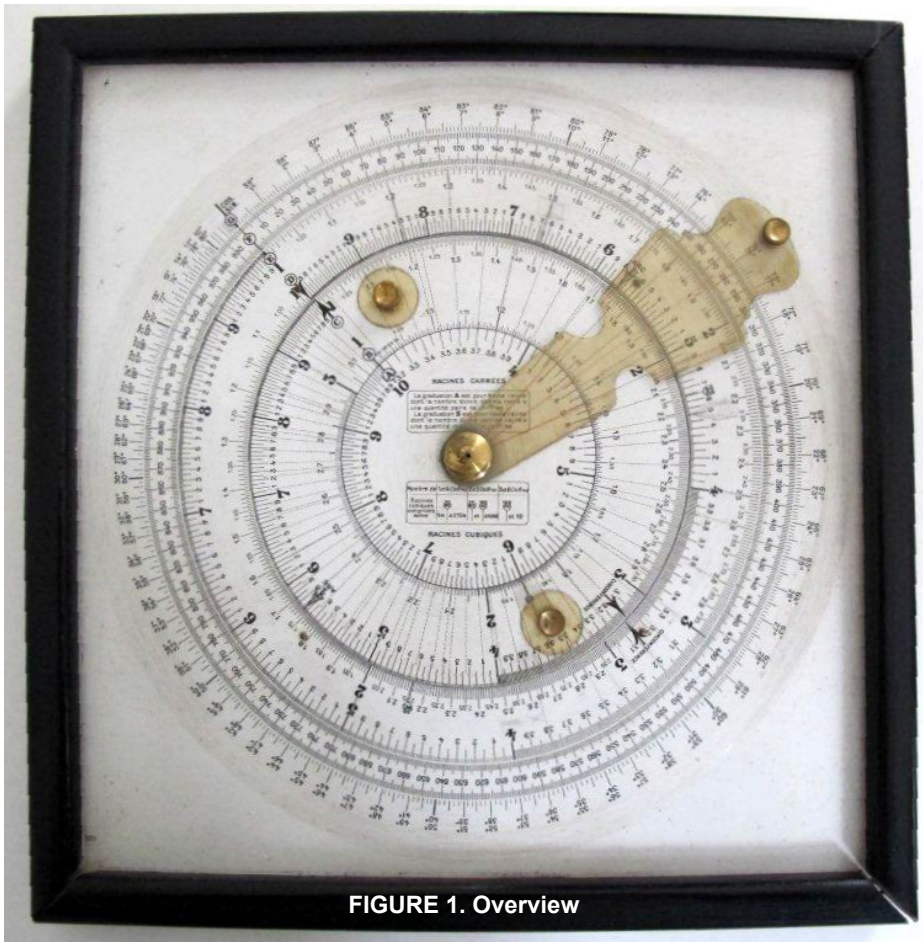


FIGURE 1. Overview

About a French Circular Slide Rule by Arnault-Paineau

Willy Robbrecht

Introduction

Most French linear slide rule makers are well known: Lenoir, Tavernier-Gravet, Graphoplex, Barbotheu, Marc, etc. Sometimes an unknown maker's name has to be added to that list. This article deals with two names, Jules ARNAULT and Louis PAINEAU, as inventors of a circular slide rule. Starting with the item in my collection, information was obtained from different sources.

FIGURE 2. Detail Frame

Description

The construction is somewhat extraordinary: a wooden base plate in a frame looks like a cabinet panel and forms a square frame of 26 cm by 26 cm (thickness 2 cm) that contains an aluminum plate bearing three parts (Figure 1 and Figure 2).

a) Around the axis is a central moving disk containing the following concentric circles:

