A Long Lost ALRO

Some innovative designs for slide rules were registered and some were patented while others were just described in brochures. But were all such designs ever made?

Introduction

Some inspired designs fail because they cannot feasibly be turned into a commercial product. The reasons can be technical, financial or simply that as launch day looms, the market potential for the idea changes or a pre-emptive competitor product fatally kills off the potential profit margin.
When it comes to slide rules, shop floor production practicalities was often the reason that the model that eventually went on sale looked somewhat different from its registered or patented design. However, models that appeared in brochures or catalogues but have never been seen are more of a mystery. One possible explanation is that some models, like the one designed by Robert Nelting [1], were so specialist or expensive that only a few were ever made and are now probably buried in the depot of some museum. This still leaves a few "Holy Grail"[1] models that avid collectors still look out for. Such an unseen model was the **PIRET** circular slide rule from Dutch maker ALRO.

The "All-Round" company

The full company name was: *ALRO, Maatschappij tot Exploitatie van Octrooien*[2]. The cryptic ALRO part stands for *All-Round*. This acronym came about because when the company started in 1936 they just sold Ø 13 cm metal cased *circular* slide rules.
A unique selling point of ALRO's patented flagship slide rule design was that when folded back, the metal lid doubled up as a handy desk stand. The method of construction used a central nut and a bolt to pack together all the washers, bearing and discs into a tight stack. Although complex, this construction method ensured a smooth operation. It also meant that many alternative scale layouts could easily be substituted into the stack, cost-effectively creating new models.

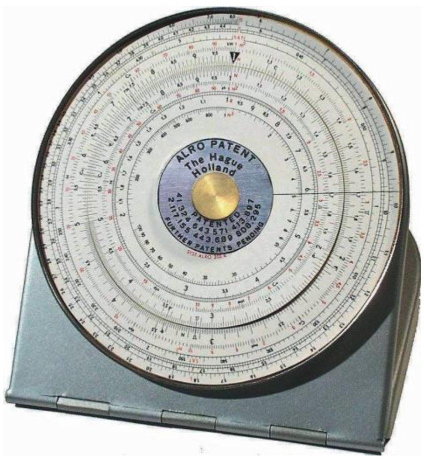

Fig. 1: Popular model 200 R in its desk stand position

[1] A metaphor for something that you very much want but is hard to get.
[2] Translated: *ALRO, Company to Exploit Multiple Patents.*

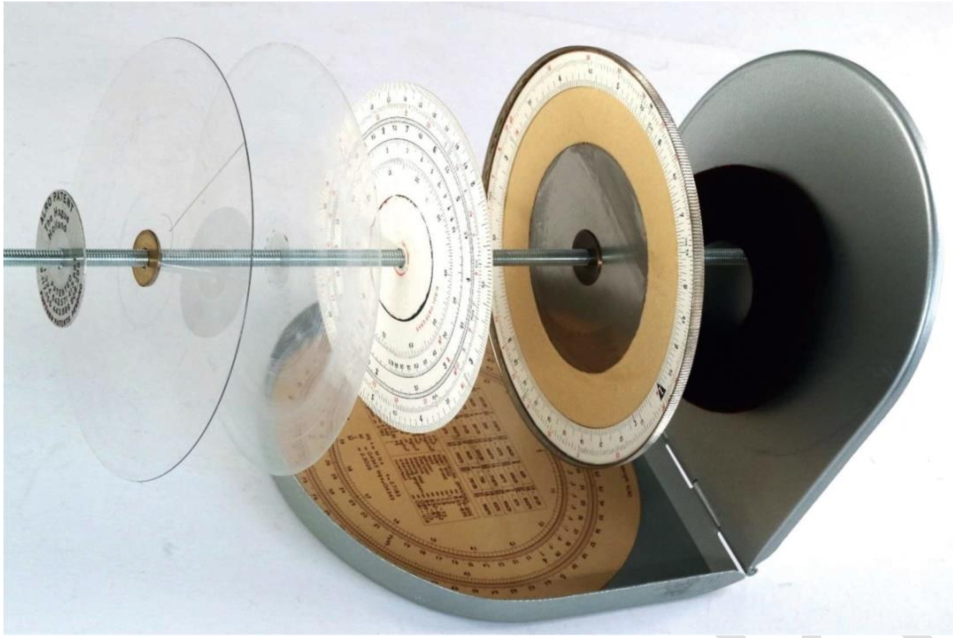

Fig. 2: Exploded 3D-view of the stacked construction on a flagship Ø 13 cm ALRO [2]

The ALRO product range

ALRO recognised the value of marketing but they only ever issued one small black-and-white Z-fold brochure [3] in 1950. It was only published in Dutch. It divided the ALRO range of calculating aids into five sections according to size - from waistcoat Ø 6 cm circular models through to 25 cm linear models. For each model there was only a scant description and an unclear thumbnail image. The most extensive series was *Section II* that listed **twelve** different Ø 13 cm circular slide rules. One of them was a model **PIRET**.

