES PODOMETRES BOUSSOLES ALTIMETRES Marque de fabrique : un curvimètre avec en haut les lettres H et B, et au dessous Paris. Paris a remplacé les lettres H et C vues sur un annuaire des années 1950 qui ne donnait pas d'information sur la société.	Directory S.G.O.I.P. (General Union of Optics and Precision Instruments) in 1979: Ets Burnat Manufactures precision instruments. Limited Liability Company Capital 20 000 F 89 rue d'Hauteville 75010 Paris Sirène: 58200 78 37 000 13 The Company Burnat is formed after the return in 1947 by Mr. Burnat from the company founded in 1905 by M. Chatelain. It specializes in the manufacture of four main products: MAP MEASURERS PEDOMETERS COMPASS ALTIMETERS Trademark: a map measurer with at the top the letters H and B, and below Paris. Paris has replaced the letters H and C shown in the directory of the 1950s which gave no information about the company.

Table 4: Henri Burnat Company registration

The Compass Museum web site (https://compassmuseum.com/) states that: "BURNAT was created in 1947 when Mr Burnat acquired the company (name ?) created in 1905 by Mr Chatelain. Products (among others): dry and fluid dampened pocket, underwater compasses and (wrist?) compasses for underwater usage."

From this we can now estimate that the logo/trade mark which combined "HB" and "HC" plus opisometer probably began to be used in 1947 or possibly as late as the early 1950's and the simpler "HB" plus "Paris" and opisometer, began to be used sometime later around 1979. A letter addressed to Baudet Burnat at the 89 rue d'Hauteville, Paris address carrying a 1953 stamp frank is known.

Boucher / Morin / Chatelain / Baudet / Burnat Calculigraphe Known Key Dates

1841	*A Boucher born 17.05.1841 Nantes*
1848	*H. Chatelain born 02.07.1848*
1859	*F. Chatelain born 18.07.1859*
1876	Boucher's French and English patents.
1878	*La Nature* article reviews the Boucher Calculator very positively.
1878	Cajori says Calculigraphe manufactured by Henri Chatelain in Paris.
1879	First mention of Fritz Chatelain via a Provisional UK patent application.
1880	Earliest known Calculigraphe instruction book. No opisometer logo, Henri Morin formed in Paris.
1884	Possible foundation date for H. Chatelain (from Chatelain 1907) catalogue, confirmed on Baudet 1925 catalogue.
1885	Manlove Alliott & Co Boucher calculator.
1886	Manlove Alliott & Fryer Co Boucher calculator.
1887	The Didot-Bottin of 1887 is the first reference to Chatelain as a maker of curvimetres and podometres at Rue de Belzunce 10, Paris.
1890	Possible earliest Stanley Boucher calculator.
1892	Manlove's Boucher calculator.
1894	Article in *La Science Illustrée* explains that Chatelain had redesigned Boucher's calculator – but when did this actually take place? Uses the FC logo on all examples. A Chatelain Catalogue carrying this date is known.
1894	First mention of F Chatelain with the rue de Balzunce address in Paris mentioned in the *"La Federation Horologere Suisse"*. This is repeated during 1895 until he has his own address in 1896.
1895	K&E advertise a K&E Boucher (Calculigraphe) for the first time.
1896	Chatelain logos with different castle and lower and upper case HC.
1896	F. Chatelain with an address in rue de l'Hopital in Neuchâtel advertises in *"La Federation Horologere Suisse"*.
1897	Provisional UK patent: 28th May 1879, No. 2130, Colin E (Chatelain F) - Combined pencil holder, wealemefna, magnetic compass & seal. Not awarded.
1898	Swiss patent CH15675 of 10 January for a pedometer with four dials.
1899	Swiss patent CH18455 of 6 February for yet another pedometer design.
1900	Chatelain pedometer (using HC logo) wins highest award at "Exposition Universelle" in Paris.
1905	Date of Chatelain's founding according to Burnat 1949. French patent to Henri Chatelain, FR354144A of 9 May for a chain drive …..
1907	Henri Chatelain catalogue (3rd edition) showing start in 1884.
1909	Final Swiss watch making patent awarded to Fritz Chatelain.
1910	Calculigraphe pour reports de Bourse advertised in Morin 1910 catalogue, no examples known.
1918	*A.E.M Boucher dies 04.02.1918 Lorient.*
1921	*F. Chatelain dies 01.05.1921, and H. Chatelain dies 01.06.1921.*

1922	H. Chatelain succeeded by F. Baudet in Rue de Belzunce 10, Paris.
1924	Secretan are still selling Boucher calculator, Morin takes over Secretan in c1964.
1925	Baudet 1925 catalogue still shows Cercel a Calcul (Calculigraphe).
1930	Baudet is still shown as Rue de Belzunce.
1936	Morin continue selling Boucher calculators.
1940	Morin still selling Boucher calculators.
1940	The Didot-Bottin of 1940 is the final reference to both Baudet and H. Chatelain who is very definitely subsumed into Baudet, at 89 rue d'Hauteville, Paris.
1947	After WW2, Burnat returned to business in 89 rue d'Hauteville, with a mention to a link with a Chatelain company founded in 1905 (which is a mystery) also a link with Baudet.
1947	"HC" "HB" and Opisometer trademark for Baudet-Burnat starts.
1958	Formation of Baudet-Burnat, Reg No 582.007.837 at the rue d'Hauteville addresses with a similar product line to Chatelain and Baudet, but no Calculigraphes are mentioned.
1979	"HB" "Paris" and Opisometer trademark in existence
1998	Baudet-Burnat at rue d'Hauteville – the last link to Henri Chatelain – ceases trading.

Table 5: Boucher / Morin / Chatelain / Baudet / Burnat Calculigraphe Known Key Dates

Negretti & Zambra Boucher calculator

In the foregoing text describing Boucher Calculators**,** we have shown several examples by third party manufacturers (and adverts for others who aspired to make but never appear to have made - or are they simply retailers?) including "Manloves," in various incarnations, Stanley, and Morin, all of whom appear to have had a known or documented relationship with Boucher. Here we have the only other third-party maker or retailer with an unknown relationship to Boucher, known from two examples, both described here. There was also an interesting set of instructions.

<table>
<tr><td colspan="2">An example of a "fat" Calculigraphe "made" by Negretti & Zambra was sold in 1998, in a Stanly Auction. However, the exact markings it carried are not known. Here we have a Negretti & Zambra device marked Bouchers Calculator advertised but never sold on eBay in 2019, see below. Whether these two devices are the same is not verifiable at present</td></tr>
<tr><td> 
</td><td>Note that the 90° placing of the sidewinder in this device is the same as that for the Manlove-Alliott & Co Boucher devices – see 1885.</td></tr>
<tr><td> 
</td><td>Item 1478 in the July 1998 Toolshop Auction is poorly illustrated (left) and advertised as "A Bouchers calculator by Negretti & Zambra, various scales no other writing" There is no detail, but it does not look like the above device, it looks more like a "fat" Calculigraphe</td></tr>
<tr><td> 
</td><td>A second example of Boucher's Calculator, Logarithmical calculating "watch" by Negretti & Zambra, London, c. 1910, in a fitted case retailed by Tho's S Cogdon & Son, 28 Budge Row, London, 8cm.</td></tr>
</table>

Figure 61: Negretti & Zambra Boucher calculator

The Calculators – Calculigraphes

Calculigraphe Markings

An attempt at finding key features of HC and FC Calculigraphes with the aim of identifying makers, dates etc., started with a review of Calculigraphe calculators, now totalling well over one hundred examples and extended to probably double that figure, which has confirmed the fifteen distinct patterns of features set out in the table below of the first fifty plus examples studied and analysed.

Calculigraphe Markings							
Type No	*No of examples*	*Front (Fixed) Face*		*Rear (Movable) Face*		*Fat /Thin*	*Comment*
		Text	*Logo*[15]	*Text*	*Logo*[16]		
1	3	Calculigraphe	No	Nothing	No	Fat	
2	3	Calculigraphe	No	HC	Yes	Fat	
3	6	Calculigraphe HC	Yes	Made in France	No	Fat	
4	1	Calculigraphe HC	Yes	HC	Yes	Fat	
5	6	Calculigraphe HC Paris	No	Made in France	No	Fat	
6	2	Calculigraphe FC[17]	FC logo	FC	No	Fat	
7	1	Calculigraphe FC	FC logo	FC	No	Fat	screw
8	2	Calculigraphe FC	FC logo	Made in France	No	Fat	
9	16	Calculigraphe HC	Yes	Nothing	No	Thin	
10	1	Calculigraphe HC	Yes	Made in France	No	Thin	
11	4	Calculigraphe	No	HC	Yes	Thin	
12	2	Calculigraphe HC	Yes	L. Fischer etc.	No	Thin	
13	1	Calculigraphe Company name	No	Made in France (faint)	Yes	Thin	
14	1	Calculigraphe Made in France (faint)	No	HC	Yes	Thin	
15	1	CALCULATEUR	No	Nothing	No	Fat	

Table 6: Calculigraphe markings

The different types

The four major obviously identifiable differences are “fat” and “thin”; and HC and FC. They have the following identifying features.

The first eight types are ‘fat’ Calculigraphes, HC (the first five types) and FC (the next three types). These ‘fat’ are 2″ (52.5mm) diameter, ¾″ (20 mm) thick and weigh 97 gm. The ‘fat’ types are noticeably bigger (chunkier) than the ‘thin’ 2⅛″ (55mm) diameter, ⅝″ (16mm) thick and weigh 75.5 gm.

The winding furniture is noticeably different between the two types. The ‘fat’ examples generally have an oblate spherical crown sitting proud on a cylindrical pendant which carries the ends of the bow or loop. ‘Thin’ examples have a flatter diamond shaped crown which sits in a cup on top of a shorter more ornate turned pendant. The cup is the termination for the ends of the loop (bow).

[15] The logo is the Opisometer for Henri Chatelain (HC) (see p50)

[16] or the Castle for FC (see p52)

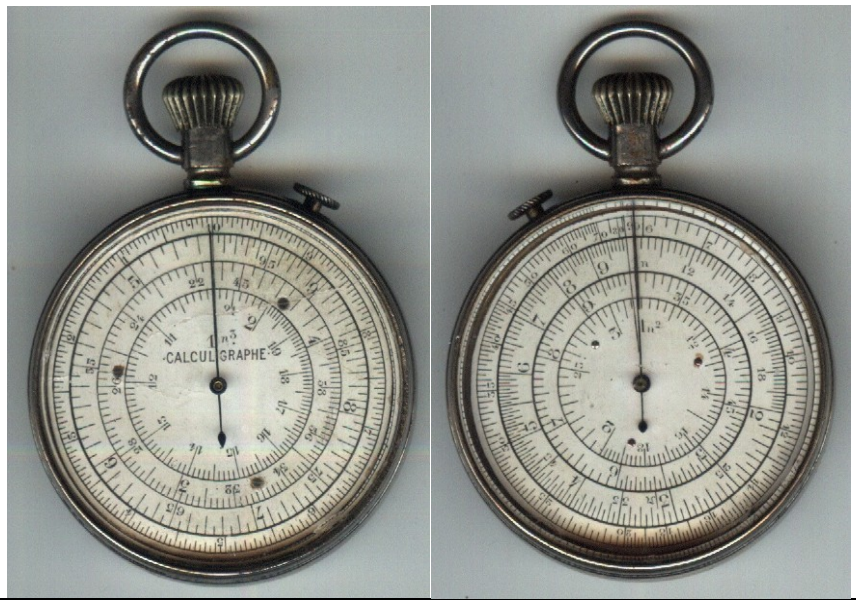
[17]. Diagram from *La Science Illustrée*, No. 347, 21 Juillet 1894; Les Inventions nouvelles. With diagrams of FC Calculigraphe.

The angle of the clutch button to the vertical is different for HC and FC types: 30° for HC and 25° for FC Calculigraphe clutch buttons. To me this signifies different manufacturers, otherwise why the difference? But no evidence has been found to support this.

Now that we can be fairly sure that all Calculigraphes were made by Henri Chatelain and that the 'French' devices were sold by Henri and the 'Swiss' by Fritz Chatelain, it is even more difficult to explain the differences particularly as the Type 8, "Fat", is marked made in France.

The side view of "Fat" and "Thin" Calculigraphes is shown in Type 7 for a "Fat" Calculigraphe, albeit with the slightly unusual feature of the extra screw let into the side for an unknown reason, and Type 9 for a typical side view of a "Thin" Calculigraphe. They are suitably different to be extremely obvious when looking at an actual example – and hence to allow the identification of truly anomalous examples, a few of which are illustrated later.

Type 1



'Fat'

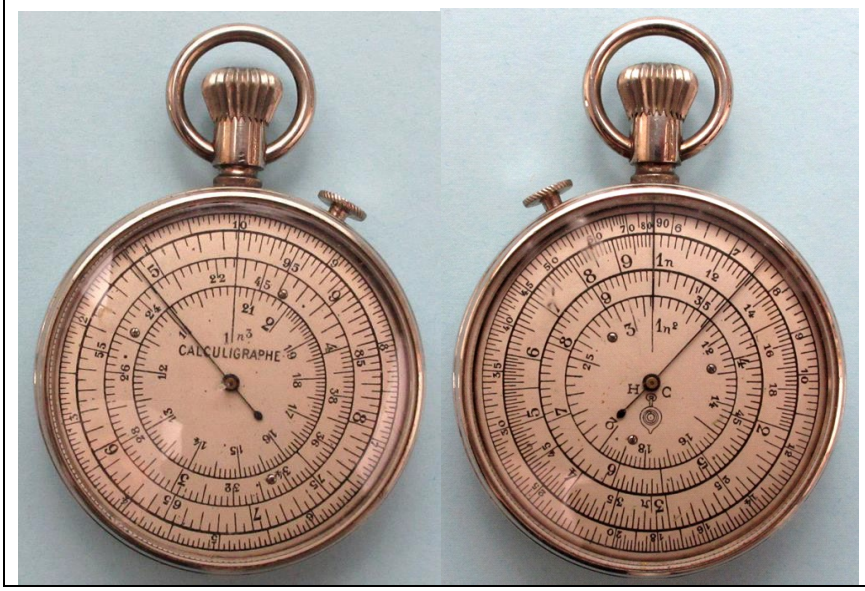
Front: Calculigraphe
Rear: No marking

This is one of only two Types (See also Type 5) which does not include the opisometer logo anywhere on the calculator. It is the simplest marking only indicating 'Calculigraphe' on the front. It may have been made by Baudet, c.f. 1925 catalogue

Paper / card scales

PMH collection.

Type 2



'Fat'

Front: Calculigraphe
Rear: HC & Opisometer logo

Metal or paper scales held on with three screws. Illustration courtesy of Gannymede Antiques.

So far, two examples which would appear to have been sold by K&E in the USA, as they both have K&E Instruction leaflets, are both Type 2 Calculigraphes. Also sold in UK. PMH Collection.

