Gravet's patent application for the Mannheim's slide rule (1851)

IM 2019

Marc THOMAS

Lenoir's successors

Date	Conceptor	Maker	Trade mark
1820-1827	Jomard (Soho 36 cm) Collardeau (Soho 25 cm)	Lenoir	Lenoir
1827-1839	Collardeau (Soho)	Mabire	Lenoir
1839-1851	Collardeau (Soho)	Gravet	Lenoir
1851-1866	Collardeau (Soho) Mannheim	Gravet	Gravet-Lenoir 14 rue Cassette
After 1866	Collardeau (Soho) Mannheim Etc.	Tavernier-Gravet	Tavernier-Gravet 14 rue Cassette 39 rue de Babylone (1868-81) 19 rue Mayet (since 1882)

Lenoir and successors

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1839-51	Collardeau (Soho)	Gravet	Lenoir
1851-66	Collardeau (Soho) Mannheim	Gravet	Gravet-Lenoir 14 rue Cassette
After 1866	Collardeau (Soho) Mannheim and others …	Tavernier-Gravet	Tavernier-Gravet 14 rue Cassette (until 1868) 39 rue de Babylone (1868-81) 19 rue Mayet (since 1882)

François-Fuscien Gravet (1812-1895)

Born at Metz

1833 Optician (*lunetier)* Place Dauphine Paris

1838 Math instrument maker Place Dauphine Paris

1839 He buys from Mabire Lenoir's workshop 14 rue Cassette Paris

1844 Bronze medal for a reflexion level and congratulations for his slide rules

1851 Patent application for enhancements of slide rules

1852 He has to use the trade mark « Gravet-Lenoir » after a sentence of the business court of Paris

1857 His daughter Léonide marries Charles Tavernier

1867 The trade mark becomes Tavernier-Gravet, 14 rue Cassette, Paris

Amédée Mannheim (1831-1906)

Born in Paris

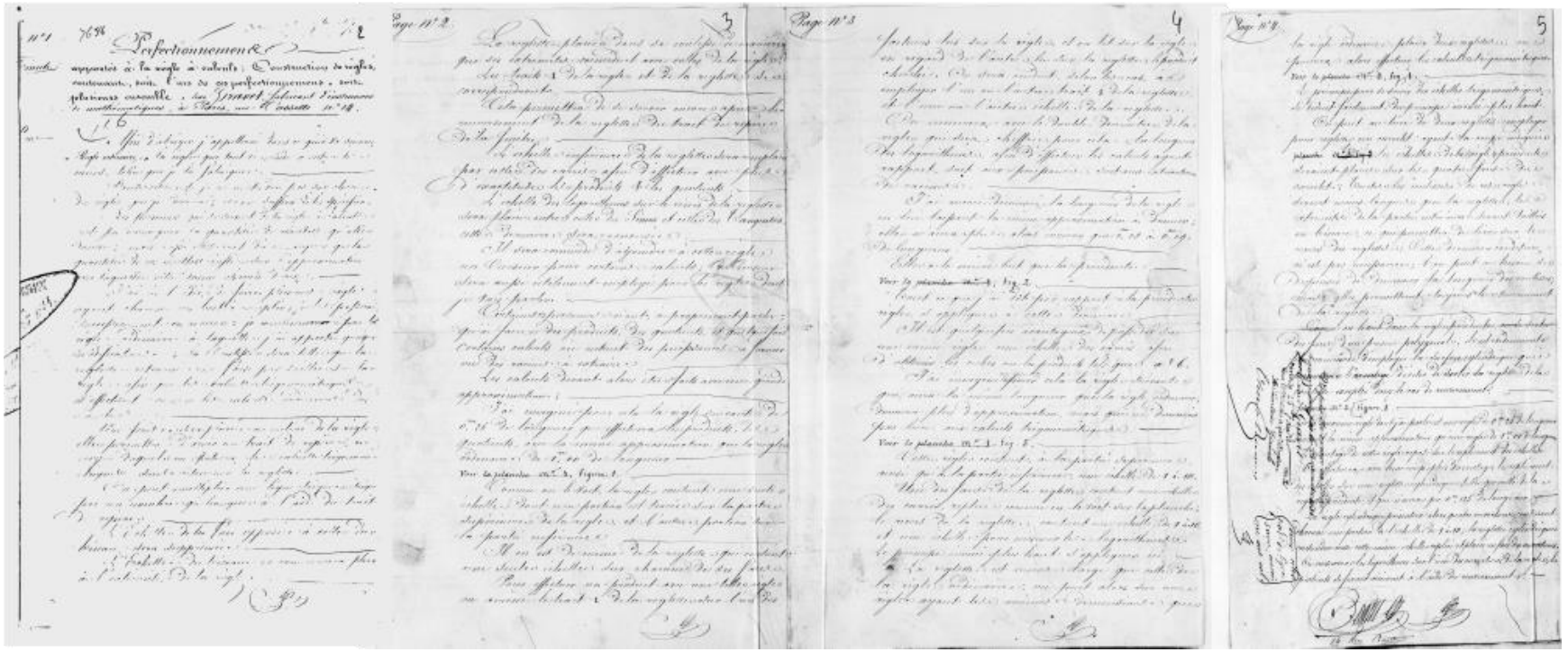
1848 Enters *Ecole polytechnique*

1850 *Ecole d'application de l'artillerie* (Application artillery school) at Metz