ALRO's overly modest 1950 brochure significantly understated their product range. It also gave no hint of what was later to come. In 1960 the company evolved into a major international producer of printed plastic cards, slide charts and rulers. This underplaying of their success inspired collector *Otto van Poelje* to research and compile a book recording ALRO's impressive history, production processes and products. *The ALRO Catalogue* was launched at the September 2019 International Collectors Meeting [2].

The ALRO Catalogue

By the time ALRO was sold off in 1987 the company had historically a large and diverse product range. Moreover, at different times, the company adopted at least two discernibly different model naming conventions for the calculating aids they sold. This meant that to itemise the entire ALRO product range unambiguously they needed cataloguing according

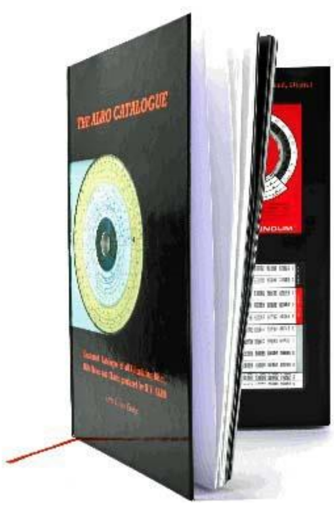

Fig. 3: Hardback *ALRO Catalogue*

to a new coding scheme. At the highest level Otto's unique classification and numbering system split all the products into two groups: (i) Slide Rules and (ii) Slide Charts and everything else. The second and larger slide chart group was further subdivided into seven application areas. Accompanying image galleries have pictures of over 50 slide rules and over 150 plastic slide charts, cards and rulers. However, an image of one model is missing. There was no known example of the **PIRET** slide rule. So this is the only entry in the catalogue with a fuzzy enlargement of the black-and-white thumbnail from the 1950 Z-fold brochure [3].

The Holy Grail

In July 2024 a saved search alerted me to a newly posted ALRO on the online auction site *eBay*. The item was the Holy Grail of ALRO's – a never seen before Ø 13 cm model PIRET slide rule. I made the winning bid.
The PIRET is a specialist machining slide rule. It was designed to perform the calculations needed for a *Wire-Drawing* operation. Oversimplified, the machining process (no heat involved) to make wire involves repeatedly pulling a rod of malleable metal though a series of increasingly smaller hardened dies to reduce the cross-sectional area, stretch its length and sometimes alter the properties of the metal.

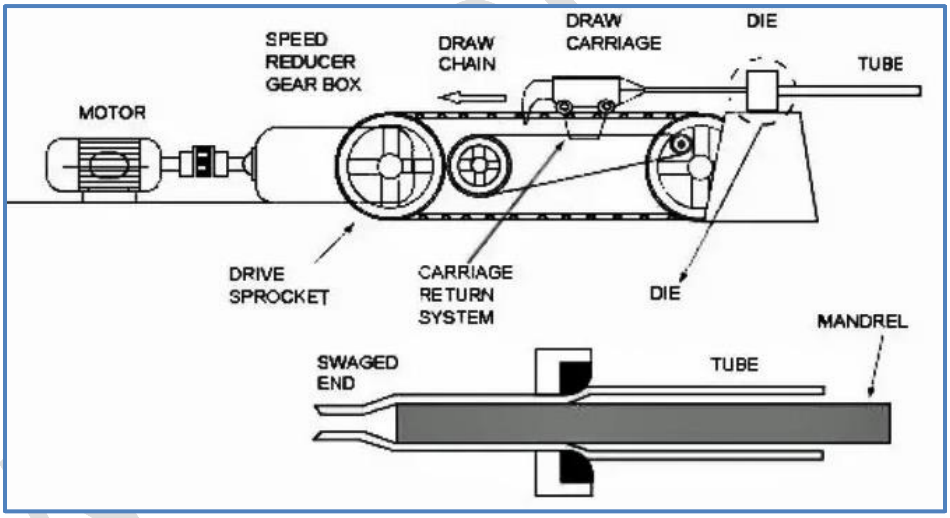

Fig. 4: Schematic of a Hydraulic Cold Wire-Drawing Bench [4]

This sounds a mundane operation to produce common-or-garden wire but the same process was also used for precious metals such as when making rolls of high-carat gold wire. Also the size of the final cross-section can make the extruded wire stand out. For example, drawing it out to just a few microns thick for light filaments or making it centimetres thick for suspension bridge cables. However, in essence the process to make wire has not fundamentally changed for centuries.