Type 3

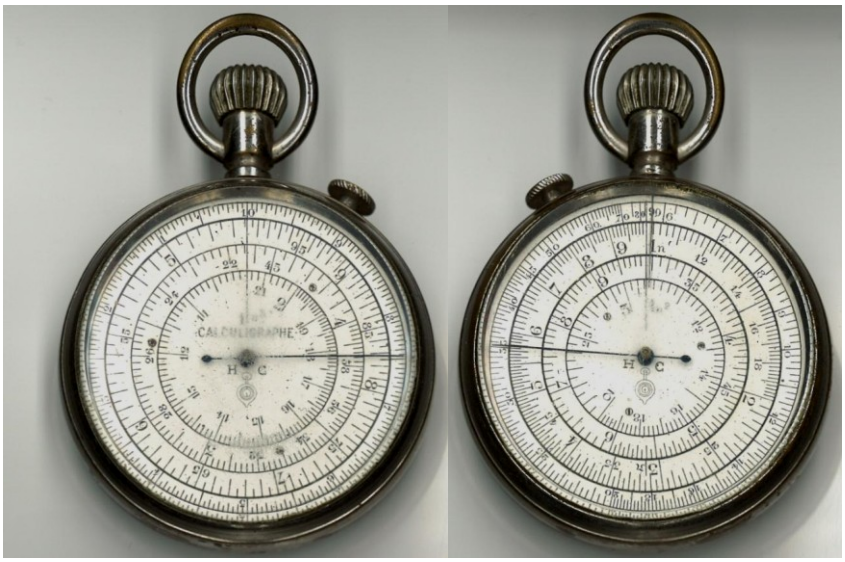
'Fat'

Front: Calculigraphe & HC & Opisometer logo
Rear: Made in France

A Type 3 example, accompanied by the 1880 dated Instruction booklet in French, has been seen on eBay.

This does not seem logical. One would assume that the statement "Made in France" on the verso would imply that it was intended for an English speaking country; the accompanying French instruction leaflet thus seems counter intuitive.

Type 4



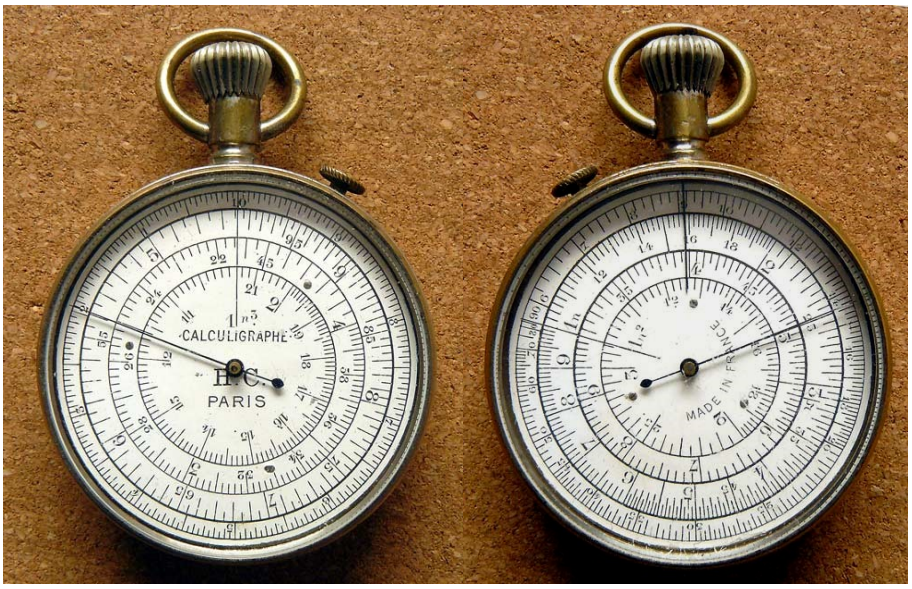
'Fat'

Front: Calculigraphe & HC & Opisometer logo
Rear: HC & Opisometer logo

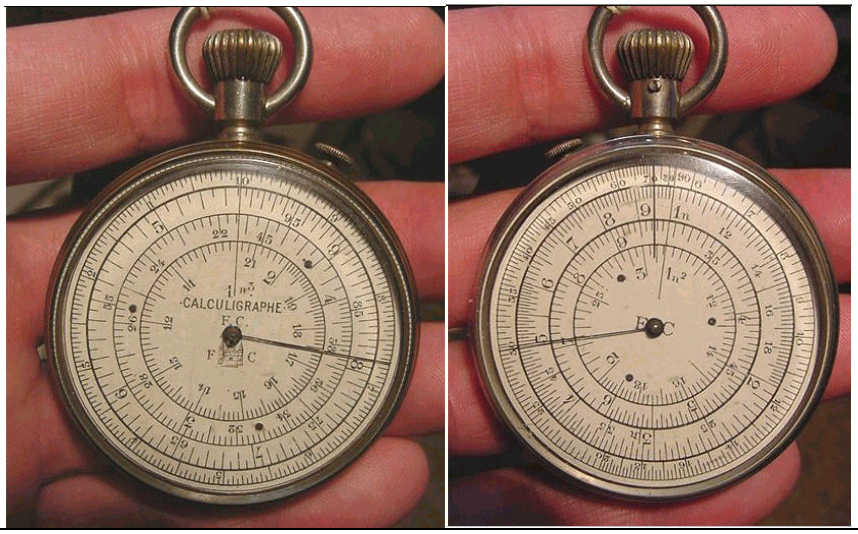
This may yet turn out to be the earliest example of a Calculigraphe; it came with a handbook in French, 'Cercle a Calcul (Calculigraphe H.C.) Système Boucher' dated August 1880 with the address 'Havre' (see Handbook Type 1)

It is the only type with the legend HC and opisometer logo on both front and rear faces. It does not say "Made in France" which is sensible for an example with French instructions.

P.v.d-M collection.

Type 5  	**'Fat'** **Front:** Calculigraphe & HC & Paris **Rear:** Made in France Type 5 seems to be the "odd-man-out" being the only one which mentions Paris anywhere on the calculator. This is not repeated on either FC or 'thin' examples. It also does not use the opisometer logo Types 1 to 5 inclusive (except Type 2) all appear to have paper scales held on by three screws each side, 120° apart.

Types 6, 7, and 8 following are three versions of FC Calculigraphe. They follow the styles already seen for 'fat' and which will also be seen later for 'thin' HC Calculigraphe examples.

Type 6  	**'Fat'** **Front:** Calculigraphe & FC & Castle logo **Rear:** FC eBay 2001

Type 7

'Fat'

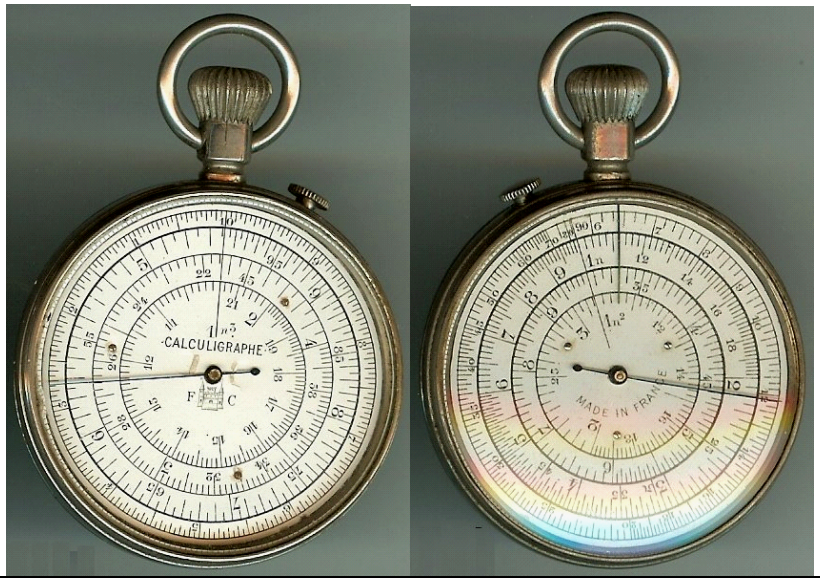
Front: Calculigraphe & FC & Castle logo
Rear: FC

It was originally thought that Type 7 was marked HC on the rear face, and was thought to be the physical proof of the commonality between the two 'types' FC and HC. This has since proved not to be the case; it is similar to Type 6 in the markings it carries. It does have another unique feature; the screw on the shoulder shown in the side view – why and for what? No other examples / types have this screw.

Note: On some other makes of pocket-watch slide rule similar screws are used to anchor a rod or axle, thus they are usually seen on the bottom of the watch case opposite the crown. There are no obvious axles at that angle on this device so its use is definitely not obvious.

With thanks to Tim and Harold Bailey Jnr.

Type 8



'Fat'

Front: Calculigraphe & FC & Castle logo
Rear: Made in France

Courtesy of Clay Castleberry, also seen on eBay

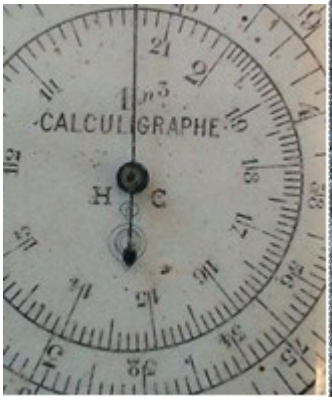
The next six types (Types 9 to 14 inclusive) are all 'thin' Calculigraphes. The most noticeable generic difference is the crown and bow. The crown is generally smaller and sits within a cup placed on top of a more ornate pendant; this cup is also the pivot for the ends of the bow.

This style of winding mechanism is fairly reliable as an indicator of the Calculigraphe in question being a ‘thin’ example, as are the very idiosyncratic hands. However, there are a small number of exceptions, i.e. a ‘thin’ Calculigraphe having a ‘fat’ winder and probably vice-versa; also different hands, so it is not absolutely accurate!

Type 9  	**‘Thin’** **Front:** Calculigraphe & HC & Opisometer logo **Rear:** No marking This is possibly the most common, standard Calculigraphe, with the largest number of examples seen. This has card faces, held on with two screws on one side only (rear), 180° apart. Compare this with the T13 which has no obvious assembly screws. The front face is glued to the annulus, unlike the example showing the internal mechanism on p82. PMH Collection.

Type 10 	**'Thin'** **Front:** Calculigraphe & HC & Opisometer logo **Rear:** Made in France No screws on front, two screws on rear. Card face? As T9 with the addition of "Made in France" on the rear face. eBay 2010

Type 11 	**'Thin'** **Front:** Calculigraphe **Rear:** HC & Opisometer logo Metalised faces, held on by two screws each side, front about 205° and back 180° apart. The front is thus most unusual to look at. Courtesy of Tom Martin

Type 12   Marked L. Fischer, 12 B. rue des Capucines Paris Hotel, as are the other Fischer examples	**'Thin'** **Front:** Calculigraphe & HC & Opisometer logo **Rear:** Third party retailer name and address Type 12 is taken as a generic type which incorporates a third-party retailers name on the verso, with HC and the Opisometer logo on the recto. This is effectively a T9 with 3rd party retailer's details, and assembly screws on the back only. Examples are known, with different retailer's names and details, see list below
 	- A second example identically marked for Fischer, is in an unusual 'Fat' format, with scale markings which are not marked in this way Early version with different case (as T14?) but same scales? eBay 2016
 	A third possibly "fat" example with yet different markings for Fischer, see left. eBay 2017

Sold in 2016, Beween 1878 and 1898 P. Berville was at 25 Rue Chaussée d'Antin in Paris, making this possibly a very early Calculigraphe.

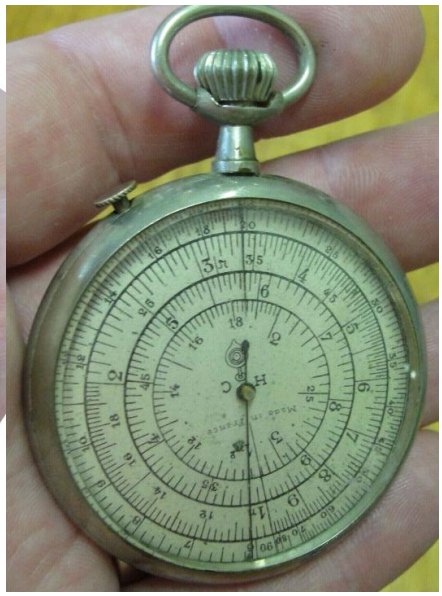
- The examples above are marked L. Fischer, 12 B. des Capucines Paris Hotel; on the rear face (two examples).
- Another Type 12 example is marked P. Berville, 24 Chausee D'Antin, Paris. (above)
- A third example marked L. Fischer with the same address is in Type 2 format, i.e. Fat, with the address on the front face.

Both Fischer and Berville were well known instrument retailers in France during the late 19th and early 20th centuries.

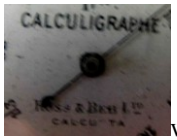
A "fat" example, supposedly "made" by Negretti & Zambra was sold in 1998, but the exact markings it carried are not known. There may be some confusion with a Negretti & Zambra Bouchers calculator which sold on eBay in 2019, see p66.

The "Queen" example which follows T14 is a genuine and quite unique American third-party maker which also has Calculigraphe scales and a clutch mechanism, but is very obviously different from both the Type 12, and Type 13 examples.

Type 13



There are no obvious assembly screws on either side. Compare with T9 & T10



which have screws on the rear only.

'Thin'

Front: Calculigraphe & third party retailer name, and part address
Rear: Made in France (very faint). HC & Opisometer logo.

Type 13 has only been seen once on an example sold on eBay in July 2010. It is sufficiently different to T12 to be given its own type number. It could also be considered a Type 11 with additional and different marks.

The retailer has no address; however under the Ross and Beb Ltd. name is what appears to be 'Calcutta' but is not definite. Nothing further found, and no record of such a Company.

Type 14

This variant has two obvious assembly screws on both sides. This is very similar to T11, with the front screws about 205° and back screws 180° apart. Thus the front has a most unusual appearance.

'Thin'

Front: Calculigraphe & Made in France (very faint)
Rear: HC & Opisometer logo.

Type 14 has only been seen once on an example sold on eBay in February 2013. It is sufficiently different to T13 to be given its own type number, however it could be considered a variant of T13 as it has very similar furniture. The lengthy neck to the pendant and the shape of the crown are features which are similar. It is unique in being marked Made in France on the front face. The case is "smooth" as T13. All other 'thin' devices have strengthening ribs on the bezels

Type 15  Peter Fox Collection	***Fat*** **Front:** CALCULATEUR This is a new and unusual naming for what is obviously a Calculigraphe complete with usual push-button. No other names or logos. **Rear:** No markings other than standard scales Type 15 has only been seen once. This example, now in the collection of Peter Fox, was sold on eBay in December 2019.
 Type 15 is typical of most 'fat' Calculigraphe in that there are three screws to each front and back, however these are noticeably larger than the standard tiny screws that feature on most other models. 	This example is unusual as it has a serial number – 37930 – an o/d of 53mm, and thickness 19.4mm which is not particularly unusual

Queen & Co. Inc.