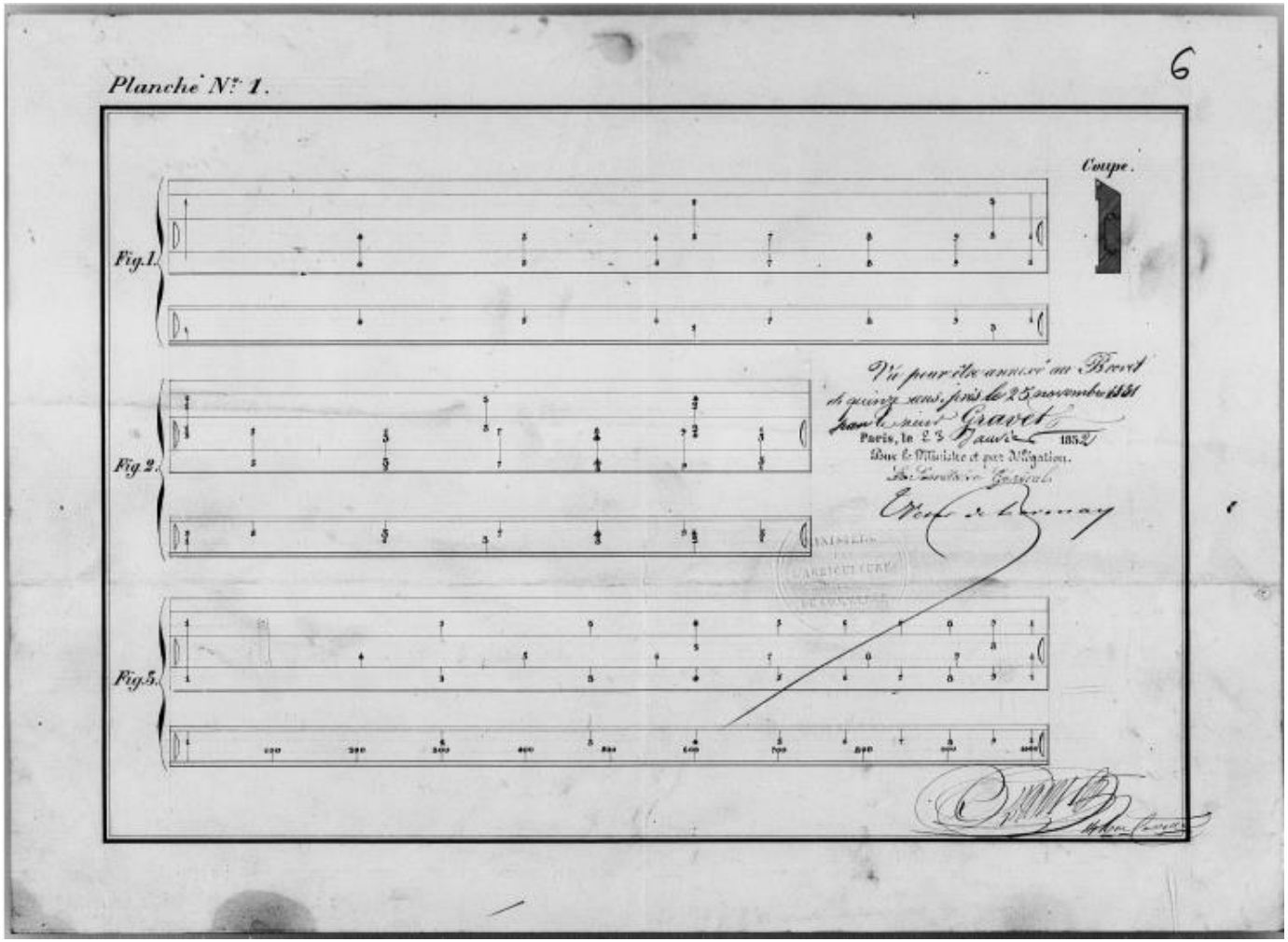
1851 Publishes *Instruction sur la règle à calcul modifiée* (Instruction for a modified slide rule) 4 pages

Then He becomes assistant professor, then examinator and finally geometry professor at the *Ecole polytechnique,* and works in mathematics, principally geometry.