   A+B = double log scale (on two circles) for square roots

   C = log scale clockwise with arrow

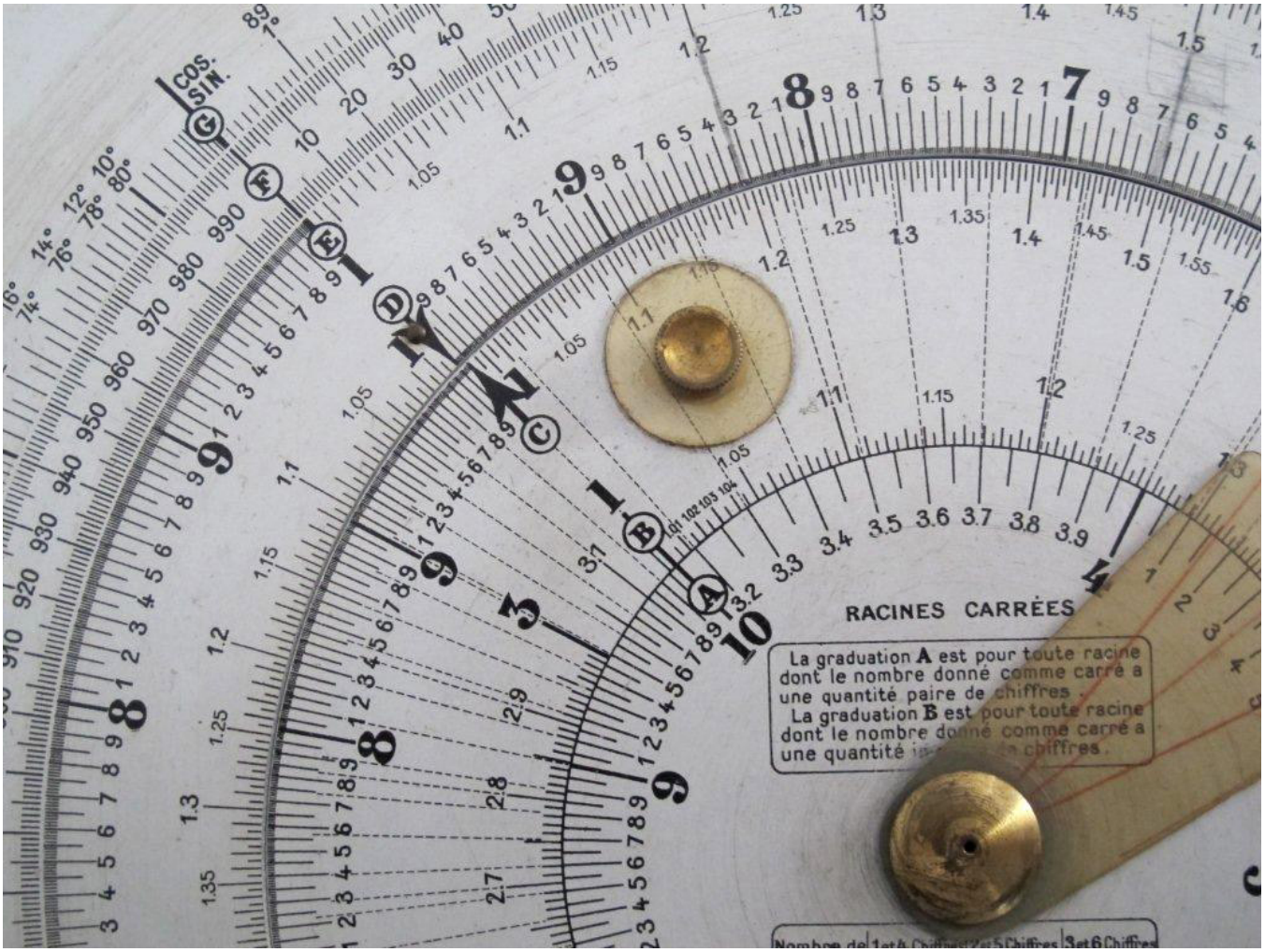


FIGURE 3. Different Labeled Scales

b) Outside the moving disk are non-movable concentric circles

D = log scale anti-clockwise with arrow

E = log scale clockwise

F = a millesimal scale = a thousand equal parts scale

G = scale with angles between 0° and 90°

c) The cursor has an irregular form (Figure 1) and has three radial lines to facilitate the reading of the numbers on the various scales (Figure 3).

d) The construction feels very solid and is quite heavy: around 850 grams.

Instructions

For example, the multiplication of 15 by 73 can be made as follows: put these two numbers in one radial line on the C and D scales and read the result 1095 on the arrows C and D.