Very little is known of Queen & Co and their Boucher calculator. One example is known. What there is has been encapsulated in my recently published "Pocket-Watch Slide Rules", expanded here below. Whether Queen had the capability to manufacture such a device is open to question. However, as at one time they were the largest maker of mathematical instruments in the USA so we have to assume that they did have such a capability. It makes them very unusual as the only American company, other than K&E, to make such pocket-watch slide rules. The calculator has not been found in any Queen catalogue.

***Queen.* (USA.)** 1853 – 1912

Address: James W. Queen,
1853 – Optical and Philosophical instruments
1859 – joined with Samuel L. Fox, became James W. Queen &Co
1888: 924 Chestnut Street, Philadelphia, USA
1893 – Incorporated as Queen & Co
The Union, 91 Walnut Street, Philadelphia, USA.

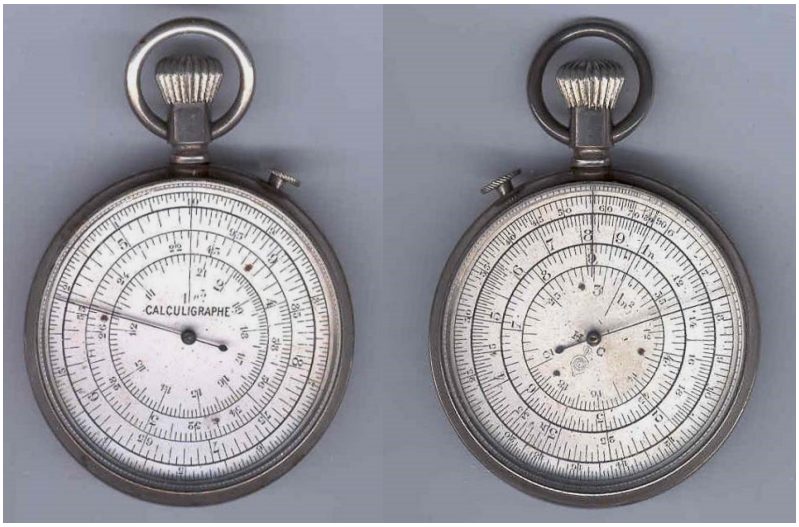
History: "James W. Queen was born in Philadelphia in 1815. He is first listed in 1839 Philadelphia directory as an optician. In 1853 he started a small firm. In 1859 he became associated with Samuel L. Fox and the firm became James W. Queen & Co. For a number of years there was a branch office in New York City. James Queen retired in 1870 and died in 1890. The business was continued as James W. Queen & Co. until 1893, when it was incorporated as Queen & Co. Queen & Co., Inc. existed until 1912 at which time it was reorganized as the Queen-Gray Co. by John G. Gray and continued as such until Mr. Gray's death in 1925." [18]. Known to have sold Faber slide rules c1902 and also a version of the Calculigraphe with their name on it.

Made: Sold a Boucher named version of the 'Calculigraphe' Pocket watch calculator

[18] Smart, Charles E. *The Makers Of Surveying Instruments In America Since 1700* Troy, New York: Regal Art Press. 1962

Anomalous Types

In confirmation of some of the anomalies that have been mentioned earlier, our last five examples shown are just those – anomalous! It could quite reasonably be argued that each is yet another distinct Type; they are as rare as Types 4, 7, 10 and 14 with only one or sometimes two identified examples. However they feel unusual. In over fifty examples only these have been found that do not obviously fit into one of the listed 14 Types. Thus for the present these have been identified as anomalous versions rather than a distinct new Type.

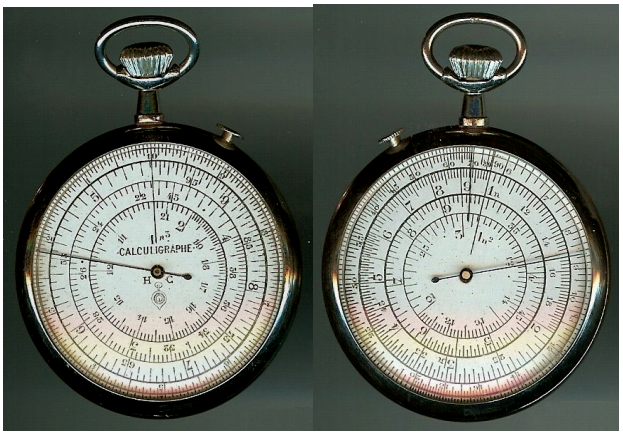


Anomaly 1. This is a Type 11 (thin), but with 'fat' winding equipment, from Rod Lovett's web site[19]. It is confirmed as 1.7 cm thick (⅝″) which definitely makes it a 'thin' device.

Anomaly 2. This is an apparent Type 9 (thin) sold on eBay, (1999), confirmed in the item description as ½″ thick, but which has 'fat' winding furniture.

A possible second example of Anomaly 2 has been seen. The Jim Bready collection has one similar to this, but it has not been possible to confirm dimensions and check whether it is truly "fat" or "thin".

[19] https://sliderules.lovett.com/chatelain/chatelain.htm



Anomaly 3. Courtesy of Clay Castleberry, is another Type 9, thin, complete with the appropriate thin watch furniture, but it has an exceptional long and very plain pendant, possibly similar to that illustrated on the Type 13 example shown earlier. It is notable for being plain rather than with turned balusters.

A second example of Anomaly 3. with the same features (below) has the markings for a Type 2, as does yet another example which appears to be older, with different hands sold in Jan 2018, shown below that.

This style of pendant may be indicative of a particular maker, (illustrations in catalogues from French maker Henri Morin show just such a long pendant) or it may have some other, as yet unknown, significance.

Mechanisms

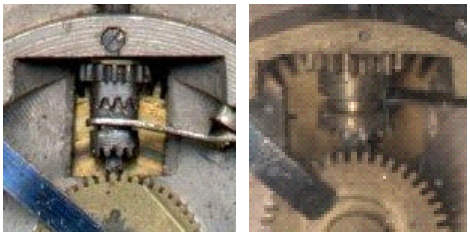
Having seen the many variants of the complete devices, it is now illuminating to have a look at the mechanisms of the two major types.

Thin calculigraphe mechanism- front

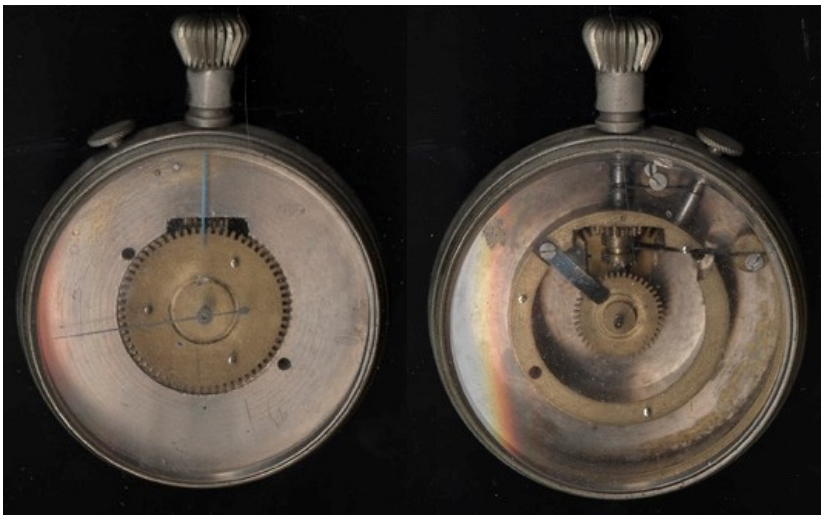
The mechanism at left is that of a "thin" Calculigraphe, as evidenced by the furniture. However, by careful study we can guess that it is perhaps yet another anomalous type because it has three equally spaced fixing screw holes on the fixed annulus of the body, something not seen on any of the identified "thin" types so far listed.

A second example of "thin" front case from the author's collection is identical but does not have the screw holes to attach the scale to the annulus; instead it has the scale glued to the ring, (below left) which is not an ideal situation for repairs!

The mechanism is very crude, and we can see perhaps why "thin" Calculigraphes do have a notchy feel to them. The upper (larger) of the two small steel gears fixed to the crown axle has perhaps 14 teeth on it, this being in permanent contact with a larger brass gear which can be seen through the aperture. This larger gear would be the one which drives the movable scale on the reverse of the calculator. Operating the clutch button disconnects the crown from the gear behind, and brings the smaller of the gears on the crown axle with only perhaps 12 teeth into contact with a smaller diameter brass gear (held in place by the blued steel spring which can be seen) which has perhaps 48 teeth. It does indeed take four turns of the crown to drive the pointers round one turn of the faces, while the movable scale requires about 5½ turns of the crown for one scale revolution.



Comparison of gearing thin & fat mechanisms



Fat Calculigraphe mechanism

The mechanism of a "fat Calculigraphe is shown above (courtesy of an intriguing device in the famous Keuffel & Esser cabinet[20] in the MIT Museum in Boston), and is identical in principle to that of the "thin" device shown previously, except that the gearing of the two movements is very different. The gears on the crown axle are larger and have a greater number of teeth. From what can be estimated from the pictures both gears have 18 teeth. This, coupled with a 48 tooth gear driving the pointers and 72 teeth on the scale gear, gives 2¾ turns for one rotation of the pointer and 4 turns for one revolution of the scale, which is considerably smoother in operation.

The three equal spaced screws used on both front fixed scale and rear movable scales are very obvious in the illustration; on the large gear for the movable scale and on the annulus (right) for the fixed scale, the rear pointer being missing.

Minor detail differences between fat and thin devices are also obvious. The thin device uses a tiny grub screw in the top of the annulus to hold in the crown axle, the fat device uses a separate spring which locates in thin shallow rings in the crown axle and also the push button clutch for location. This is a more expensive but probably ultimately a smoother solution.

A second example from the author's collection is shown at left with other small differences.

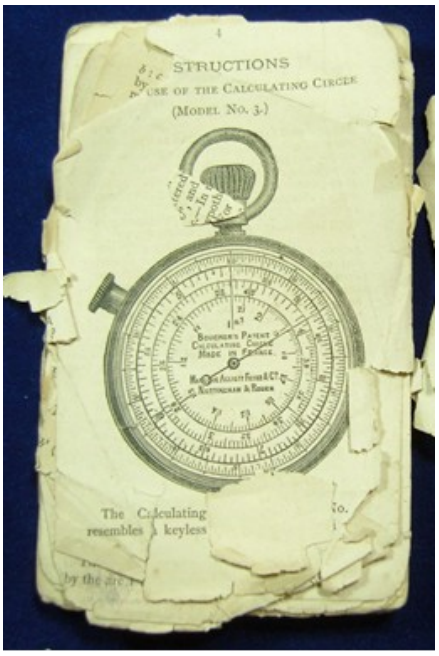
The mechanism of the Calculateur (Type 15) with its distinctive serial numbers is shown at right.

[20] https://webmuseum.mit.edu/media.php?module=objects&type=browse&id=9&term=Keuffel+%26+Esser+Company+Collection&page=2&kv=87947&record=93&media=1

Boucher Instruction Books

Only two true Boucher instruction booklets are known, neither in any detail. The first, shown below, is part of an "early" Boucher calculator with the 'Havre' address. A date of 1878 can be seen on the cover, but the context is missing, as is the content! Two other examples follow. I have yet to see a complete example.

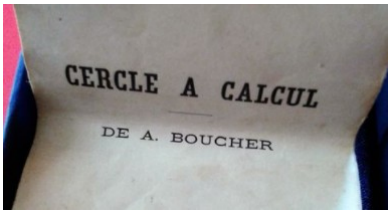
The second example is the one previously covered which was part of a MAF Boucher Calculator and is repeated here for completeness.



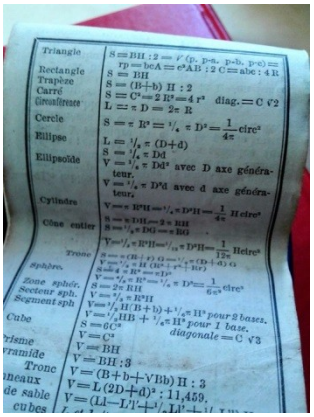
Neither has any reliable date that can be attributed to it.

A Boucher handbook was a part of the Negretti & Zambra device sold by Cheffins in 2018 and is shown below. The extremely faint picture shows that the instructions are actually for a Type 3 Boucher "Calculating Circle" made by Manlove of London! This is similar to the MAF instructions shown earlier

An 'Early' Bucher sold by Catawiki in France also had a set of instructions which are strangely reminiscent of the Calculigraphe instructions; see below for the assortment illustrated



The words accompanying the sale are confusing, firstly quoting an 1875 date for the first Boucher and then implying this device was made much later by the "second" manufacturer – Morin.



Many questions remain to be answered on the subject of handbooks!

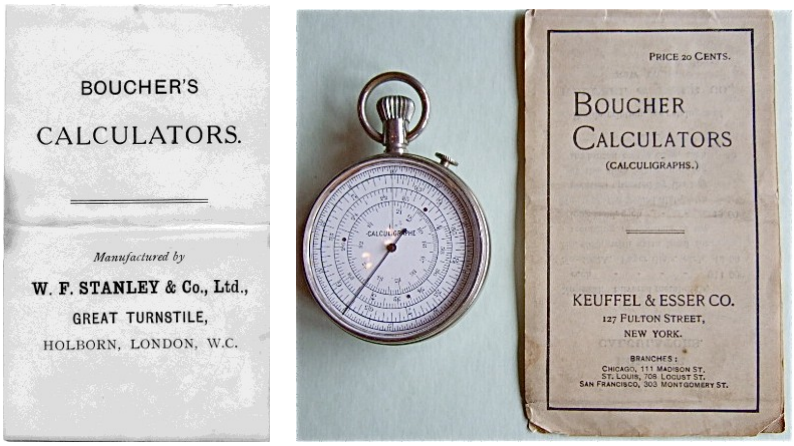
Calculigraphe Instruction Books

In the absence of any example of original Boucher instruction booklet, (other than one from Stanley for their "Boucher's Calculators" – below) there are fortunately a number of Calculigraphe instruction books to hand to be able to start a classification.

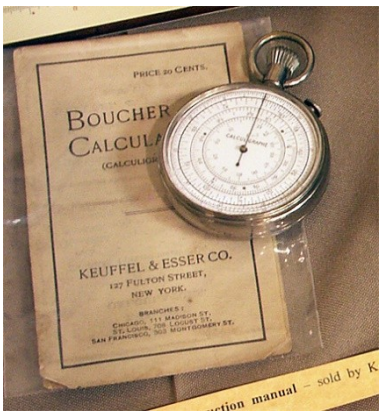
Whether the very confusingly labelled "Boucher Calculators (Calculigraphs)" instructions produced by Keuffel & Esser in the USA (below) would provide any more information is not known as we have not been able to examine a set in detail. Note the different spelling, with the missing 'e'.