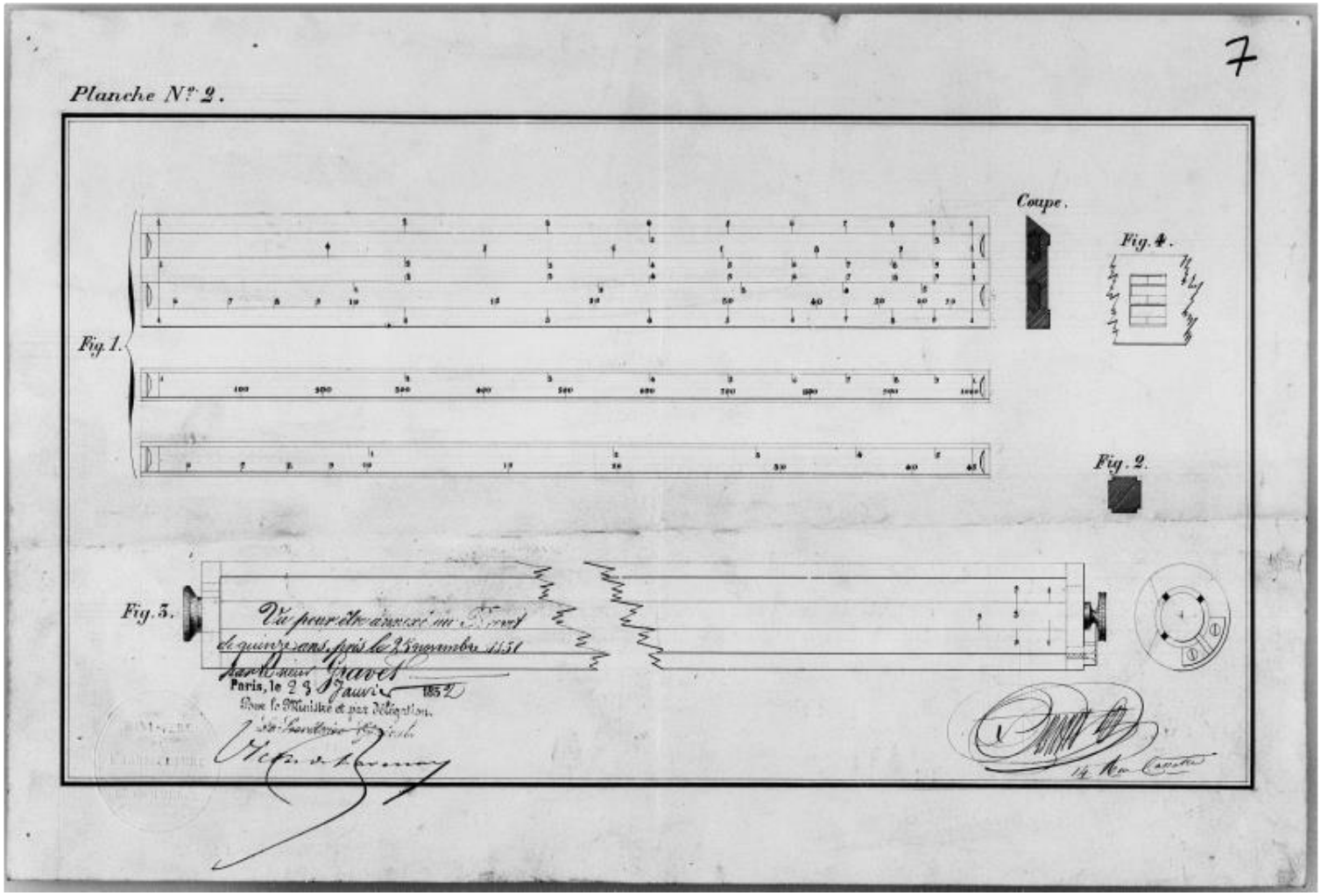
The original text (November, 25th 1851)



First page of drawings



Second page of drawings



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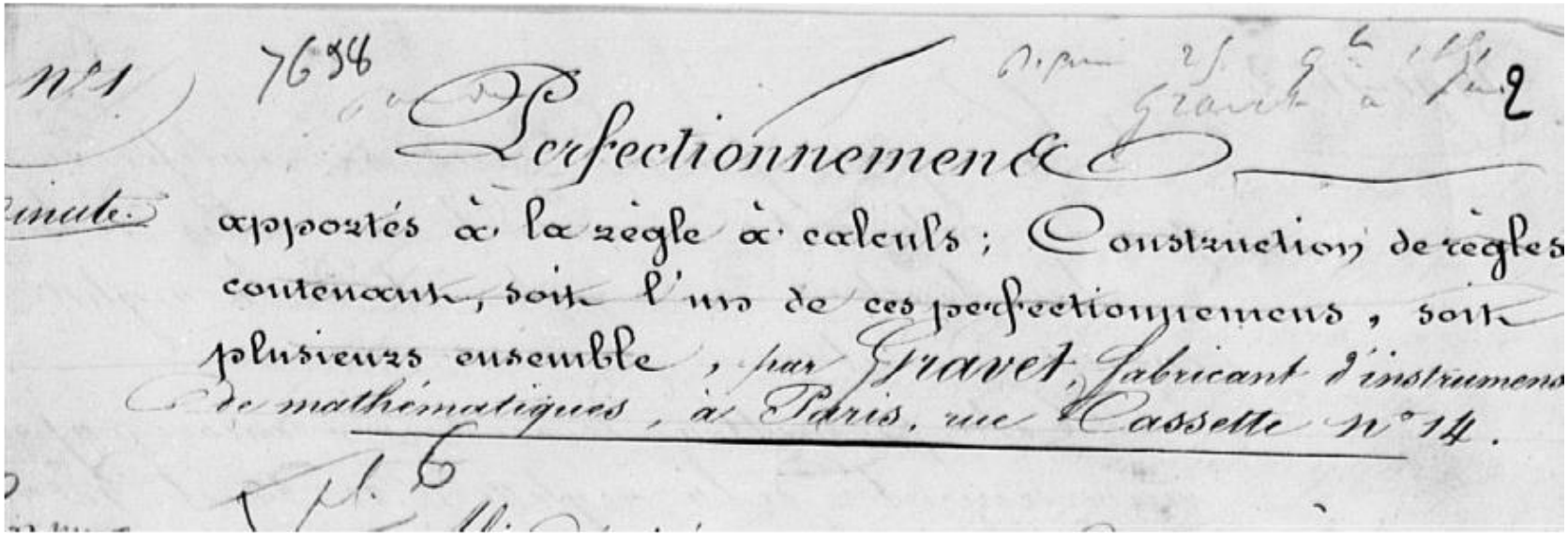

