The Roulette "X" Circular Slide Rule

Nathan Zeldes

The Roulette "X" is one of those one-off devices that are at once impressive and mysterious. Impressive because of its size, its detailed scales and gauge points, and the overall beauty of its construction. Mysterious because despite a 22 page instruction manual, we know nothing about its inventor or origins. So perhaps the "X" in the name is aptly chosen.

FIGURE 1. The Roulette "X"

Description

It is a possibly interesting observation that whereas practically all linear slide rules follow the same structure and operation mode – a stick sliding in a groove in another stick – circular slide rules are much more varied in how they work. My own collection includes 30 general-purpose (non-specialized) circular slide rules which embody no fewer than 17 different mechanisms, many of them quite ingenious; and the Roulette "X" is one of the ingenious ones. It consists of a fixed disc, a movable disc, and a movable pointer, all pivoted together at the center; but rather than allowing the parts to rotate freely, this pivot is designed to also allow these parts to be locked together in various combinations during the course of a computation.

The device is 24 cm in diameter. Its components, going from the back (bottom) side to the front, are as follows (see Figures 2 through 5):

1. A metal backplate, apparently chrome plated, which forms the back of the device. A short tube, 14 mm in diameter and 8 mm high, is fixed to its center and serves as the pivot around which the next parts can rotate. I will refer to this below as "the inner pivot".

2. A fixed cardboard disc with a protective celluloid layer, which is glued to the metal back and bears two concentric single cycle logarithmic scales. Following the French instructions, I will refer to the outermost scale as F, and to the inner as G (see Fig. 2).

3. A movable metal pointer that projects from under the movable disc to point at scale F on the fixed disc. This pointer is soldered to a flange at the bottom of a wider hollow tube ("the outer pivot") that is inserted around the inner pivot tube, rotating around it when the pointer is moved.

4. A movable cardboard disc, also protected with celluloid, which bears a single cycle logarithmic scale, H, as well as many gauge marks. This disc is reinforced by a "hubcap", a metal disc covering its center; the cardboard, celluloid and hubcap are glued together to form one disc with a wide hole at the center. The hole fits over the outer pivot.

5. A wide annular knurled knob that screws onto the outside of the outer pivot. Tightening this knob presses on the hubcap, thereby locking the movable disc to the pointer, so they move as one. Loosening the knob allows them to move separately.

6. A smaller knurled knob that screws into the inside of the inner pivot. Tightening this knob presses it on the top of the outer pivot, thereby locking the pointer to the fixed disc; and, if the annular knob has also been tightened, also locking the movable disc so the entire device is locked solid. [This small knob was missing in my device, but a friend who is a gifted machinist made me an exact replica based on photos of the two other exemplars mentioned below.]

Note that scales F and H are calibrated from 20 to 200, while scale G goes from 200 to 2000.