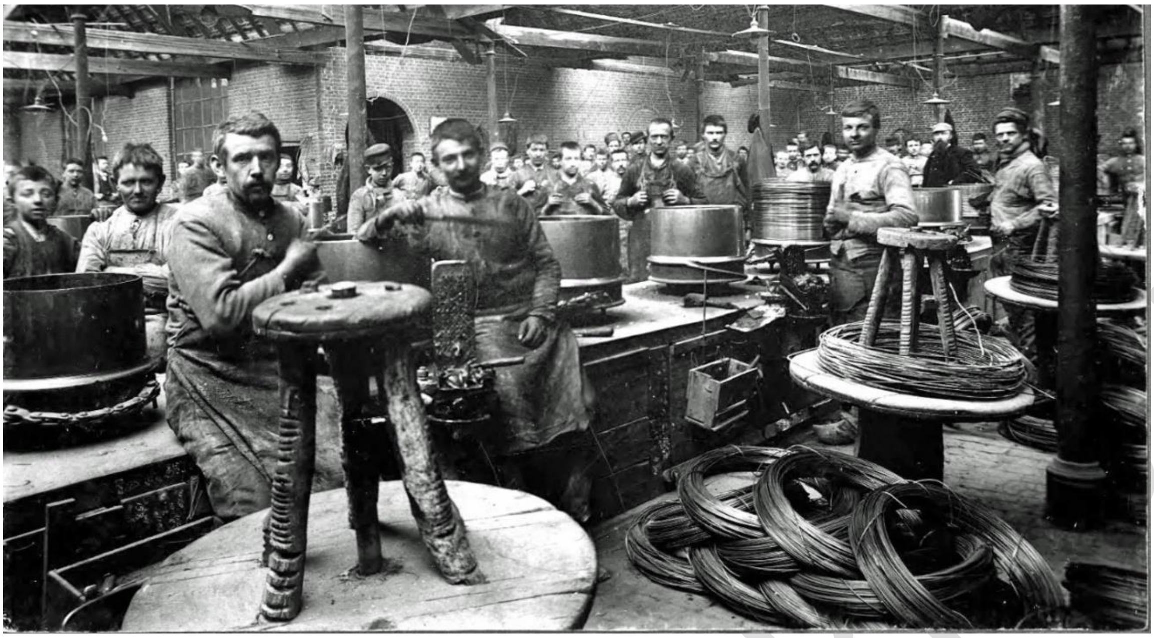

Fig. 5: Workers in a wire-drawing mill around the end of the 19th century [5]

In bygone days the wire-drawing process was labour intensive and steam-driven but now it is an automated machine-controlled process.

ALRO specialist PIRET slide rule

Specialist slide rules were developed for particular trades or industries. The most common specialist slide rule was the "Elektro" – a model for electrical engineers most manufacturers produced [6]. By contrast the specialist PIRET slide rule has just a handful of contemporaries – they are listed in the Epilogue. As is often the case with specialist slide rules, makers commissioned an outside expert to come up with a design. In this case that expert was engineer **Nestor Edmond Jean Piret**. But Nestor Piret is atypical name. He was born in 1910 of Belgium parents in Tagaron, a port city in south-western Russia. It falls outside the scope of this article but Tagaron was at the time a Belgium enclave. For the Piret family and other Belgium compatriots, the enclave came about because of available work in the local *Taganrog Metallurgical Plant* [7].

Probably sometime in the 1930s Nestor Piret left Russia and emigrated to the land of his forefathers, Belgium, and started a family. At some point the family moved to The Netherlands and Nestor joined the workforce of *Van Thiel's Draadindustrie*. This now defunct Dutch manufacturing company was based in Beek en Donk, a town close to the Dutch/Belgium border in the south of The Netherlands. As depicted at the heart of the company logo, the company started off making metal nails before later also producing wire. Nestor's

Fig. 6: Nail-based Logo

employment record at *Van Thiel's Draadindustrie* in unknown but he may have been the factory manager. He appears in several archived company photographs from the 1950s.