Gravet's signature, with his address : 14 rue Cassette

Enhancements to the slide rule. Making rules containing one of these enhancements, or some together, by Gravet, mathematical instruments maker, Paris, rue Cassette n° 14 .

- *To shorten, I'll call in this document « ordinary slide rule » the rule that everybody has in the hands, such I make it. In this note, I'll not want to go into the details of each model of the rules I describe ; I'll just specify them.*
- *I got the idea of making several rules, each of them having one aim, I'll go through them successively : I'll begin by*

Enhancements to the slide rule,

Making rules containing one of these enhancements, or some together, by Gravet, mathematical instruments maker, Paris, rue Cassette n° 14 .

The introduction :

To shorten, I'll call in this document « ordinary slide rule » the rule that everybody has in the hands, such I make it. In this note, I'll not want to go into the details of each model of the rules I describe ; I'll just specify them.
I got the idea of making several rules, each of them having one aim, I'll go through them successively : I'll begin by the ordinary slide rule to which I brought some changes. The well will be made such as the slide turned over does not pass over the rule so that trigonometric calculations can be made like the ordinary numbers.

A window will be placed in the middle of the rule, with a line mark to make trigonometric calculations without turning the slide over. So it's possible to multiply a number by a trigonometric value by means of this mark.

The ruler on the opposite side of the bezel will be removed. The bezel's ruler will no more begin at the beginning of the rule.

The slide will be placed in its ***runner (coulisse****) such as its endings correspond with these of the rule. The marks 1 of the rule and the slide match each other. That will allow using the line mark of the window with the slide turned over.*

Back of a Gravet Soho rule before 1851 (no window)

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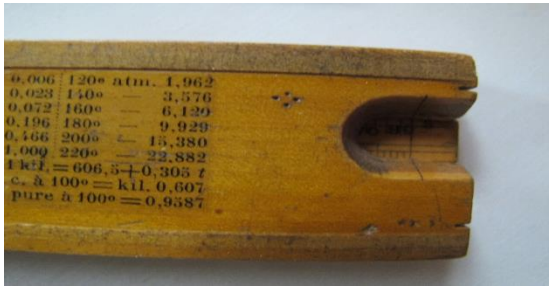
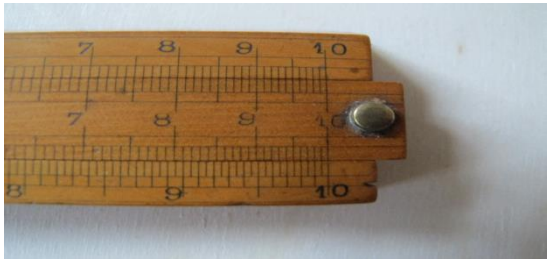
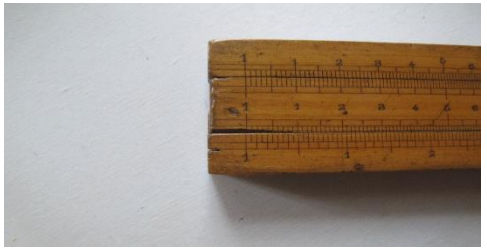


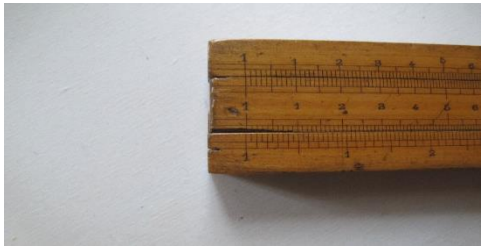
Before, the marks on the rule and the slide



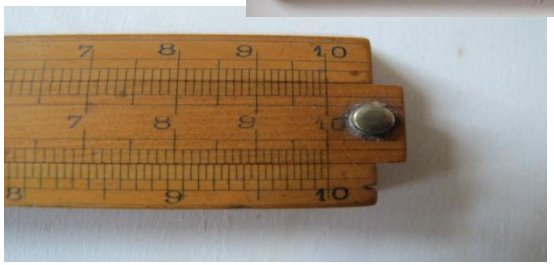
The new positions of the marks on the rule and the slide.