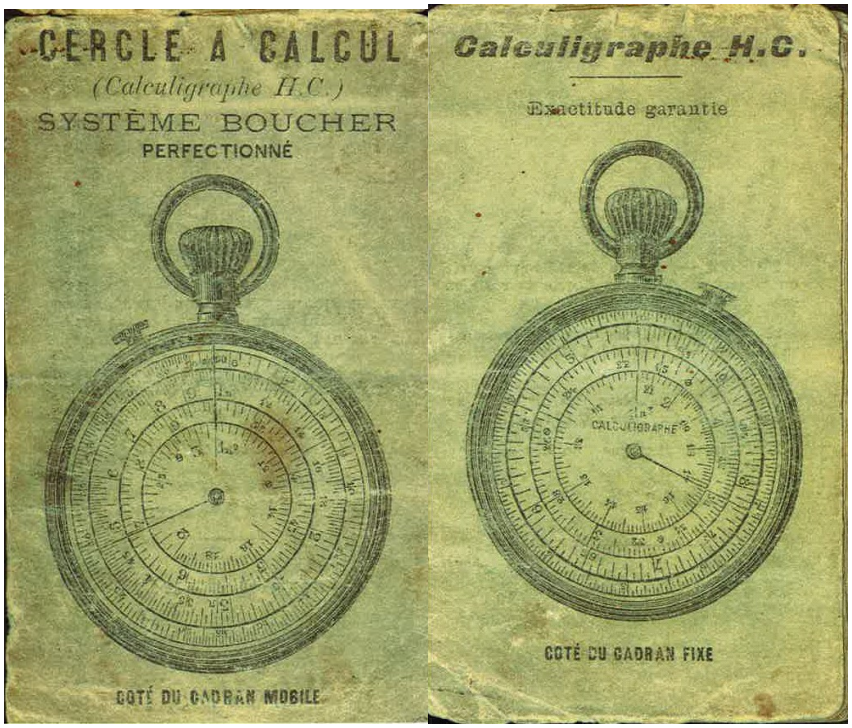
Again, one would have thought that the K&E instructions must also be a possible source of dating information. Whether anything can be made of a particular instruction book which came with a particular calculator remains to be seen, but we must always remember that these are the ultimately transferable part of a slide rule!

A number of types have been identified but so far there is little or no correlation between calculator types and instruction book type, or indeed between books in French or English.



W.F. Stanley and K&E instruction booklets



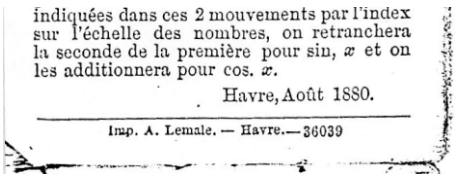


Handbook Type 1

Dated 1880, address Havre.

Ex Pierre vander Meulen.

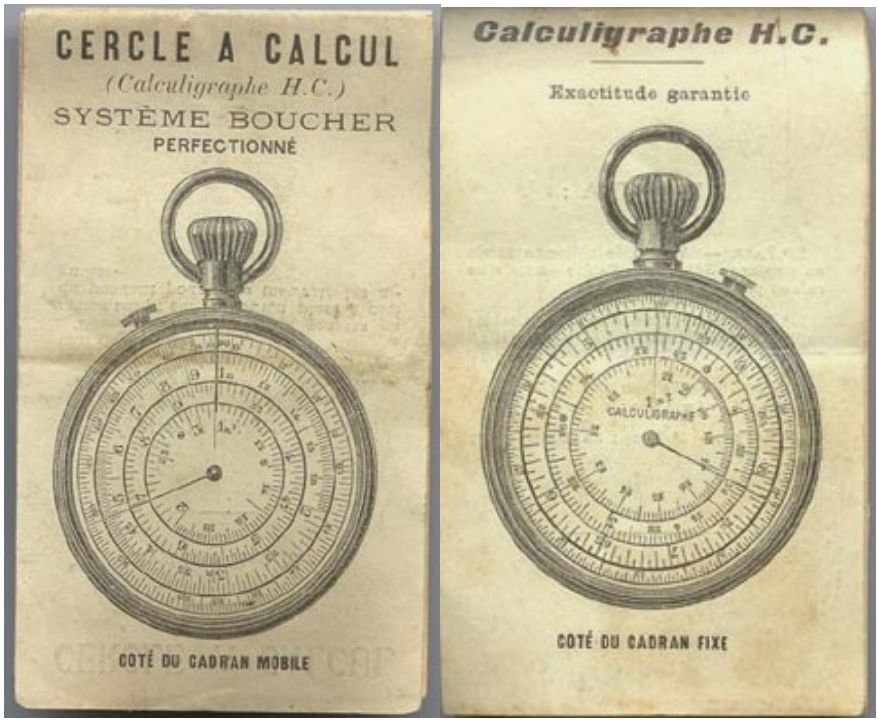
Came with a Type 4 Calculigraphe.


indiquées dans ces 2 mouvements par l'index sur l'échelle des nombres, on retranchera la seconde de la première pour sin, x et on les additionnera pour cos. x.

Havre, Août 1880.

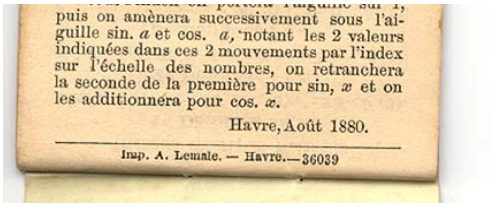
Imp. A. Lemale. — Havre.— 36039

The publisher 'Impression A. Lemale' appears well established in L'Havre from 1835 onwards, so is probably contemporaneous with the Boucher invention and early Calculigraphes from Henri Chatelain.



Handbook Type 1 (Copy 2)

Dated 1880, address Havre.

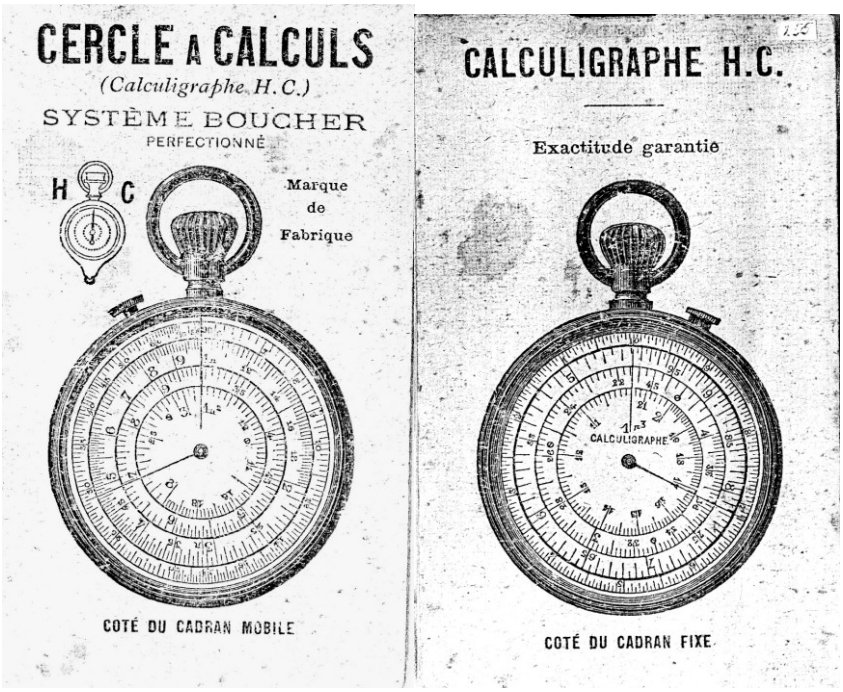
Ex e-Bay 357228 2001. 

puis on amènera successivement sous l'aiguille sin. a et cos. a, notant les 2 valeurs indiquées dans ces 2 mouvements par l'index sur l'échelle des nombres, on retranchera la seconde de la première pour sin, x et on les additionnera pour cos. x.

Havre, Août 1880.

Imp. A. Lemale. — Havre.—36039

Came with a Type 3 Calculigraphe.



Handbook Type 2

Unknown date, but very similar to Type 1 except that it uses the HC Opisometer logo and has slight differences:

- Cercle a Calculs versus Calcul (Type1)
- Upper case replaces lower case font on reverse

Ex Herman van Herwijnen .

Came with a Type 9 Calculigraphe.

This is the first known use of the opisometer logo, but it is not used on the illustration of the Calculigraphe itself. It is a shame that there is no date anywhere on this copy of instructions which seems to be closely following in date to the Type 1 version above.

Handbook Type 3 (Copy 2)

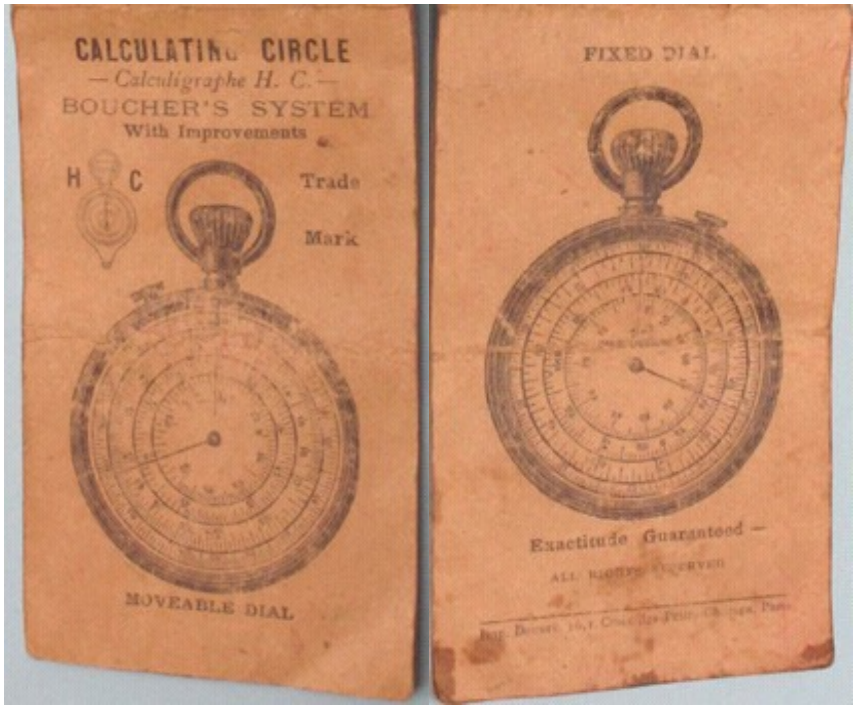
Unknown date, but appears to be the English translation of the Type 2 handbook.

Differences:
- "Calculigraphe HC" missing from the back – a feature of English handbooks?

Ex eBay 2004, and ISRM .pdf copy.

Examples came with Types 1 & 5 Calculigraphes.

(**Note**: the eBay advertising words used in the sale relating to the Calculigraphe that these instructions were sold with was extremely confused, stating that: "Two copies of this instruction book" were sold with it, and also called the device a Stanley Boucher calculator! It continued "It comes with 2 manuals (there might have been two copies of the manuals, but a third book was the "*Slide Rule & Watch Calculator*" which has nothing at all to do with the Calculigraphe.)



Handbook Type 4 (Copy 1)

Unknown date, but appears to be another version of the English translation of the Type 2 handbook

Differences:

- "Calculigraphe HC" missing from the back
- French Publisher's address:

Imp. DOUSTE,16,r.Croix-des-Petits-Champs, Paris

Publisher "Impression E. Douste" is known from 1877 – (a dated Photogravure picture.)

Ex Ganymede antiques, with thanks to Keith Petts for details.

Came with a Type 2 Calculigraphe.

Our conclusion on handbooks is so far limited to Calculigraphe handbooks. One example of a "Boucher" instruction booklet from any of the French makers has been found, though several are illustrated on p84. One example of a Stanley Boucher handbook is known, from which no obvious conclusions can be drawn.

Restricting our comments to Calculigraphe handbooks, the most we can say at the moment is:

There appear to have been at least two editions in French and only one edition in English but possibly several reprints. There has been no publisher identified for any English version, nor obvious dating information.

The obviously dated 1880 version, significantly, does not show the opisometer logo, so we can only assume that this famous logo came into use sometime between 1880 and 1894 when we have a dated Chatelain catalogue which does use this logo.

Conclusions

Despite all the foregoing observations, there are few firm conclusions that can be drawn:

- There are at least three makers of Boucher calculators.
- Henri Morin was a major maker.
- There are different "fat" and "thin" Calculigraphes.
- FC Calculigraphes are only ever "Fat" devices (so far?).
- HC and FC Calculigraphes have a different angle for their clutches, HC "fat" and "thin" are the same angle.
- We have discovered who might have sold FC Calculigraphes – Fritz Chatelain in Neuchâtel in Switzerland.
- It is entirely possible that all Calculigraphe models were made by Henri Chatelain in Paris, but sold by other retailers, especially the FC marked devices by Fritz Chatelain.
- Chatelain was succeeded by F. Baudet and then ultimately by Baudet-Burnat when Henri Burnat appeared later.

We cannot be definite as to why there are so many variations or types or which was the earliest. We cannot distinguish between devices made by either of the Chatelains and any other makers. The different clutch angles between FC and HC marked devices points to different makers, but as it is now believed that they might have been made by the same maker, it is highly possible that they were only retailed by Fritz and Henri respectively. The common features between the Types are self-evident, for instance it is satisfying to note that each major "family" – fat, thin and FC – features a "Made in France" example which surely had to have been made for the English speaking market.

The fact that a little more has been discovered about Henri Chatelain himself is a great step forward, however his early days and his antecedents remains a mystery. How he comes to be the re-designer and ultimately the maker of the Calculigraphe, an apparent improvement on the Boucher, which seems quite good, similarly remains an on-going mystery. We can now be definite on why HC and FC variants exist; there were two retailers with an unknown relationship. However, as a result of the discovery of the Chatelain 1894 catalogue which now shows both HC and FC devices as made by a Chatelain, with the possibility that one brand name was made in Switzerland at his "manufactory" – probably Maison Chatelain run by Fritz Chatelain, and the other made in Henri's Paris facility, brings us no nearer an answer and as yet there is no obvious explanation for this situation. The remaining frustration is the absence of a sensible rationale for the two factories and how they inter-related! Nevertheless there are now the beginnings of a catalogue of Calculigraphe variants which can be added to, and further explored within our new context in the fullness of time.

The excellent research via the Didot-Bottin French trade catalogues has enabled a timeline to be started for Henri Chatelain, and we now know that the firm was first mentioned in 1887 at rue de Belzunce 10, Paris; later at No 12. We have two other cases where it is said they were founded in 1884 and we have another where it is said they were founded in 1905. We believe they were making Calculigraphes much earlier than these dates – we need an explanation.