If we have to execute a multiple multiplication, for example 15 x 73 x 6, we make the above calculation and–without moving the disks–we put the third factor 6 on the E-scale. The result 6570 is read on the C-scale by using the cursor.

Scale A gives the square root of an even digit number on scale C.

Scale B gives the square root of an odd digit number on scale C.

The log of a number on scale E reads on scale F.

The sin and cos of an angle on scale G reads on scale F.

RÉPUBLIQUE FRANÇAISE.

OFFICE NATIONAL DE LA PROPRIÉTÉ INDUSTRIELLE.

BREVET D'INVENTION.

XII. — Instruments de précision, électricité.

3. — Poids et mesures, instruments de mathématiques, compteurs et procédés d'essai. **N° 516.480**

Calculateur.

MM. Jules ARNAULT et Louis PAINEAU résidant en France (Vienne).

Demandé le 5 avril 1919, à 14h 51m, à Paris.

Délivré le 6 décembre 1920. — Publié le 19 avril 1921.

Cette invention a pour objet un calculateur à l'aide duquel les additions, soustractions, multiplications, divisions, racines carrées, racines cubiques et d'autres calculs encore peuvent être faits aisément et rapidement.

à 8 : huit unités, donc au-dessus du o de A B, on a bien neuf unités de A′-B′, de même au-dessus du o de A′-B′, on a neuf unités de A-B.

Cette démonstration se répète pour 2 et 7, 35 3 et 6, 5 et 4, etc.

FIGURE 4. Patent

Patents

A French patent N° 516480 was granted to Messieurs Jules Arnault and Louis Paineau, both citizens of France near Lyon. The application date is April 5, 1919 (Figure 4). Remarkable is the lack of a cursor in the patent's model (Figure 5). Maybe the model was modified later.

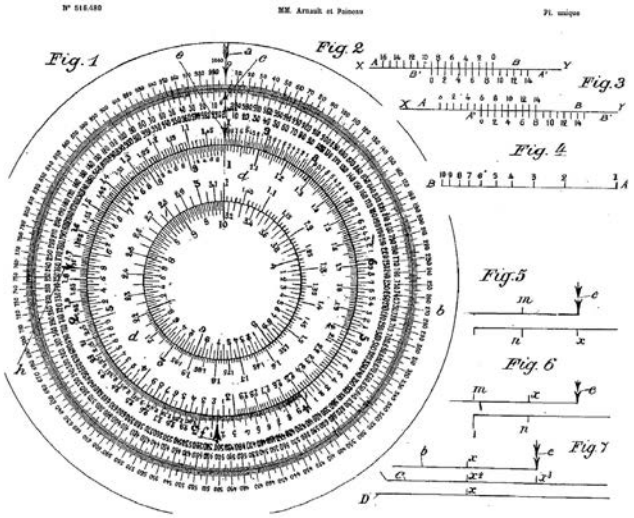


FIGURE 5. Patent's Model without Cursor

Models

According to [4], [5], [6] several models do exist. However, a chronological order cannot be deduced. Thus, the next list is arbitrary.

Model I: model as described above with scales from A to G; dimensions 26 cm x 26 cm (Figure 1).

Model II: this is model I but reduced in scales (from A to E) and in dimensions: 12cm x 12cm. Note also the different shape of the cursor, see Figure 6 and Figure 7 courtesy of collector Gonzalo Martin [6].

Model III: this seems to be a cardboard model in a cardboard box [7] (maybe the first model?).

Historical note: the French Academy of Sciences acquired a castle named after Antoine d'Abbadie (1810-1897), scientist and member of the academy. This castle in the village of Hendaye in southern France has a collection of several scientific instruments; among them are shown two distinct Arnault-Paineau circular slide rules. There is a copyright on the pictures so there is no image herein. A manual reveals the name Arnault-Paineau [7].