GRAVET LENOIR



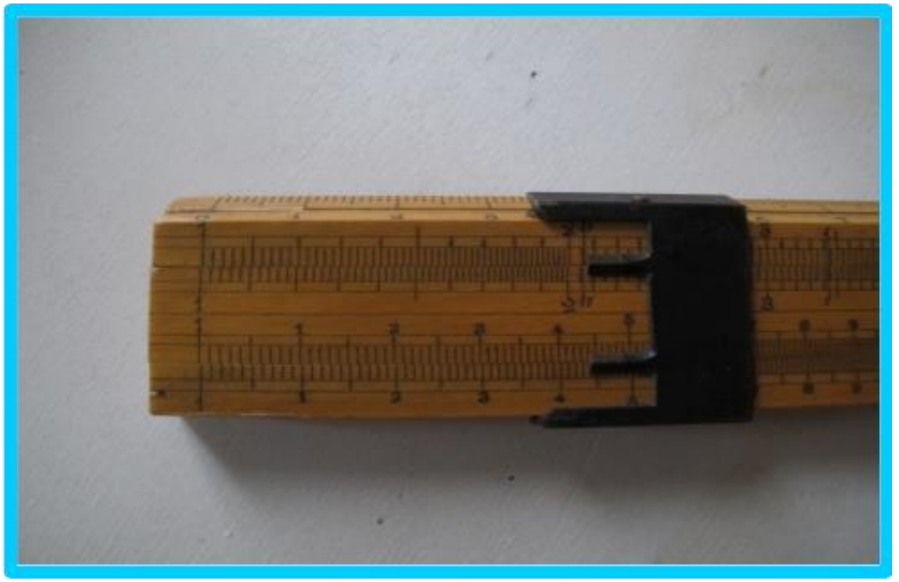

0,006 120° atm. 1,962
0,023 140° — 3,576
0,072 160° — 6,129
0,196 180° — 9,929
0,466 200° — 15,380
1,009 220° — 22,882
1 kil. = 606,5 + 0,305 t
c. à 100° = kil. 0,607
pure à 100° = 0,9587


7 8 9 10
7 8 9 10
8 9 10

Here's the paragraph describing the new disposition of scales : the Mannheim slide rule was born

The lower scale of the slide will be replaced by a square scale so that multiplications and divisions can be done with better precision. ***The log scale on the reverse side of the slide will be put between the sine and tangent scales, this one being inverted.***

With this rule it will be convenient to use a cursor for some calculations ; this cursor will be useful for the rules I'm going to speak of.

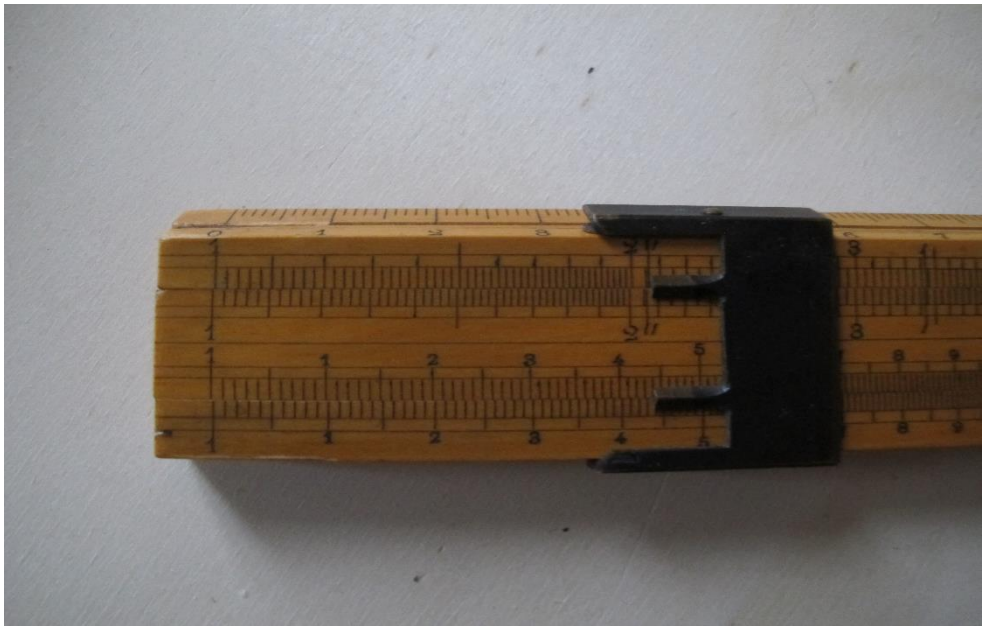


Here’s the paragraph describing the new disposition of scales : the Mannheim slide rule was born

The lower scale of the slide will be replaced by a square [root] scale so that multiplications and divisions can be done with better precision.