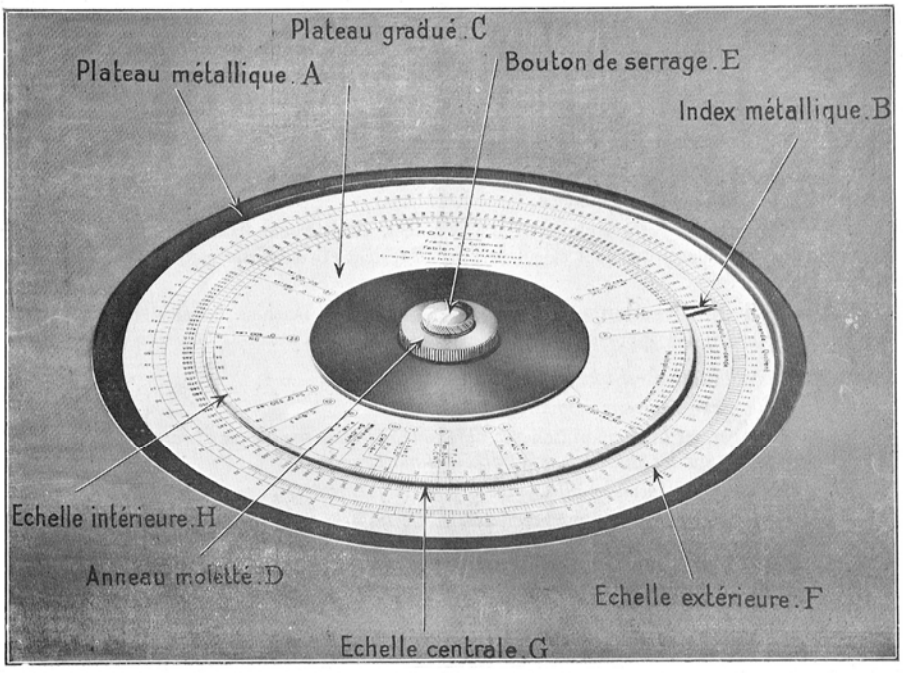

FIGURE 2. Device Components, as Identified in the Instruction Booklet

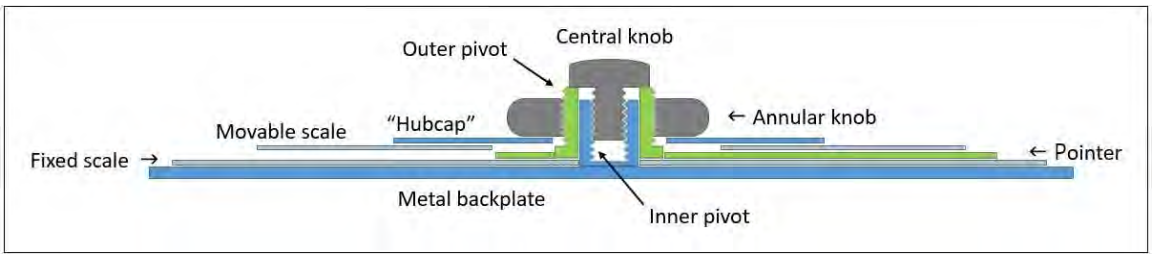

FIGURE 3. Structure of the Device in Cross-Section (not to scale)

FIGURE 4. Central Knobs Assembly (the small knob is a replica)

FIGURE 5. Dismantled Components

Fig. 5 shows the separate parts of the device and exposes the surprising sloppiness of the hidden part of the fixed scale. It can be seen that the fixed and mobile scales were cut from two printouts of the same combined drawing, and the assembly was done by hand. The brown dark blotches are dried glue under the celluloid layer; there are pencil alignment marks and cutouts made with what must have been the equivalent of an X-Acto knife. This suggests that the Roulette "X" was made in a home or small workshop, not in an industrial plant.

Principle of Operation

The instructions booklet focuses on using the device to apply the "Règle de trois", the Rule of Three, meaning the calculation of the value of (**a** x **b**) / **c**. This is effected as follows:

1. Fix the pointer at **c** on scale H (that is, set it there and tighten the annular ring to lock it to the movable disc).
2. Rotate the movable disc until the pointer attached to it points to **a** on scale F.
3. Read the result on scale G opposite the position of **b** on scale H.

An example of this calculation is shown in Figure 6.

Multiplication of two factors, **a** x **b**, is seen as a special case when **c** = 1, and is done by fixing the pointer to 100 on scale H in step 1, and following steps 2 and 3. Division is also done with the pointer at 100, and the details will be left as an exercise for the reader

The device is described in the accompanying booklet as intended for use in commerce, and the rest of the instructions gives pages and pages illustrating commercial calculations of various kinds that must have troubled the 19th century merchant a good deal, back in the days of non-decimal weights and measures. There are problems involving currency conversions, profit margins, pricing of various commodities in various unit systems, and the like. Some of the calculations make use of the many gauge marks on the movable disc, whose cryptic captions are explained in the tables at the end of the instructions.