Other models: the above list is not exhaustive. Indeed several indications are found.

a) Figure 8 is a picture with the label "compressed repro-

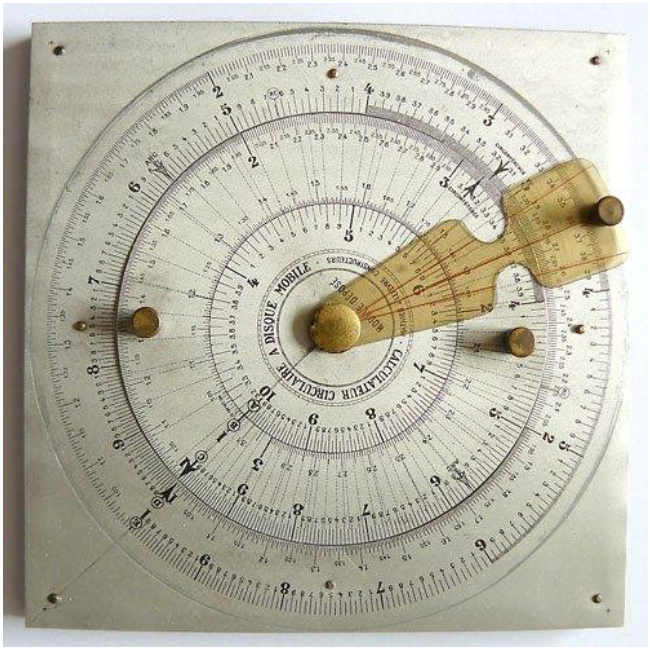


FIGURE 6. Smaller Model II

duction of Model N°2" suggesting there is also a Model N°1 [5] ?

b) Figure 9 is the title page of an instruction manual with an insert mentioning there are new models [5].

An advertisement [4] states there is an office model for 65 Frs. and a pocket model for 35 Frs. Frs. (francs) being the French currency at that time. Maybe these are the previous models I and II.