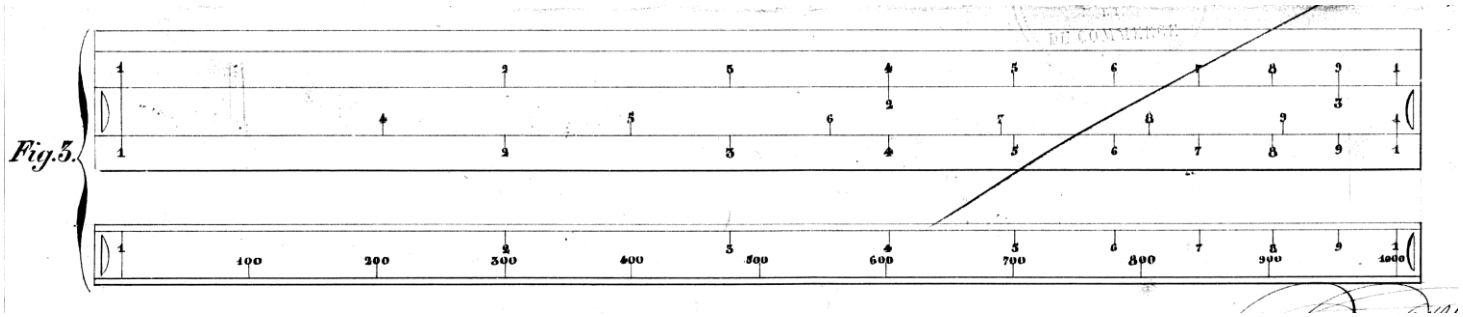
The log scale on the reverse side of the slide will be put between the sine and tangent scales, this one being inverted.

With this rule it will be convenient to use a cursor for some calculations ; this cursor will be useful for the rules I'm going to speak of.



Another paragraph of the text presents a disposition of scales which corresponds to a prototype made by Mannheim himself, conserved in the reserves of the CNAM Museum in Paris

Sometimes it's avantageous to have on the same rule a square scale in order to obtain cubes or products like a^2b. So I imagined the next rule which will have the same length that the ordinary rule, will give a better precision, but will not be able to make trigonometric calculations (see pl. #1, fig. 3). This rule contains, at the upper part and the lower part, a scale from 1 to 10. One of the faces of the slide contains a square scale, folded as it is seen on the picture ; back of the slide there is one scale from 1 to 10 and a scale to measure logarithms.



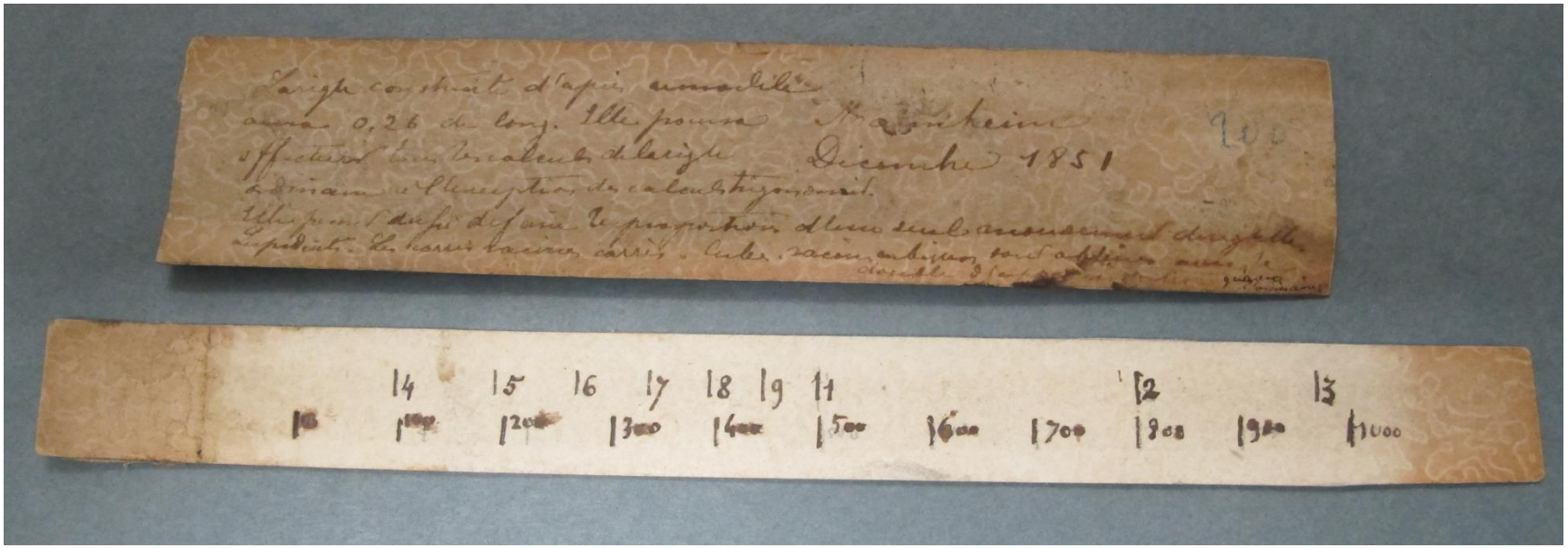


Photo CNAM

Mannheim wrote : *"The rule built according to this model will be 0,26 long. It can make all the calculations of the ordinary rule excepted trigonometric calculations. It can do proportions with only one slide movement, products, squares, square roots. Cubes, cubic roots are obtained with ...* (unreadable due to use)". Signed : *Mannheim, December 1851*.