We know that they had a manufactory in Neuchâtel in Switzerland as well as the Paris address, and this is confirmed variously by advertisements from both Henri and Fritz. We now also know that Henri was succeeded by F. Baudet (another new maker to further investigate) sometime about 1922, but we do not know why, but can guess that followed his death. Fritz appears to cease activity somewhat earlier, again for unknown reasons, but also died in 1922. F. Baudet disappears from the scene in about 1942. There is then Henri Burnat with his HB logo, and the slightly mysterious Baudet-Burnat relationship through to 1998. Burnat was the owner of the HB+HC logo on the well-known opisometer image.

The excellent on-line archives of “Feuille d’Avis de Neuchâtel” – a daily paper which carried adverts as well as news and entries in the Swiss “La Fédération Horlogere Suisse” Bulletins have enabled us to produce a reasonably comprehensive timeline for Fritz Chatelain. Sadly the start and the finish of this particular thread require more detail.

For Boucher the situation is largely similar:

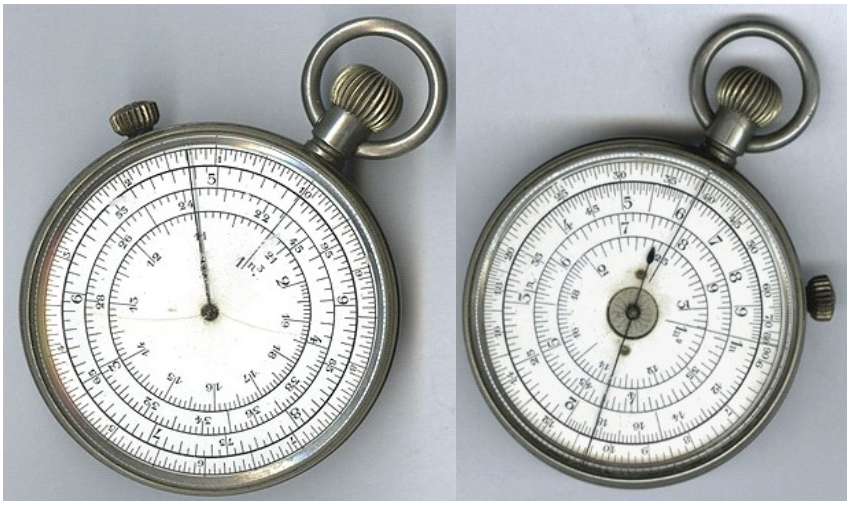
- We still do not know who made the earliest Boucher calculators.
- Neither is it possible to identify any maker of “later” Boucher calculators.
- The maker of anything labelled ‘Manlove’ etc. also remains a mystery!

All things come to those who wait – or as this relates to French makers: ‘*tout vient à celui qui sait attendre’* – we shall see what other information appears, hopefully as a result of this catalyst!

Postscript

I'm not sure exactly how to approach the final examples illustrated here. I do not believe that the first is truly a Calculigraphe; certainly not in my terminology, as that would require it to have a clutch. But it has very obvious "Calculigraphe" scales. Yet there is no maker's name, country or logo to give us a clue as to who made it or where or when it might have been made. Vitally for my definitions, it uses a side winder instead of the more usual Calculigraphe clutch to move the hands on both sides; the crown moves the scale on the verso exactly as a Calculigraphe. Is it a Boucher calculator from one of the makers we have explored; maybe the one that was initially found wanting?

Type 16 or Type 0?



Only two examples are known. This one from the Gemmary web site courtesy of Rick Blankenhorn, and a second, shabbier example, is in the author's collection.

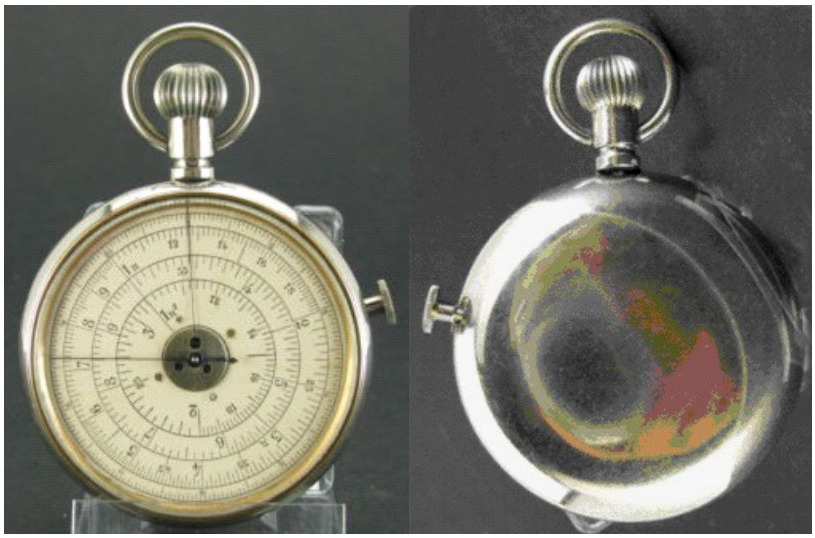
In terms of size and general appearance, with the exception of the side winder and the very much more prominent central "axle" on the verso, which does not actually move, this could be a "fat" Calculigraphe. The diameter and thickness are the same, the weight similar – 102gm v 97gm for a "fat" Calculigraphe.

My example, and it would appear the Gemmary one as well, have porcelain faces, exquisitely marked but obviously rather fragile.

The winder angle is very different (55°) versus 30° or 25° for HC or FC Calculigraphe clutch respectively, or 27° for the Queen example.

So what is it and who made it? Should it be called a Calculigraphe Type 16? No! I believe definitely not as it does not have a clutch mechanism / button which rules that out as a possibility. Might it be a Boucher Type 0? The one that required improving and which did not find favour with their customers? It is possible, but the scales are definitely those of the later Calculigraphe type rather than an 'early' Boucher. Whichever it is, it is absolutely relevant to this discourse as it is perhaps the exception that proves the rule wrong, being a bit of both types! We do not know – yet!

Type what?



And then where would this device fit? Sold on eBay in Dec 2013, it is probably the only so far known example of a single sided Calculigraphe – the button appears more like a clutch than a winder – and the single scale is a 'normal' rotating scale as on any other two-sided Calculigraphe. But it is completely different to the single-sided, single-scaled Calculigraphe illustrated in *La Science Illustrée edition No 347 of July 1894,* see Appendix B.

With the exception of the scale, in terms of size and general look, the device has the look and feel of a different calculator altogether. Below is shown a side view which very clearly shows that a normal pocket-watch case is used. Unfortunately we do not know the diameter or thickness or indeed the weight.

The winder angle is very different (75°) versus 30° or 25° for the HC or FC Calculigraphe clutch respectively, or 27° for the Queen example. The mechanism is also completely different to any known example from any of the makers we have shown here, e.g. the very prominent central axle.

Considering the device as a single sided Boucher, or indeed possibly one or other of the single sided Calculigraphe mentioned in various instructions booklets, catalogues or elsewhere, none of those show the use of the 'standard' rotating scale from a Calculigraphe as the single scale of choice.

This presents us with a second mystery we cannot at this stage explain.

18.03.2021

Bibliography

The following books are mentioned with descriptions as to where they have a part to play in our search for knowledge on the vexed question of Boucher and Calculigraphe pocket-watch slide rules and their various makers

[1] *Slide Rules, their History Models and Makers*. Peter Hopp: Astragal Press 1999
My first book was particularly thin on the coverage of pocket-watch slide rules and the Boucher / Calculigraphe story is hardly touched upon – it is effectively the start, and still has an excellent list of makers!

[2] *Pocket-watch* S*lide Rules*. Peter Hopp: Astragal Press 2011
This is my third book where the lack of detailed knowledge of the early French manufacturing industry and the makers of Boucher and Calculigraphe pocket watch slide rules has now led to this "monograph".

[3] *A History of the Logarithmic Slide Rule and associated instruments.* Cajori, Florian: Astragal Press reprint, 1994
Cajori is the Old Testament to my New Testament. It is however still a pre-eminent source of data on when specific slide rule types first made their appearance, and we have nothing better in some cases than Cajori's word.

[4] *The Slide Rule;* C.N. Pickworth; Various editions, especially edition 6, 1900.
Pickworth is the source of one reference in Cajori. Pickworth was published from 1894, some sixteen years before Cajori, and a little light is shed on Pickworth adverts in relation to Boucher calculators – particularly those of the Stanley Boucher family.

[5] *Slide Rules and How to Use Them* by Thos. Jackson, Chapman & Hall, Limited, London; published in about 1900.
Jackson publishes instructions on how to use a pocket-watch slide rule as an Appendix and for some completely unknown reason has decided to use the Calculigraphe as his example for the description.

[6] *Calculating Machines and Instruments: Catalogue of the Collections in the Science Museum* by D. Baxendahll & Jane Pugh, Science Museum; London 1975.
The examples within the Science Museum hopefully should cast some light when models were made and then donated to their collection; sadly they do not as there are remarkably few examples of Boucher / Calculigraphe calculators in the UK collections. The Science Museum has but one – a Stanley Boucher's, Item 160, accession number 1908 – 138.

[7] *The use of the Slide Rule.* F.A. Halsey; Van Nostrand & Company New York, 1899.
A typical publication of the time that mentions the "Boucher Calculator" as a typical pocket-watch or circular (not an obvious name to me) slide rule and then uses a Calculigraphe for illustration.

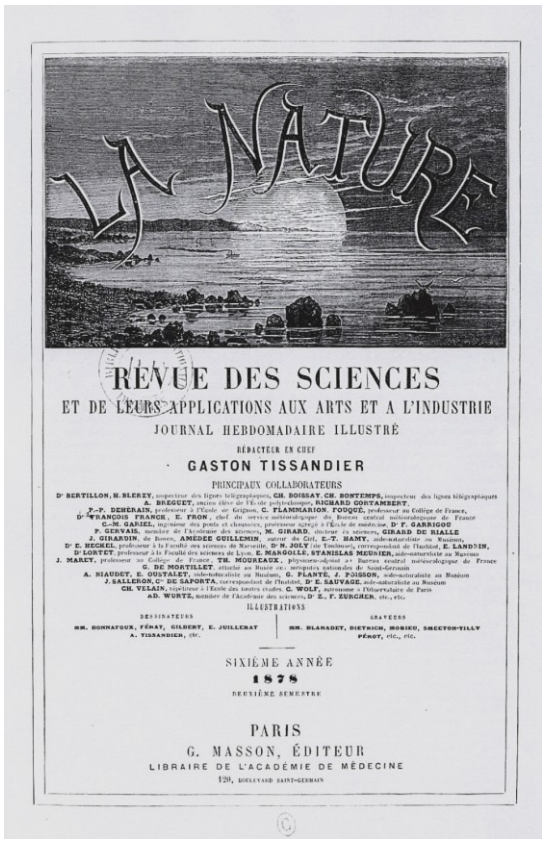
[8] *Le Calcul Simplifié.* Maurice d'Ocagne; Gauthier-Villars, Paris 2nd edition 1905.
d'Ocagne was a premier French writer on calculating instruments at the turn of the 20th century and this book is a "must read" for anyone interested in the history of the trade at that time. The first edition followed meetings in Paris during 1894 on the subject of mathematical instruments. The second edition of 1908 is available as a download on the web, as is the third edition 1928, see: https://archive.org/details/lecalculsimplif00ocaggoog/page/n8/mode/2up for the second and https://gallica.bnf.fr/ark:/12148/bpt6k9693084c.texteImage for the third edition.

[9] В. Г. Фон-Бооль: Приборы и машины для
механическаго производства арифметических действий.
Описание и оценка счетных приборов и машин, 1896, 244 стр.. 1896,
Bohl, von, Waldemar: Mechanisms and Machines
mechanical calculation. Description and evaluation of computing devices and machines, 1896, 244 pp. and one Page with pictures.
Apparently on page 42, Счетный круг Буше – which crudely translates as "Counting range of Boucher" is mention of a Boucher's calculator.

[10] ***La Science Illustrée***
An album edition is available as an on-line resource, please see:
https://en.calameo.com/read/0002450620ff3c71298eb

Appendix A

La Nature 1878 Article



LA NATURE.

REVUE DES SCIENCES

ET DE LEURS APPLICATIONS AUX ARTS ET A L'INDUSTRIE

JOURNAL HEBDOMADAIRE ILLUSTRÉ

RÉDACTEUR EN CHEF

GASTON TISSANDIER

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ILLUSTRATIONS

DESSINATEURS: MM. BONNAFOUX, FÉRAT, GILBERT, E. JUILLERAT, A. TISSANDIER, etc.

GRAVEURS: MM. BLANADET, DIETRICH, MORIEU, SMEETON-TILLY, PÉROT, etc., etc.

SIXIÈME ANNÉE

1878

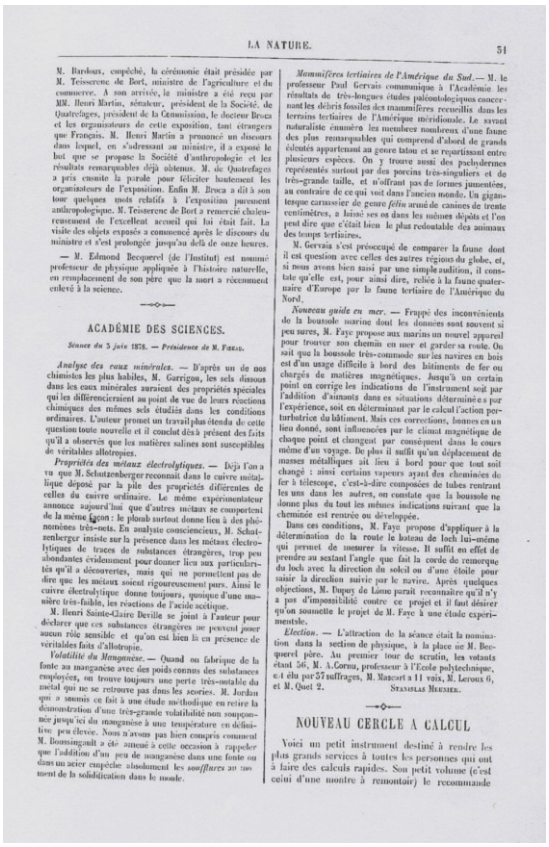
DEUXIÈME SEMESTRE

PARIS

G. MASSON, ÉDITEUR

LIBRAIRE DE L'ACADÉMIE DE MÉDECINE

120, BOULEVARD SAINT-GERMAIN



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M. Bardoux, empêché, la cérémonie était présidée par M. Teisserenc de Bort, ministre de l'agriculture et du commerce. A son arrivée, le ministre a été reçu par MM. Henri Martin, sénateur, président de la Société de Quatrefages, président de la Commission, le docteur Broca et les organisateurs de cette exposition, tant étrangers que Français. M. Henri Martin a prononcé un discours dans lequel, en s'adressant au ministre, il a exposé le but que se propose la Société d'anthropologie et les résultats remarquables déjà obtenus. M. de Quatrefages a pris ensuite la parole pour féliciter hautement les organisateurs de l'exposition. Enfin M. Broca a dit à son tour quelques mots relatifs à l'exposition purement anthropologique. M. Teisserenc de Bort a remercié chaleureusement de l'excellent accueil qui lui était fait. La visite des objets exposés a commencé après le discours du ministre et s'est prolongée jusqu'au delà de cinq heures.