Here is an example worked out in the instructions:

Find the equivalent rate in francs and kilograms of merchandise valued at P pounds (sterling) per English ton. This calculation makes use of the gauge mark no. 1, located at 1016, which is the number of kilograms in an English ton. Assuming an exchange rate of C francs per pound sterling, one needs to

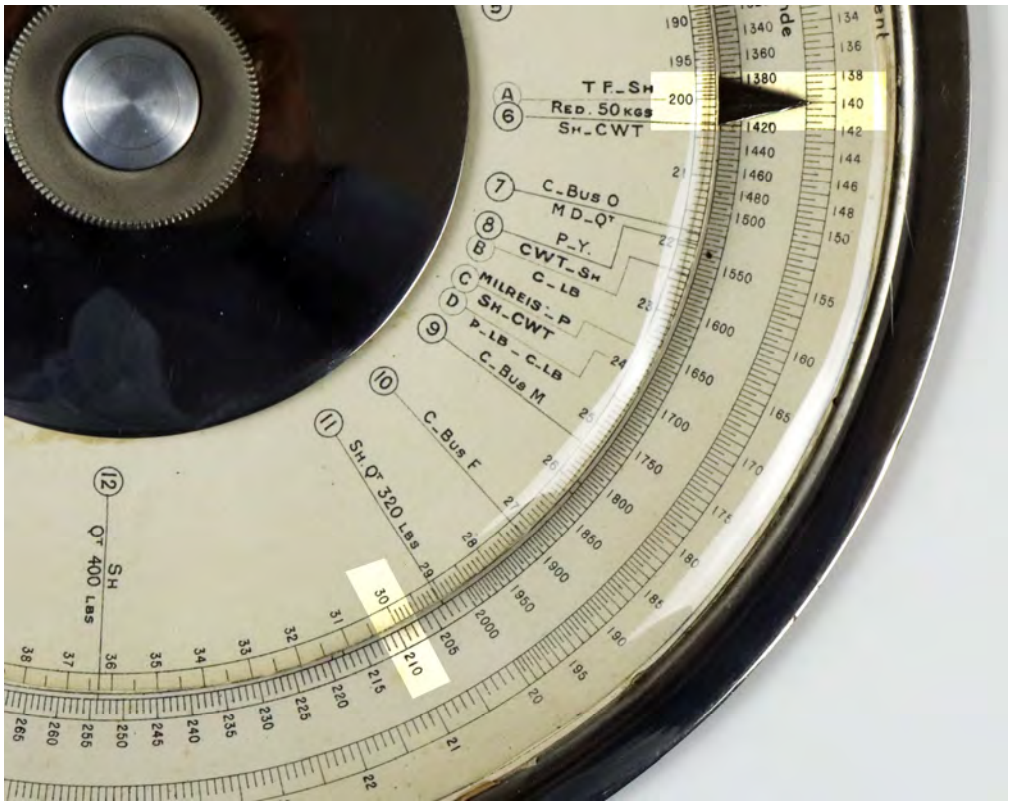

FIGURE 6. The Roulette "X" Set Up to Calculate (14 x 3) / 2 = 21

calculate (P x C) / 1016, which gives the result in francs per kilogram. One therefore fixes the pointer at the said gauge mark, and proceeds to apply the Rule of Three calculation method described above for the multiplicands P and C.

The gauge mark at 1016 is captioned "£–TA, Sh–CWT". The first pair refers to "Pound sterling –Tonne anglaise", referencing the calculation above; the second pair stands for Shilling (1/20 of a pound) and Hundredweight (1/20 of a ton), which would require the same denominator.

Variations and Origins

I have knowledge of only three other exemplars of the Roulette "X":

1. One was in the collection of Daniel Toussaint, and a photo of it is in his rarities document that is accessible online.[1] It is very similar to mine, except that it has fewer gauge marks.

2. Another was in the collection of Bob Otnes, and can be seen in the OS galleries.[2] This one, which is branded as "mod b", has a slightly different scale design and no gauge marks at all. This may or may not be the one mentioned briefly in a report by Bob Otnes[3] about a Breker auction he attended in 1994 where a "Roulette X Mod. b" was sold for $121.