Folded scales and cylindrical rule

Instead of two slides, it's possible to use as a slide a four sided slide like pl. #2, fig. 2. The scales of the earlier rules should be on the 4 faces of this slide. All the runners of this rule will be shorter than the slide.The ends of the external part will be beveled, which will allow to read on the back of the slides. This last condition is unnecessary ; one may not shorten the runners, but it must be possible to reverse the slide.

As one see in the earlier rule, we use faces of a polygonal prism ; of course, it's more convenient to use a cylindrical surface which has the advantage to avoid getting the slide out, unless in the case of reversing it. (see pl.#2, fig. 3)

The second rule I spoke about is 0m25 long, giving the same precision that a one meter long rule. The advantage of this rule is due to folded scales. Folding scales on a cylindrical slide, like the previous one, is more advantageous. It will be only 0m125 long.

The cylindrical rule will then have four apertures, each containing a part of the 1 – 10 scale, the cylindrical slide will also contain the same folded scale in front of the apertures. Logarithms will be measured under one of the apertures of the rule, quotients will be done by reversing the slide.

Planche N°. 2.

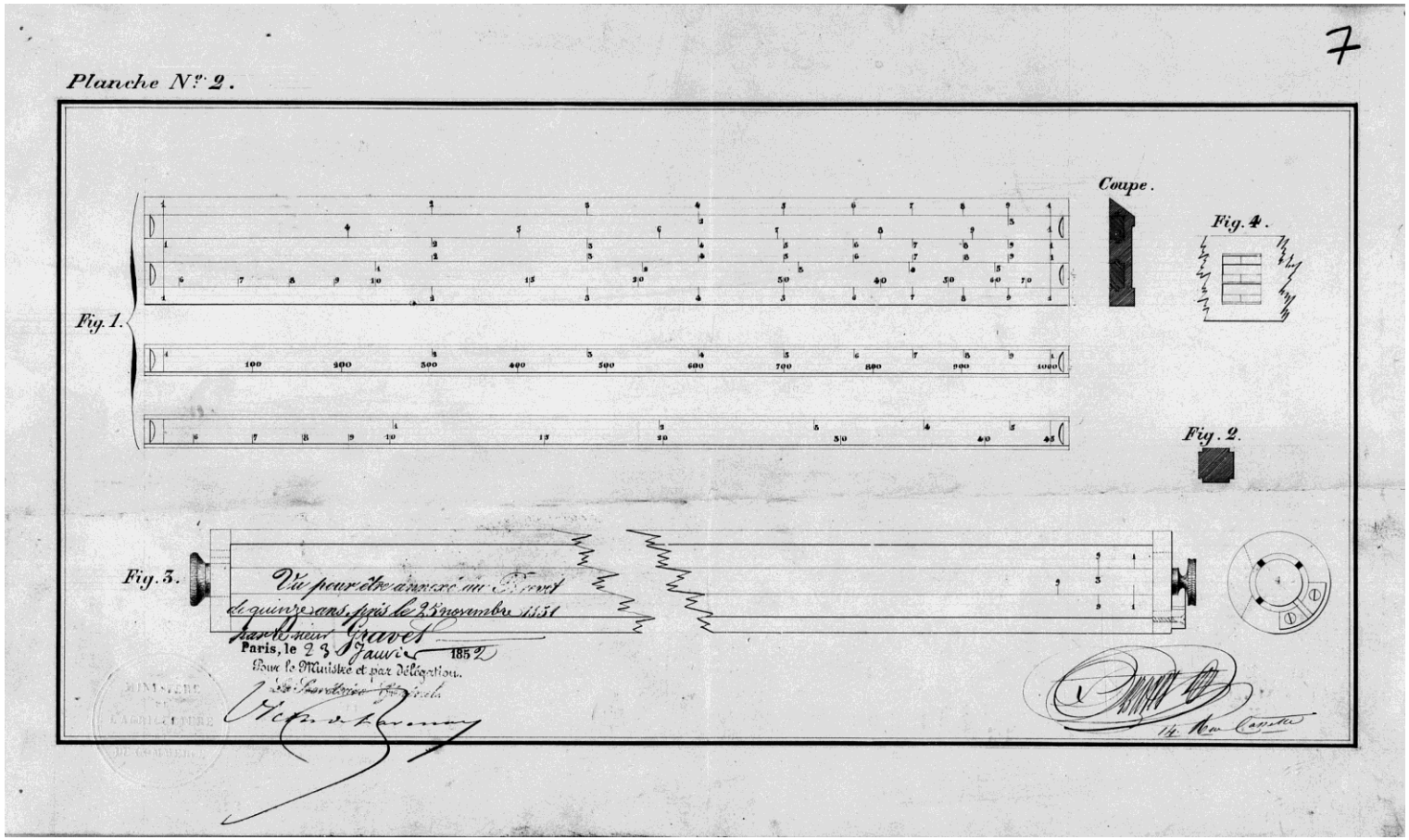


Fig. 1.
Coupe.
Fig. 4.
Fig. 2.
Fig. 3.
Vu pour être annexé au Brevet
de quinze ans, pris le 23 novembre 1851
par le sieur Gravet
Paris, le 23 Janvier 1852
Pour le Ministre et par Délégation.