— M. Edmond Becquerel (de l'Institut) est nommé professeur de physique appliquée à l'histoire naturelle, en remplacement de son père que la mort a récemment enlevé à la science.

ACADÉMIE DES SCIENCES.

Séance du 5 juin 1878. — Présidence de M. Fizeau.

Analyse des eaux minérales. — D'après un de nos chimistes les plus habiles, M. Garrigou, les sels dissous dans les eaux minérales auraient des propriétés spéciales qui les différencieraient au point de vue de leurs réactions chimiques des mêmes sels étudiés dans les conditions ordinaires. L'auteur promet un travail plus étendu de cette question toute nouvelle et il conclut déjà présent des faits qu'il a observés que les matières salines sont susceptibles de véritables allotropies.

Propriétés des métaux électrolytiques. — Déjà l'on a vu que M. Schutzenberger reconnait dans le cuivre métallique déposé par la pile des propriétés différentes de celles du cuivre ordinaire. Le même expérimentateur annonce aujourd'hui que d'autres métaux se comportent de la même façon : le plomb surtout donne lieu à des phénomènes très-nets. En analysie consciencieux, M. Schutzenberger insiste sur la présence dans les métaux électrolytiques de traces de substances étrangères, trop peu abondantes évidemment pour donner lieu aux particularités qu'il a découvertes, mais qui ne permettent pas de dire que les métaux soient rigoureusement purs. Ainsi le cuivre électrolytique donne toujours, quoique d'une manière très-faible, les réactions de l'acide acétique.

M. Henri Sainte-Claire Deville se joint à l'auteur pour déclarer que ces substances étrangères ne peuvent pour aucun rôle sensible et qu'on est bien là en présence de véritables faits d'allotropie.

Volatilité du Manganèse. — Quand on fabrique de la fonte au manganèse avec des poids connus des substances employées, on trouve toujours une perte très-notable du métal qui ne se retrouve pas dans les scories. M. Jordan qui a soumis ce fait à une étude méthodique en retire la démonstration d'une très-grande volatilité non soupçonnée jusqu'ici du manganèse à une température en définitive peu élevée. Nous n'avons pas bien compris comment M. Boussingault a été amené à cette occasion à rappeler que l'addition d'un peu de manganèse dans une fonte ou dans un acier empêche absolument les *soufflures* au moment de la solidification dans le moule.

Mammifères tertiaires de l'Amérique du Sud. — M. le professeur Paul Gervais communique à l'Académie les résultats de très-longues études paléontologiques concernant les débris fossiles des mammifères recueillis dans les terrains tertiaires de l'Amérique méridionale. Le savant naturaliste énumère les membres nombreux d'une faune des plus remarquables qui comprend d'abord de grands édentés appartenant au genre tatou et se répartissant entre plusieurs espèces. On y trouve aussi des pachydermes représentés surtout par des porcins très-singuliers et de très-grande taille, et n'offrant pas de formes jumentées, au contraire de ce qui voit dans l'ancien monde. Un gigantesque carnassier de genre *félin* armé de canines de trente centimètres, a laissé ses os dans les mêmes dépôts et l'on peut dire que c'était bien le plus redoutable des animaux des temps tertiaires.

M. Gervais s'est préoccupé de comparer la faune dont il est question avec celles des autres régions du globe, et, si nous avons bien saisi par une simple audition, il constate qu'elle est, pour ainsi dire, reliée à la faune quaternaire d'Europe par la faune tertiaire de l'Amérique du Nord.

Nouveau guide en mer. — Frappé des inconvénients de la boussole marine dont les données sont souvent si peu sures, M. Faye propose aux marins un nouvel appareil pour trouver son chemin en mer et garder sa route. On sait que la boussole très-commode sur les navires en bois est d'un usage difficile à bord des bâtiments de fer ou chargés de matières magnétiques. Jusqu'à un certain point on corrige les indications de l'instrument soit par l'addition d'aimants dans en situations déterminées à par l'expérience, soit en déterminant par le calcul l'action perturbatrice du bâtiment. Mais ces corrections, bonnes en un lieu donné, sont influencées par le climat magnétique de chaque point et changeant par conséquent dans le cours même d'un voyage. De plus il suffit qu'un déplacement de masses métalliques ait lieu à bord pour que tout soit changé : ainsi certains vapeurs ayant des cheminées de fer à télescope, c'est-à-dire composées de tubes rentrant les uns dans les autres, on constate que la boussole ne donne plus du tout les mêmes indications suivant que la cheminée est rentrée ou développée.

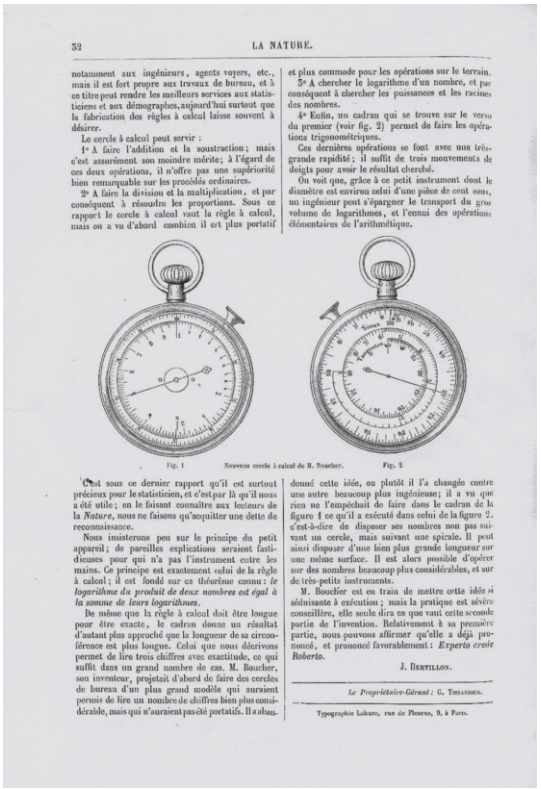
Dans ces conditions, M. Faye propose d'appliquer à la détermination de la route le bateau de loch lui-même qui permet de mesurer la vitesse. Il suffit en effet de prendre au sextant l'angle que fait la corde de remorque du loch avec la direction du soleil ou d'une étoile pour saisir la direction suivie par le navire. Après quelques objections, M. Dupuy de Lôme paraît reconnaître qu'il n'y a pas d'impossibilité contre ce projet et il faut désirer qu'on soumette le projet de M. Faye à une étude expérimentale.

Election. — L'attraction de la séance était la nomination dans la section de physique, à la place de M. Becquerel père. Au premier tour de scrutin, les votants étant 56, M. J. Cornu, professeur à l'École polytechnique, a été élu par 37 suffrages, M. Mascart a 11 voix, M. Leroux 6, et M. Quet 2.

STANISLAS MEUNIER.

NOUVEAU CERCLE A CALCUL

Voici un petit instrument destiné à rendre les plus grands services à toutes les personnes qui ont à faire des calculs rapides. Son petit volume (c'est celui d'une montre à remontoir) le recommande



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notamment aux ingénieurs, agents voyers, etc., mais il est fort propre aux travaux de bureau, et à ce titre peut rendre les meilleurs services aux statisticiens et aux démographes, aujourd'hui surtout que la fabrication des règles à calcul laisse souvent à désirer.

Le cercle à calcul peut servir :

1° A faire l'addition et la soustraction ; mais c'est assurément son moindre mérite ; à l'égard de ces deux opérations, il n'offre pas une supériorité bien remarquable sur les procédés ordinaires.

2° A faire la division et la multiplication, et par conséquent à résoudre les proportions. Sous ce rapport le cercle à calcul vaut la règle à calcul, mais on a vu d'abord combien il est plus portatif et plus commode pour les opérations sur le terrain.

3° A chercher le logarithme d'un nombre, et par conséquent à chercher les puissances et les racines des nombres.

4° Enfin, un cadran qui se trouve sur le verso du premier (voir fig. 2) permet de faire les opérations trigonométriques.

Ces dernières opérations se font avec une très-grande rapidité ; il suffit de trois mouvements de doigts pour avoir le résultat cherché.

On voit que, grâce à ce petit instrument dont le diamètre est environ celui d'une pièce de cent sous, un ingénieur peut s'épargner le transport du gros volume de logarithmes, et l'ennui des opérations élémentaires de l'arithmétique.

Fig. 1 Nouveau cercle à calcul de M. Boucher. Fig. 2

C'est sous ce dernier rapport qu'il est surtout précieux pour le statisticien, et c'est par là qu'il nous a été utile ; en le faisant connaître aux lecteurs de la *Nature*, nous ne faisons qu'acquitter une dette de reconnaissance.

Nous insisterons peu sur le principe du petit appareil ; de pareilles explications seraient fastidieuses pour qui n'a pas l'instrument entre les mains. Ce principe est exactement celui de la règle à calcul ; il est fondé sur ce théorème connu : *le logarithme du produit de deux nombres est égal à la somme de leurs logarithmes.*

De même que la règle à calcul doit être longue pour être exacte, le cadran donne un résultat d'autant plus approché que la longueur de sa circonférence est plus longue. Celui que nous décrivons permet de lire trois chiffres avec exactitude, ce qui suffit dans un grand nombre de cas. M. Boucher, son inventeur, projetait d'abord de faire des cercles de bureau d'un plus grand modèle qui auraient permis de lire un nombre de chiffres bien plus considérable, mais qui n'auraient pas été portatifs. Il a abandonné cette idée, ou plutôt il l'a changée contre une autre beaucoup plus ingénieuse ; il a vu que rien ne l'empêchait de faire dans le cadran de la figure 1 ce qu'il a exécuté dans celui de la figure 2, c'est-à-dire de disposer ses nombres non pas suivant un cercle, mais suivant une spirale. Il peut ainsi disposer d'une bien plus grande longueur sur une même surface. Il est alors possible d'opérer sur des nombres beaucoup plus considérables, et sur de très-petits instruments.

M. Boucher est en train de mettre cette idée si séduisante à exécution ; mais la pratique est sévère conseillère, elle seule dira ce que vaut cette seconde partie de l'invention. Relativement à sa première partie, nous pouvons affirmer qu'elle a déjà prononcé, et prononcé favorablement : *Experto credo Roberto.*

J. BERTILLON.

Le Propriétaire-Gérant : G. TISSANDIER.

Typographie Lahure, rue de Fleurus, 9, à Paris.

Appendix B

La Science Illustrée edition No 347 of July 1894 Article

RECETTES UTILES

L'essai des ponts. — M. Lotz propose, dans le *Deutsche Bauzeitung*, d'appliquer la photographie à l'essai des ponts en prenant, d'un point de base convenable et avec un appareil assez grand, des photographies du pont sans surcharges et avec ses surcharges réglementaires.

La comparaison des deux épreuves permettrait de se rendre un compte exact des modifications produites par ces surcharges.

LE MOUVEMENT INDUSTRIEL

LES INVENTIONS NOUVELLES[1]

Le Calculigraphe ou cercle à calcul.

Ce petit appareil a été inventé, il y a une vingtaine d'années, par M. Boucher, ingénieur au Havre, mais des défectuosités de fabrication empêchèrent qu'il ne se répandit dans le public, lorsque M. Chatelain le reprit tout récemment et le modifia de fond en comble de façon à en faire un instrument de précision, d'une marche sûre et impeccable. Le calculigraphe, tel qu'il est construit à présent, constitue à ce titre une invention nouvelle. Son usage ne tardera pas à se généraliser, car il apporte aux personnes chargées d'effectuer des calculs longs et minutieux, une aide rapide et sûre, dont les résultats sont d'une irréprochable exactitude.

Le calculigraphe se fabrique sur deux modèles. Le plus simple à unique cadran, suffit à toutes les opérations d'arithmétique.

Le modèle à double face résout les problèmes d'algèbre, de géométrie, de trigonométrie.

Le principe de cet appareil repose sur cette propriété des logarithmes, à savoir que : la somme des logarithmes de deux nombres est égale au logarithme de leur produit, et inversement que : si du logarithme d'un nombre on retranche le logarithme d'un autre nombre, on obtient le logarithme du quotient de la division du premier par le second.

Sans s'occuper plus longtemps de la théorie des logarithmes, toute personne en possession de la marche de l'instrument, et cette science spéciale consiste uniquement à lire sur des cercles à divisions chiffrées, comme on lit sur un double-décimètre gradué en millimètres, toute personne sera apte à se servir utilement du calculigraphe.

Le modèle simple est une réduction du modèle à double cadran, nous aborderons la description de ce second type, dont on déduira celle du premier.

Le diamètre représenté en vraie grandeur par nos croquis, est de 0m,05; le boîtier qui contient le mécanisme porte deux cadrans protégés par des glaces. L'un de ces cadrans est fixe, l'autre mobile. Celui-ci reçoit son mouvement, au moyen de la couronne du pendant, que l'opérateur fait pivoter entre ses doigts, comme s'il s'agissait de remonter une montre à remontoir. Le bouton placé à côté du pendant actionne deux aiguilles, placées l'une sur le cadran fixe, l'autre sur le cadran mobile. Ces deux aiguilles rivées sur le même axe, tournent ensemble. Une troisième aiguille, l'index, est fixée à demeure sur le bord supérieur du boîtier, devant le cadran mobile.

Les deux cadrans portent chacun quatre cercles concentriques, divisés d'une façon particulière donnant : sur le cadran mobile, trois groupes de divisions ou *échelles*, et sur le cadran fixe, deux échelles seulement.

Au moyen de la couronne du pendant on amène sous l'aiguille ou sous l'index telle division voulue du cadran mobile, de même qu'au moyen du bouton, on peut porter l'aiguille de l'un ou l'autre cadran sur une division quelconque de ce cadran.

Les positions diverses qu'occupent à volonté les aiguilles et le cadran mobile, forment une série de combinaisons qui permettent d'effectuer les opérations annoncées plus haut.

Les échelles du cadran mobile comptent :

1° L'échelle des nombres ordinaires développée sur le troisième cercle intérieur;

2° L'échelle des carrés développée sur les deux premiers cercles intérieurs;

3° L'échelle des sinus des angles développée sur le cercle extérieur.

Les échelles du cadran fixe sont :

1° L'échelle des cubes développée sur les trois cercles intérieurs;

2° L'échelle des décimales, des logarithmes développée sur le cercle extérieur.

Cette description demanderait à être amplifiée par une indication de la représentation des logarithmes sur les cadrans du cercle, et par quelques renseignements sur la division et la lecture du cadran mobile et du cadran fixe. Les personnes désireuses de s'éclairer plus à fond, s'en référeront à la notice imprimée, très détaillée et très claire que le constructeur du calculigraphe a rédigée, et que son étendue nous empêche de reproduire.

Nous nous bornerons à donner le mécanisme de quelques opérations, qui démontreront l'utilité et la simplicité réelles de cet appareil.

En général, quel que soit un problème posé, il se réduit toujours à une formule numérique, qui relève des opérations de l'arithmétique.