Fig. 7: Directors (sitting) and personnel (Nestor Piret is standing second from the left) of *Van Thiel's Draadindustrie* about 1950 [8]

The specialised nature of the PIRET slide rule is reinforced by its unusual layout of scales. Perhaps uniquely for any known slide rule, all the standard scales are reciprocal versions.

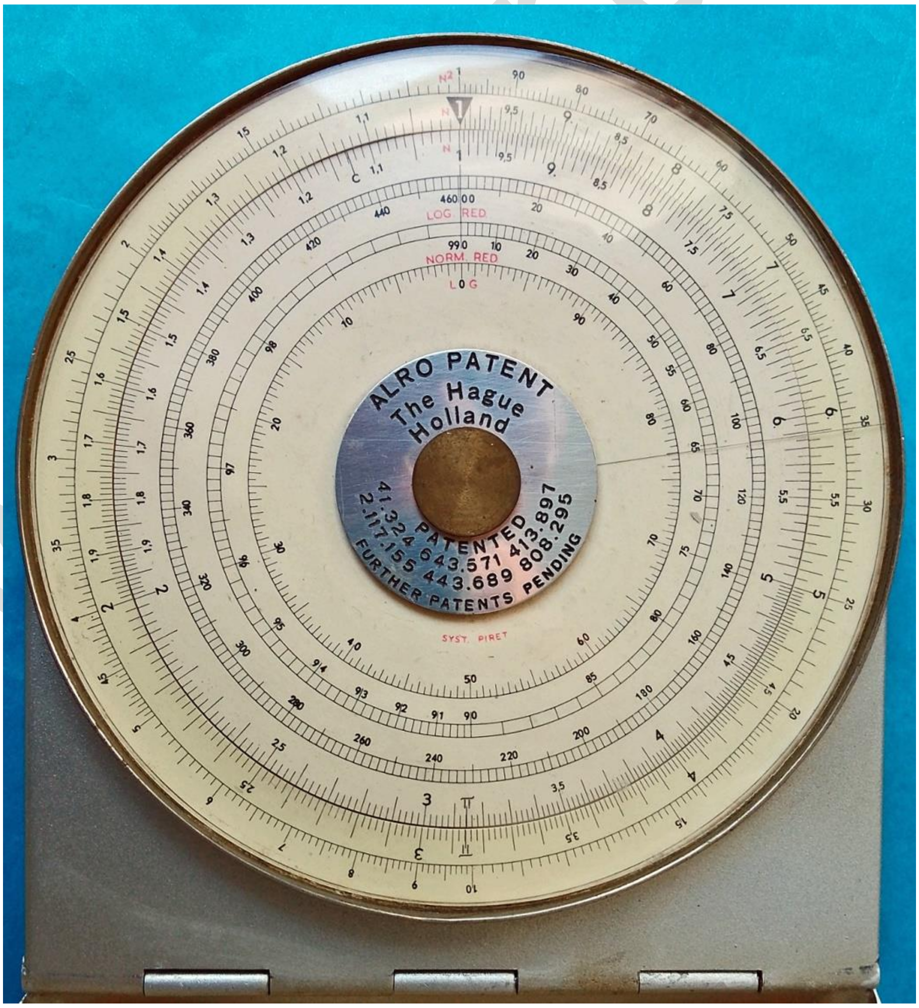

Fig. 8: ALRO metal-cased Ø 13 cm model PIRET slide rule

The scale layout starts with two standard reciprocal scales: **BI** (N^2) and **CI** (N) on the outer rotatable rim. Predictably the next scale on the fixed inner disc is a standard **DI** (N) reciprocal scale. This is followed by the first of the specialist scales annotated **LOG RED** (00-460). This is for calculating the *logarithmic* cross-sectional area reduction percentage. Next to it is another specialist scale annotated **NORM RED** (0-99). This shows the *normal* or linear cross-sectional area reduction percentage. Finally the innermost scale is a standard **LI** (L0G) reciprocal scale. Although labelled **SYST. PIRET** by ALRO, the name coined by Nestor was: "*Reductimetre*" [9].