Wooden model (prototype) of the Mannheim's cylindrical slide rule (CNAM museum)

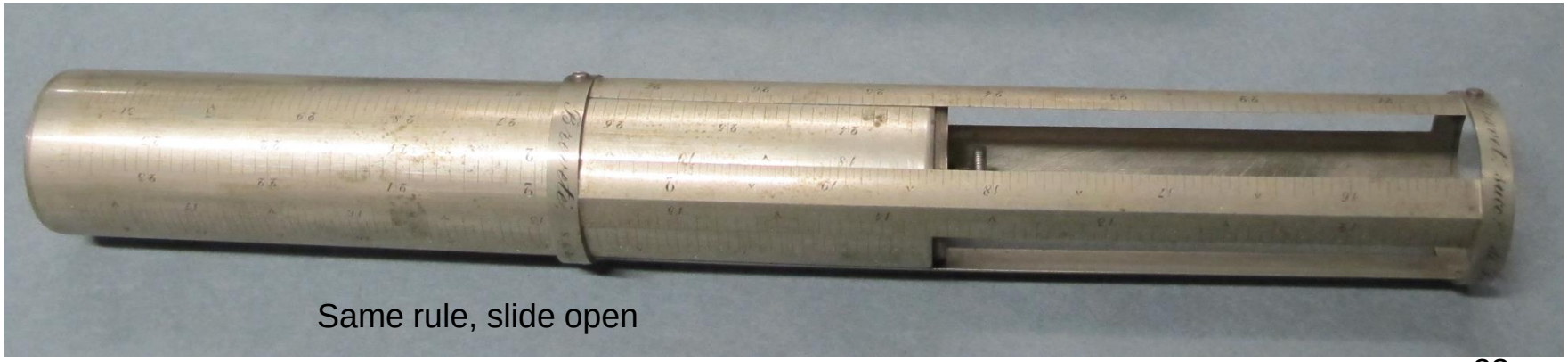
After, Gravet presents a cylindrical rule. The CNAM Museum owns a wooden prototype and a model made and sold by Gravet of this rule.

Wooden prototype :

Photo CNAM

This rule is signed "Gravet, succr. de Lenoir 14 rue Cassette Paris". In the inventory book of the Museum, we read that it has been given by Mannheim and is worth 150 francs, very expensive at the time (about 10 francs for an ordinary Mannheim rule !), and I doubt it has been succesfull.

Overall lenght : c. 15 cm



Same rule, slide open

Mannheim's cylindrical slide rule (CNAM museum)

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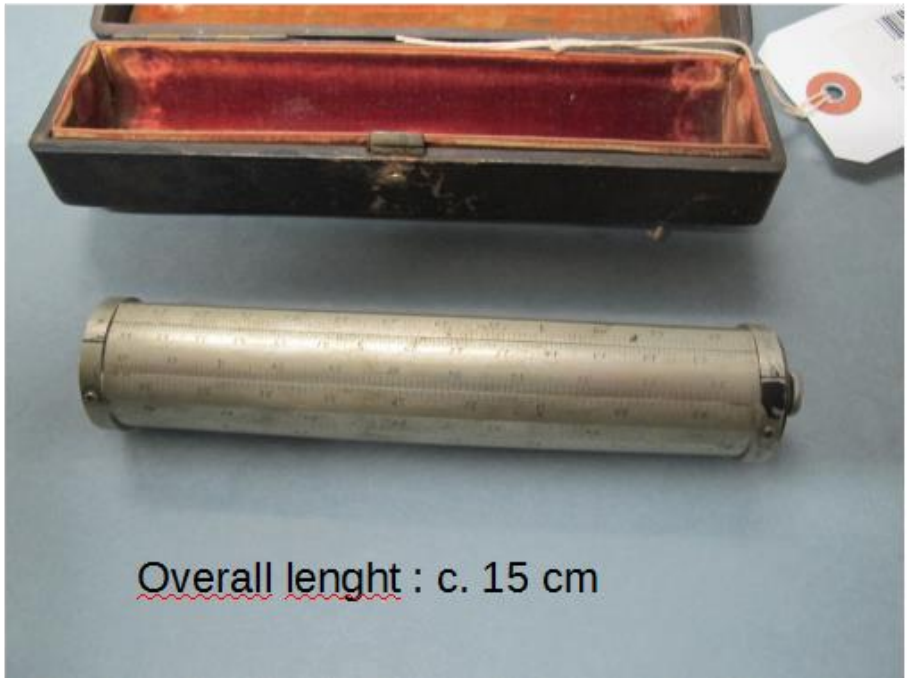

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