Ces opérations se font sur l'échelle des nombres, où se lisent les résultats, quand même on ferait intervenir des valeurs obtenues sur les échelles des carrés, des cubes ou des sinus.

Commençons par la multiplication. Soit à multiplier A par V. On amène A sous l'index, on porte l'aiguille sur 1, et on amène V sous l'aiguille. L'index indique alors le produit. Lorsque V est variable, on épuise toutes les valeurs de V.

Pour diviser A par B, on amène A sous l'index, puis on porte l'aiguille sur B, et on amène le 1 du cadran mobile sous l'aiguille, l'index indique alors le quotient. On peut procéder en portant l'aiguille

(1) Voir le n° 343.

sur B, le 1 du cadran étant à l'index, on amène alors A sous l'aiguille et l'index montre le quotient.

Pour trouver le quatrième terme d'une proportion dont on connaît les trois premiers, on amène le

Les inventions nouvelles.
Le Calculigraphe à un seul cadran.

deuxième terme sous l'index, on porte l'aiguille sur le premier, et on amène le troisième sous l'aiguille; l'index indique le quatrième. En général, l'index et

Les inventions nouvelles.
Le Calculigraphe à deux faces.
Cadran mobile. Le bouton est à droite.

l'aiguille indiquant les deux termes d'un rapport, tous les nombres qu'on amènera en ces points seront dans le même rapport.

La similitude des mouvements indiqués dans les trois règles précédentes montrent que la multiplication et la division sont des proportions dans lesquelles l'un des termes est l'unité.

Exemples : Si 24 francs représentent le prix d'un objet, on demande le prix de 32 objets semblables. On établit la proportion 1 : 24 : : 32 : *x*. On amènera donc 24 sous l'index et on portera l'aiguille sur 1. On aura ainsi les deux termes d'un rapport indiqués l'un par l'aiguille et l'autre par l'index; le troisième terme 32 étant amené sous l'aiguille, on lira la valeur de *x*, c'est-à-dire 768 francs, qui viendront sous l'index.

Si on demande le prix d'un objet, sachant que 32 objets coûtent 768 francs, on établit la proportion 32 : 768 : : 1 : *x*. On amènera donc 768 sous l'index et on portera l'aiguille sur 32. On aura ainsi les deux termes d'un rapport indiqués l'un par l'aiguille et l'autre par l'index; le troisième terme 1 étant amené

Les inventions nouvelles.
Le Calculigraphe à deux faces.
Cadran fixe. Le bouton est à gauche.

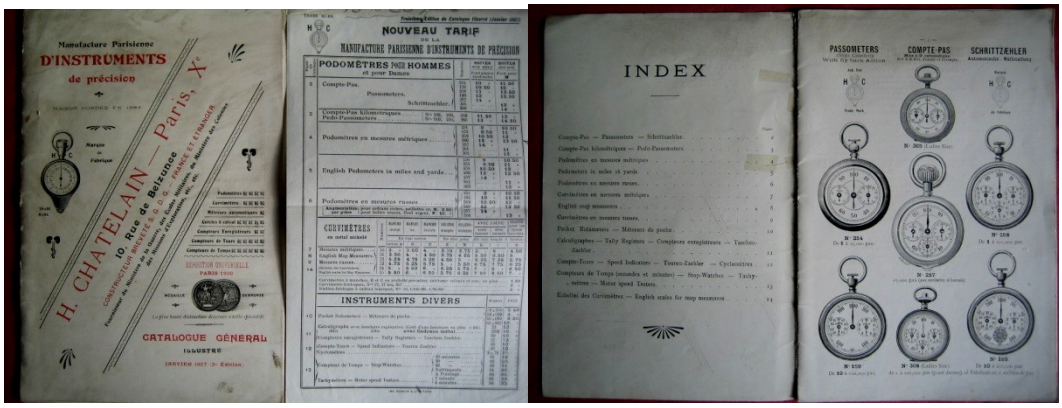
sous l'aiguille, on lira la valeur de *x*, c'est-à-dire 24 francs qui viendront sous l'index. Sous l'aiguille sont toujours des unités de même nature et sous l'index également. Dans cet exemple, l'aiguille ayant servi à indiquer les objets, l'index a servi à indiquer les francs.

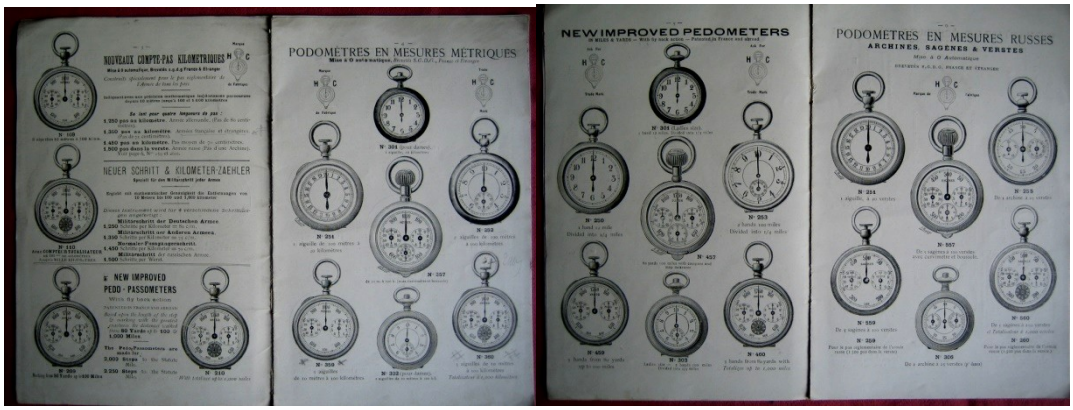
Il serait facile de multiplier les exemples. La notice, dont nous avons parlé, fournit, nous le répétons, tous les renseignements désirables sur le calcul des logarithmes, des carrés, des cubes, des sinus, des triangles, etc., sur la division et la lecture des cadrans mobiles ou fixes. Ce petit appareil, très simple, quoique compliqué en apparence, est d'un prix qui le rend accessible aux bourses les plus modestes.

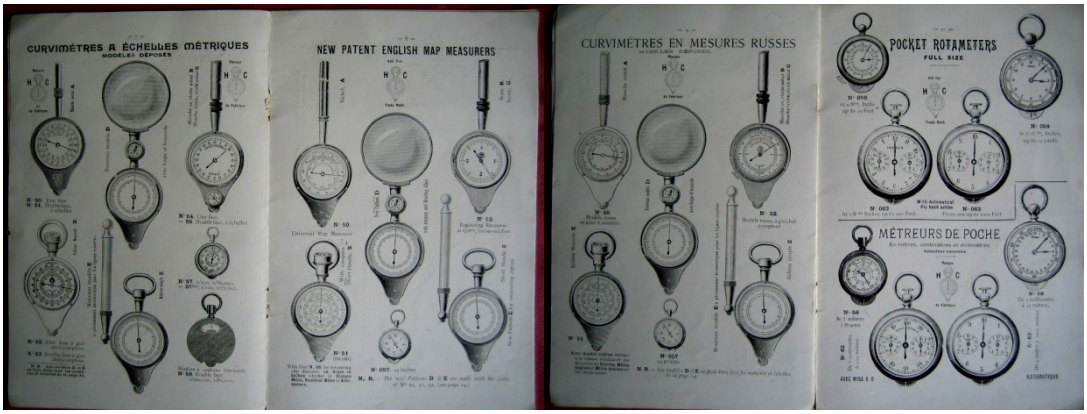
G. TEYMON.

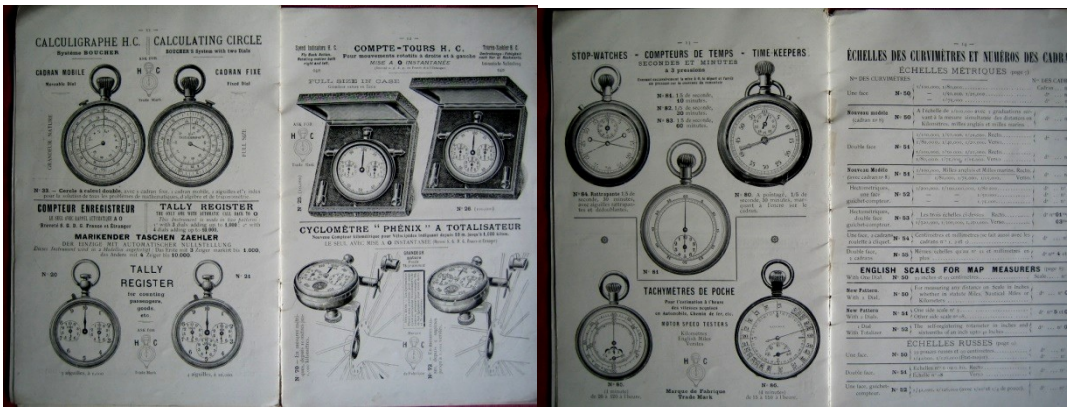
Appendix C

H Chatelain catalogue 1904



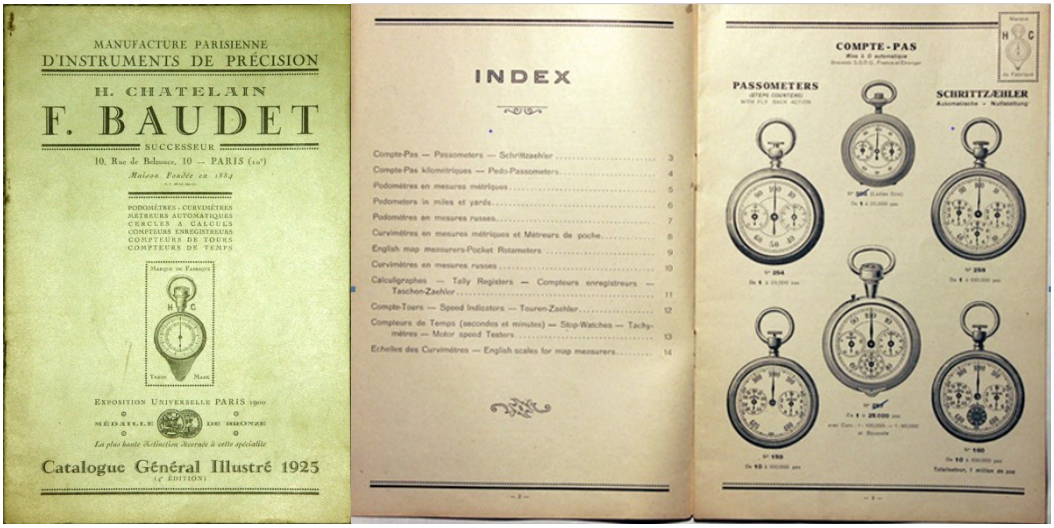






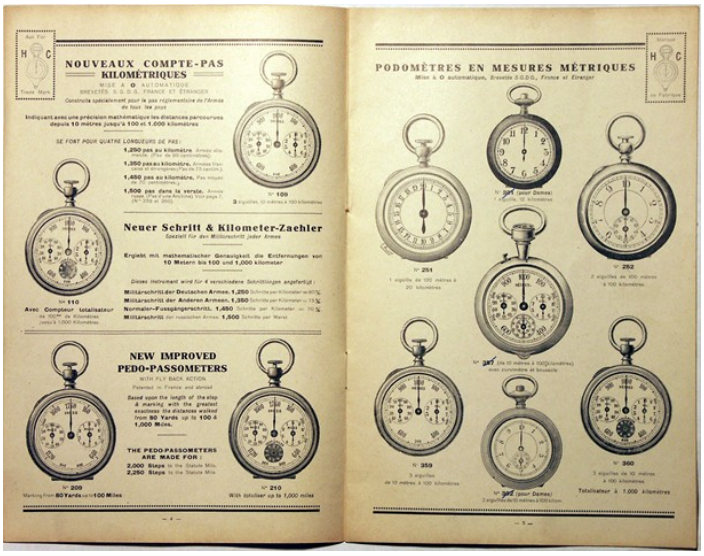
Appendix D

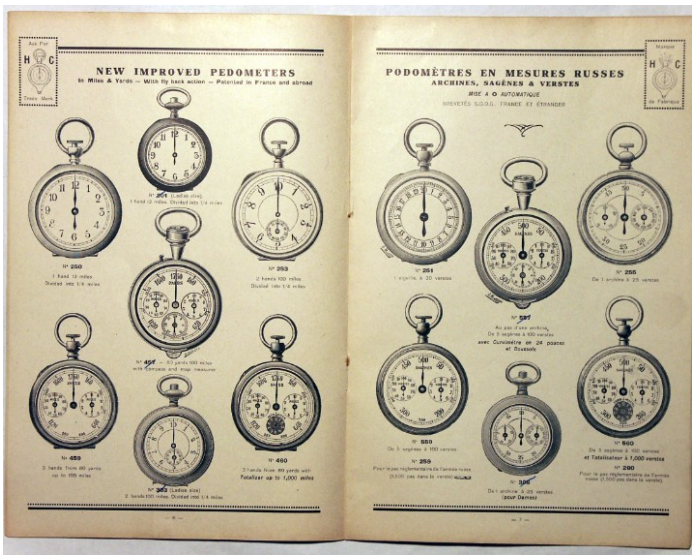
F Baudet Catalogue 1925

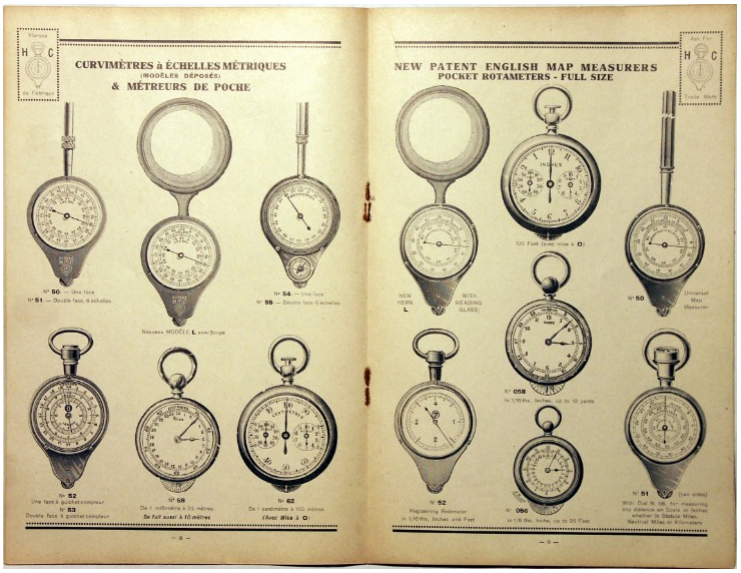

MANUFACTURE PARISIENNE
D'INSTRUMENTS DE PRÉCISION
H. CHATELAIN
F. BAUDET
SUCCESSEUR
10, Rue de Belzunce, 10 — PARIS (10e)
Maison Fondée en 1884
PODOMÈTRES - CURVIMÈTRES
MÈTREURS AUTOMATIQUES
CERCLES À CALCULS
COMPTEURS ENREGISTREURS
COMPTEURS DE TOURS
COMPTEURS DE TEMPS
EXPOSITION UNIVERSELLE PARIS 1900
MÉDAILLE DE BRONZE
La plus haute Distinction décernée à cette spécialité
Catalogue Général Illustré 1925
(4e ÉDITION)