3. There is also a mention of a "Rossier Roulette "X" Systeme Fabien CARLI" in H. van Herwijnen's Slide Rule Catalogue,[4] but unfortunately no photo is included.

There is no other information about this device anywhere I can find, online or off. We do have on the device (see Figure 7) the names and locations of two marketing agents: Fabien Carli of Marseille, named as the agent for France and its colonies, and Henri Kurd of Amsterdam, responsible for "Etranger" – the rest of the world. Carli's name is in larger font and one might conjecture that he was also the actual inventor of the device... maybe.

The instructions repeat the above two names, but there is a third agent added in blue ink (possibly a rubber stamped addition): Lucien Coudert, the "Agency in Paris".

Whoever Carli was, he took care to sell his Roulette with a detailed instructions booklet and in a red protective pouch made of "Pégamoïd", which was the fake leather of his time. See Figure 8. This material was patented in England in 1891 and in France in 1897, and since it is explicitly named in the instructions, we have a lower bound on the time of manufacture.

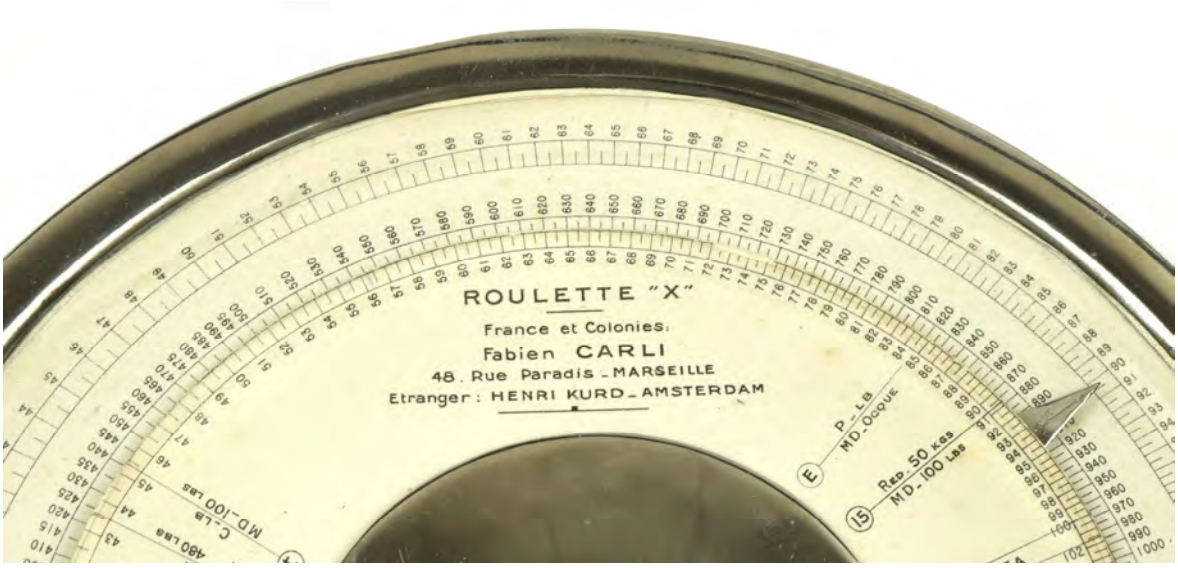

FIGURE 7. Close-up Showing the Agents' Names

FIGURE 8. Case and Instructions Booklet

JOS Plus

- A scan of the instruction booklet.
- A high resolution version of Fig. 1.

Notes

1. http://www.machineacalculer.fr/divers/1218.pdf
2. https://osgalleries.org/collectors/otnes/info_and_image.cgi?string1=circular_and_spiral&string2=3038
3. Otnes, Bob, *Travels and the Market Report*, Journal of the Oughtred Society, Vol. 4 No. 1, March 1995.
4. https://sliderules.lovett.com/herman/fulldetails.cgi?match=2286