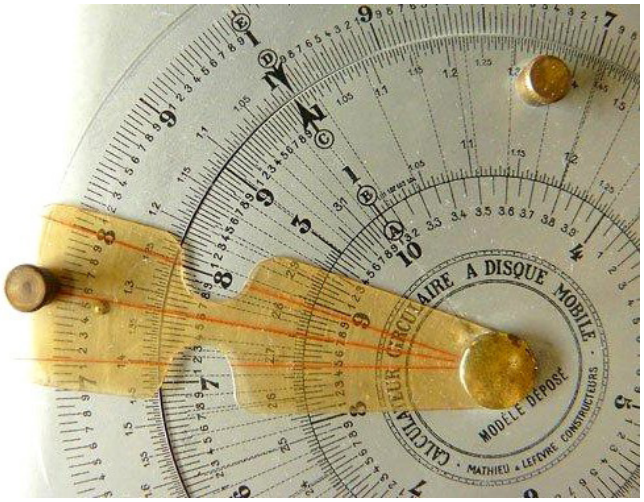


FIGURE 7. Details Model II

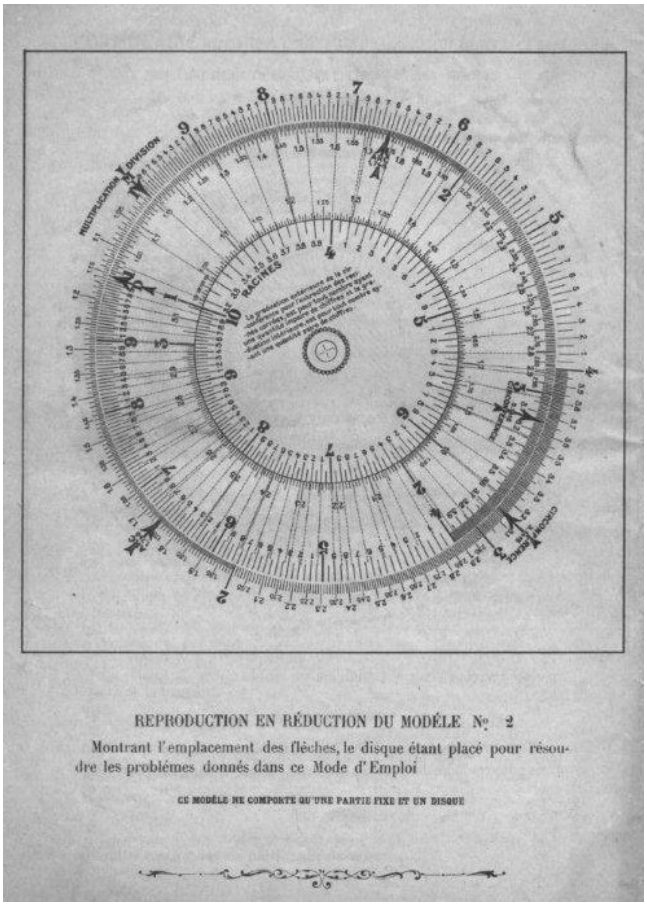


FIGURE 8. Model N° 2

Manufacturer

On earlier models, no manufacturer's name is found. However, Model II bears the mention "Mathieu et Lefèvre Constructeurs". Very useful is the inscription "Calculateur à disque mobile" (Circular calculator with moving disk), which is nearly a standard quote in several advertisements. The patent's publication date is April 19, 1921. Therefore, advertisements for this device obviously appear around this date. In such an advertisement (Figure 10), the factory is located at Montrouge, 2-4 rue Fénelon, which is in the suburbs of Paris.

References

1. La Science et la Vie, N° 61, 1922, p. 196

2. La Science et la Vie, N° 61, 1922, p. 364

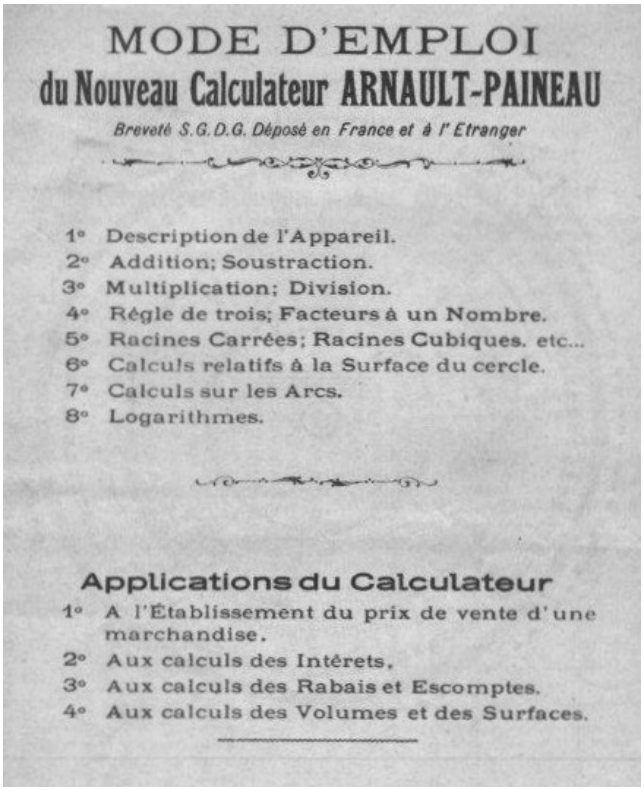
3. La Science et la Vie, N° 101, 1925, p. 402

4. La Science et la Vie, N° 101, 1925, p. XLIV

5. http://www.computer.org/portal/web/tomash, The Erwin Tomash Library, Chapter A, p. 59

6. www.photocalcul.com, picture slide rule of Arnault-Paineau

7. www.culture.gouv.fr


MODE D'EMPLOI
du Nouveau Calculateur ARNAULT-PAINEAU
Breveté S.G.D.G. Déposé en France et à l'Etranger

1° Description de l'Appareil.
2° Addition; Soustraction.
3° Multiplication; Division.
4° Règle de trois; Facteurs à un Nombre.
5° Racines Carrées; Racines Cubiques. etc...
6° Calculs relatifs à la Surface du cercle.
7° Calculs sur les Arcs.
8° Logarithmes.

Applications du Calculateur
1° A l'Établissement du prix de vente d'une marchandise.
2° Aux calculs des Intérets.
3° Aux calculs des Rabais et Escomptes.
4° Aux calculs des Volumes et des Surfaces.