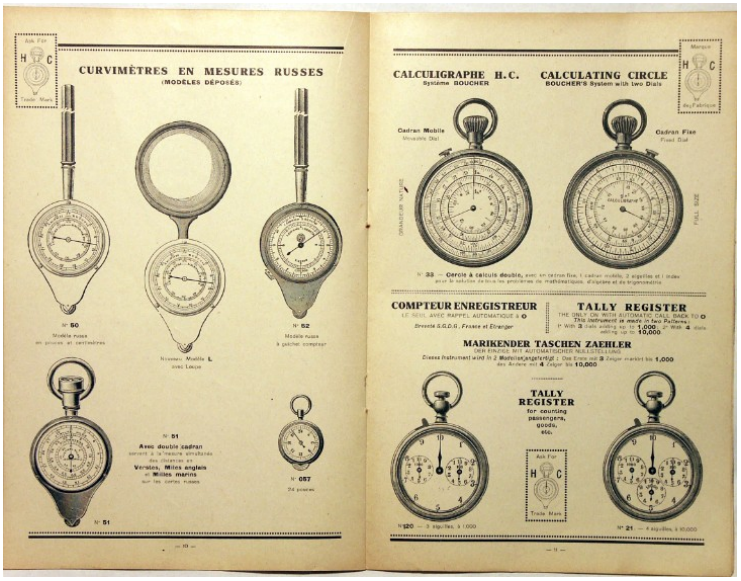
INDEX

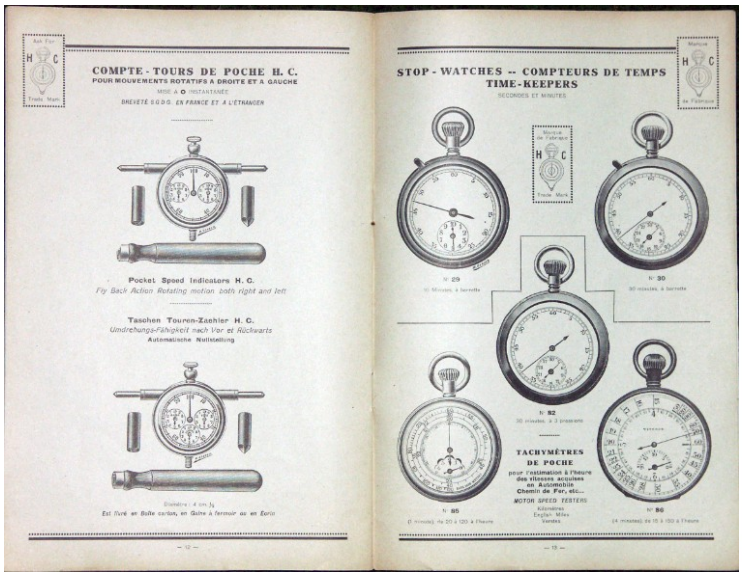
COMPTE-PAS
PASSOMETERS
SCHRITTZÆHLER


NOUVEAUX COMPTE-PAS KILOMÉTRIQUES
Neuer Schritt & Kilometer-Zaehler
NEW IMPROVED PEDO-PASSOMETERS
THE PEDO-PASSOMETERS ARE MADE FOR :
PODOMÈTRES EN MESURES MÉTRIQUES


NEW IMPROVED PEDOMETERS
PODOMÈTRES EN MESURES RUSSES
ARCHINES, SAGÈNES & VERSTES


CURVIMÈTRES à ÉCHELLES MÉTRIQUES
(MODÈLES DÉPOSÉS)
& MÉTREURS DE POCHE
NEW PATENT ENGLISH MAP MEASURERS
POCKET ROTAMETERS - FULL SIZE


CURVIMÈTRES EN MESURES RUSSES
(MODÈLES DÉPOSÉS)
CALCULIGRAPHE H.C.
Système BOUCHER
CALCULATING CIRCLE
BOUCHER'S System with two Dials
COMPTEUR ENREGISTREUR
TALLY REGISTER
MARIKENDER TASCHEN ZAEHLER
TALLY REGISTER
for counting passengers, goods, etc.


COMPTE-TOURS DE POCHE H.C.
POUR MOUVEMENTS ROTATIFS A DROITE ET A GAUCHE
Pocket Speed Indicators H.C.
Fly Back Action Rotating motion both right and left
Tachometer H.C.
Umdrehungs-Fähigkeit nach Vor et Rückwarts
Automatische Nullstellung
STOP-WATCHES -- COMPTEURS DE TEMPS
TIME-KEEPERS
TACHYMÈTRES
DE POCHE
MOTOR SPEED TESTERS


ÉCHELLES DES CURVIMÈTRES ET NUMÉROS DES CADRANS
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ENGLISH SCALES FOR MAP MEASURERS
ÉCHELLES RUSSES

Appendix E

Brief Chronological History of "Manlove"

"Manlove" existed as Manlove Alliott and Co., Manlove Alliott and Fryer, and as Manlove itself at various times. How and why these name changes happened, and in what chronological order is the mystery. They also had addresses in various parts of Nottingham, and also a period when they were in Nottingham and Rouen. There were also addresses in London, Manchester and elsewhere in the UK. The following attempts to chart these changes and produce some logic to the chronology of the named variants of Boucher calculator listed in the main document. As best we can, the following dates apply.

1837 Manlove Alliott & Seyrig founded (is this the same as or different to the next entry?)
1837 Manlove, Alliott & Co. founded by Edward Manlove and Alexander Alliott in Lenton, Nottingham
1843 Keely and Alliott of Lenton Works, Nottingham, patent drying machine
18xx expanded to Bloomsgrove Works on Ilkeston Road in Radford, Nottingham.
1851 Award at Great Exhibition for Centrifugal washing and drying machine (as Manlove, Alliott & Seyrig)
1874 Albert Fryer patent for the "Destructor" incinerator system
1876 Fryer becomes a partner in Manlove Alliott & Co hence Manlove Alliott & Fryer
1882 Manlove, Alliott, Fryer & Co has an office in Rouen
1882 Manlove, Alliott, Fryer & Co Ltd has offices in Bloomsgrove Works, Nottingham, London, Glasgow, Manchester and in Rouen. (from an Advert in "The Engineer for Halpin's patent condensing engine 1882/09)[21]
1885 Partnership with Fryer dissolved – not sure whether company name changes, I think not …. Still in Rouen as well
1886 Manlove Alliott & Co Ltd - incorporated as a Limited Company
1888 Manlove, Alliott, Fryer & Co has offices in Bloomsgrove Works, Nottingham, London, Glasgow, Manchester and in Rouen ??? Is this a hangover?.
1888 The National Archives hold a document BT 31/4263/27648 Company No: 27648; Manlove, Alliott and Company Ltd. Incorporated in 1888. Dissolved before 1916.
1891 Manlove, Alliott and Co of Manchester, Nottingham, London and Glasgow were suppliers of equipment for the cotton industry. (Advert in "Worrals Cotton Spinners Directory" for Atkinsons patent cycle gas engine 1882/09) [22]
1892 Manlove, Alliott and Co. Ltd of Nottingham, Manchester, London Glasgow, Steam Disinfector (Advert in "The Colonies and India" 3 Dec 1892)
1899 Manlove, Alliott and Co. Ltd of Nottingham, were suppliers of refuse destructors. (Advert in "Worrals Cotton Spinners Directory" for Atkinsons patent cycle gas engine 1882/09)[23]
1901/2 Manlove, Alliott and Co. Ltd. of Nottingham, were suppliers of refuse destructors
1938 Manlove, Alliott and Co. Ltd of Nottingham, Bijou incinerators
1958 Manlove, Alliott & Co Ltd, Bloomsgrove Works still in existence, also 41 and 42 Westminster Street , London
1959 Taken over by Melbray Group
1961 Manlove, Alliott & Co Ltd, Bloomsgrove Works, also 41 and 42 Westminster Street, London still advertising.
1976 "Manlove" closes

[21] https://www.gracesguide.co.uk/File:Im1882EnV54-p178.jpg
[22] http://www.douglas-self.com/MUSEUM/POWER/unusuallCeng/atkinson/atkinson.htm
[23] https://en.wikipedia.org/wiki/Manlove,_Alliott_%26_Co._Ltd.Advert

Summaries for each identified instantiation of the Company (notes based on Pocket-watch Slide Rules)

Manlove, London

Manlove was a well-known general engineering firm from Nottingham dating from about 1892 who produced a wide variety of civil engineering equipment and are well known as the originators of incinerating apparatus as well as some state-of-the-art engines. They were originally called Manlove, Alliott & Fryer (see below), and were originally agents for Boucher (see quote in Stanley above). How this related to Newton who was patent agent for the original application, and what business relationship existed between the various parties is not known. The Boucher's calculator shown in Figure 36 from Manlove has the second crown and the standard suite of scales as per original patent and Stanley's implementation, and was probably made by the same people but with Manlove name rather than the Stanley name. There is nothing to indicate whether the calculator was made in France or England.

Manlove, Alliott & Fryer, Nottingham and Rouen

As previously noted, this firm was probably a predecessor to Manlove (see above). This is confirmed by the fact that the example shown in Figure 37 is made in France, $2^{1}/_{16}$" (52 mm) diameter, $^{9}/_{16}$" (14 mm) thick and is an 'early' version with the 'A.B' signature. Also the firm claims Nottingham and Rouen as working addresses. This speculation assumes that all later examples of Boucher calculator were made in England, but this could be far from the truth. Manlove, Alliott & Fryer, like the later Manlove, were a well-established, forward looking and long lived engineering firm based in Nottingham who made steam engines, pumps and other civil engineering and waste disposal equipment supplied throughout the world. What the Rouen address was based on is not known or has not yet been found. Manlove, Alliott & Fryer are mentioned in Cajori as 'making Boucher's calculators', the example in Figure 37 is marked 'Boucher's Patent Calculating Circle Made in France' and 'Manlove, Alliott, Fryer, & Co. Nottingham & Rouen' and having an 'AB' 'Boucher' signature on the reverse which would imply that it was an early example – see other examples of early Boucher calculators above.

Page 26 – between Manloves and Manlove Alliott & Fryer add Manlove Alliott & Co Limited,

A recently seen Boucher's calculator carrying the label of Manlove & Alliott &Co Limited allows us to more accurately date this as being before the formation of Manlove Alliott & Fryer Limited in 1886. The style follows that of the Manlove Alliott & Fryer example (Figure 37) including size, the scales and font. However the name and other labelling is more akin to that of the Manloves example (Figure 36) being circular in format. It does not seem to carry an 'AB' signature, but it does have the large axle that seems to be a feature of the early Boucher devices. Interestingly and surprisingly, the second winder appears to be perpendicular to the crown; this 90° angle being unique to this design and not the same as the earlier and later ones which mirror their closest relation, Manlove Alliott &Fryer after the Boucher itself, and Manlove like the Stanley Boucher.

Page 148 – after the end of Manloves and before Manlove Alliott & Fryer add Manlove Alliott & Co Limited:

Manlove Alliott & Co Limited. (GB) c 1886
Address: London, England

History: See Manlove (above) and, Manlove Alliott & Fryer below

Made: Boucher calculator, middle version – Manlove Alliott & Co Limited

Manlove & Alliott. EDWARD MANLOVE and ALEXANDER ALLIOTT were examples of how young men with energy, enterprise, and character, may rise, succeed, and benefit their fellows.

They were drapery shop assistants, started in a small way as bleachers, at Lenton, and afterwards, being joined by Mr. J. G. Seyrig, developed the centrifugal drying machine, revolving a thousand times per minute. They established the great engineering works on Ilkeston Road, and found employment for hundreds of hands. They were men of strict integrity and business habits. Mr. Alliott's father was the Rev. Dr. Alliott, for forty-six years the able minister of Castle Gate Chapel. He, the son, was many years superintendent of the Sunday School. He died in 1870, and his son, the late James B. Alliott, was the worthy son of a worthy sire. Both of them were Deacons of the chapel named.

Confirmatory information from from Grace's Guide: "Manlove Alliott & Fryer"

Manlove, Alliott, Fryer and Co of Bloomsgrove Works, Ilkeston Road, Nottingham. Colonial and General Engineers.
Related companies:

- Manlove and Alliott (1837-1845)
- Manlove, Alliott and Seyrig (1845-1860)
- Manlove, Alliot and Co (1860-1870s)
- Manlove, Alliott, Fryer and Co (1870s-80s)
- Manlove, Alliott and Co (1886-)

1876 Produced the Destructor for waste incineration patented by Alfred Fryer, who became a partner in the firm.
1879 Henry Cripps Matheson became head draughtsman
1882 of Nottingham and Rouen.[1]
c.1884 John McClure Caldwell Paton was admitted to the firm as a partner
1885 Partnership change. '... the Partnership which has for some time past been carried on by us Edward Manlove, James Bingham Alliott, and Alfred Fryer, under the style or firm of Manlove, Alliott, Fryer, and Co., at the town of Nottingham, at 50, Queen Victoria-street, London, and at Rouen, in the Republic of France, in the trade or business of Engineers, was this day dissolved, by mutual consent, so far as regards the said Alfred Fryer. All debts due to and owing by the late firm will be received and paid by the said Edward Manlove and James Bingham Alliott, by whom the business will in future be carried on under the same style or firm....'[2]
1886 Incorporated as a Limited Company.

From Graces Guide: "Manlove Alliott & Co"
of Bloomsgrove Works, Nottingham.
Previously:

- Manlove and Alliott (1837-1845)
- Manlove, Alliott and Seyrig (1845-1860)
- Manlove, Alliot and Co (1860-1870s)
- Manlove, Alliott, Fryer and Co (1870s-80s)
- Manlove, Alliott and Co (1886-)

1886 Incorporated as a Limited Company. James Bingham Alliott and John McClure Caldwell Paton were appointed joint managing directors.
1888 The Lyons disinfector. Illustrated and described in The Engineer. [1]
1889 Centrifugal Machines (fans). [2]
1889-92 Manufacturing engines based on the Atkinson cycle rated from 2 to 20 hp.
1891 Manlove, Alliott and Co of Nottingham, London and Glasgow were suppliers of equipment for the cotton industry. [3]
1914 Engineers, Colonial and General. Specialities: Engines, Boilers, Sugar Machinery, Oil Mill Plant, Power Laundry Plant, Centrifugal Machines, Refuse Destructors. Employees 400. [4]
By 1962 was part of the Melbray Group[5]
1971 Attempt by Melbray to merge Manlove, Alliott and Co with the D. and J. Tullis operations encountered problems with key staff unwilling to move and unexpectedly higher wages on Clydebank. Became Manlove Tullis.