FIGURE 9. Instruction Title Page

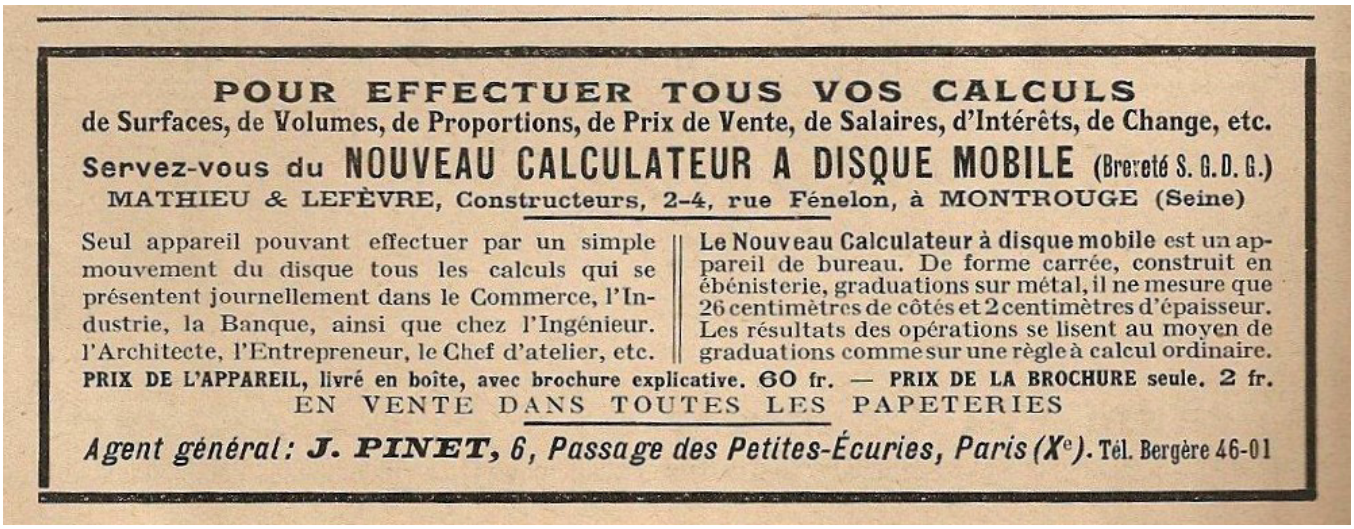


FIGURE 10. Advertisement for the Circular Calculator

Call for Papers: IM 2013

19th International Meeting of Collectors and Researchers
of Slide Rules and Other Computing Instruments

Berlin, 11-13 October, 2013

We invite you to submit your presentation for the IM 2013. Traditionally, the main subjects of IM presentations are slide rules and other computational aids based on logarithms, but we are also interested in other types of mathematical instruments, like integrators, mechanical calculators, and tables. The focus is not on just getting a numerical result; we particularly value reports about applications and how specific instruments, like special purpose slide rules, solved the problem at hand. Furthermore, talks on educational and training issues are most welcome.

The place of the conference provides a theme for some of the sessions: Berlin was and is not only a place for politics and culture, but an industrial metropolis. Since the mid of the 19th century Berlin exploded in area and population, becoming the largest industrial city in central Europe before World War II. The second industrial revolution not only meant production plants, but also facilities for research and development in the city. Famous names like Borsig, Siemens, AEG stand out, but there are many, many more. All that was not possible without the right tools, which is our theme for IM 2013:

Computing for Science, Engineering, and Production: Mathematical Tools for the Second Industrial Revolution

Conference languages will be English and German. All presentation slides will be in English, even if the talk is in German, and summary translations will be provided by the organizers as necessary. The organizers will assist with the slides, if needed. Proceedings will be published as a book and be available at the conference.

As soon as possible, register your talk with the organizers, as well as additional proposals and suggestions for the program.

15 February 2013: Submission of your paper

30 June 2013: Final version for the proceedings

Program committee: Professor Karl Kleine karl.kleine@fh-jena.de; Barbara Haeberlin barbara@anklick-bar.de

Local Organizer: Klaus Krämer klaus.kraemer.berlin@t-online.de

Website: http://www.fh-jena.de/~kleine/im2013