Using the PIRET

Nestor's made up nickname for his design is apt as the slide rule's purpose is to work out the reducing die sets needed to produce a specific gauge of wire. Despite the wire-drawing machining process sounding simplistic, many factors have to be taken into account. This starts with the type of material – for example, copper is inherently softer than stainless steel. Equally machine speeds, slippage, elongation, starting and exiting die diameters, avoiding excessive wear to die sets, etc all have a bearing. To mill wire classically involves drawing a rod of raw material through a succession of different sized dies. Skill is needed to know the optimum number of dies and their respective step-down sizes. Historically such skill came from shop floor experience and "gut feeling" before being replaced by calculations involving formulae's, nomograms and tables. Nestor wanted to replace the need for these longhand calculations with a fast, simple-to-use and accurate slide rule "anyone" could use.
Sadly no ALRO instructions came with my PIRET. But luckily in an article about his design written for a trade journal Nestor outlines how it calculates cross-sectional area reductions [9]. The basic equation for such reductions is:

$$\boldsymbol{required\ reduction} = \frac{\boldsymbol{initial\ area - final\ area}}{\boldsymbol{initial\ area}}$$

The example calculation Nestor used in his article was to find the reduction needed to draw a 0.203 gauge wire down to 0.0825. Wire size or its gauge is usually measured in imperial circular Mils[3] or metric mm. As the main purpose of PIRET slide rule is to work out the *required reduction* it works equally well for either imperial or metric based units of area. The calculation steps Nestor outlined for his example are:

[3] A unit of area equal to the area of a circle with a diameter of one mil or 1/1000 inch.

1. Set 203 (0.203) on the **CI** scale to the start of the **DI** scale – i.e. the index line or 1 on the **DI** scale
2. Next move the cursor hairline to 825 (0.0825) on the **DI** scale
3. Now where the cursor hairline crosses the **LOG RED** scale shows the logarithmic cross-sectional area reduction needed – i.e. in this example **180%**
4. Where the cursor hairline crosses the next **NORM RED** scale shows linear cross-sectional area reduction needed – i.e. in this example **83.6%**

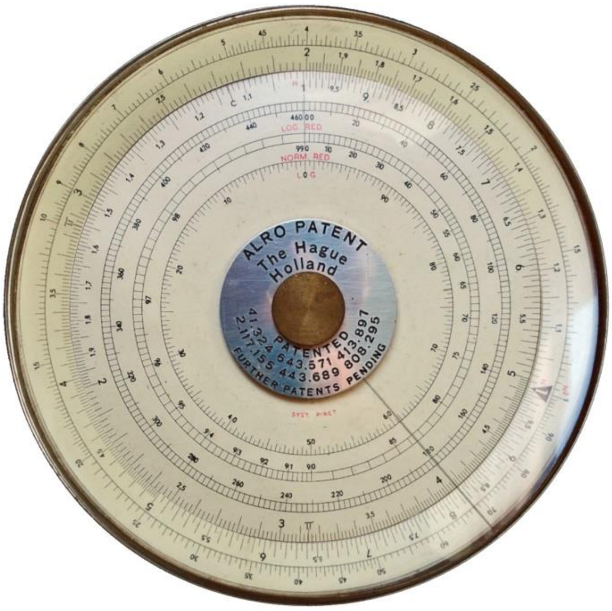

Fig. 9: Online simulation of Nestor's example calculation [10]

Calculating the total amount of reduction needed is the starting point in the wire-drawing process. A rule of thumb in wire drawing is that reductions in the cross-sectional area possible per pass range up to about 45%. Usually, the smaller the initial cross section, the smaller the reduction per pass. Extremely fine wires are usually drawn at 15 to 25% reduction per pass and larger sizes at 20 to 45%. In Nestor's outlined example he opts for the simplest approach of 4 equal percentage reduction passes[4] to achieve the desired gauge. Using the logarithmic cross-sectional area reduction figure of 180% means that with each pass the thickness of the wire is drawn down by 180/4 or 45%. So to draw down the starting gauge of wire in four passes, the dies need to be set respectively to the draw sizes shown in the following table:

	Logarithmic reduction %	**Initial/Final gauge**	**Draw size**
Start	0	**0.203**	-
1st pass	0 + 45 = 45		0.1620
2nd pass	45 + 45 = 90		0.1295
3rd pass	90 + 45 = 135		0.1033
4th pass	135 + 45 = 180		0.0825
Finish		**0.0825**	

Table 1: Details of the 4 passes needed to achieve the final gauge of wire

[4] Other passing schemes were also used – e.g. arithmetic or geometric progressions.

The needed *draw size* values listed in *Table 1* can easily be gleaned from the completed reduction calculation. Keeping the slide rule set as in *Fig. 9*, merely move the cursor hairline respectively to the values 45, 90 and 135% on the **LOG RED** scale. At each increasing interval of 45% the achieved *draw size* can be read off where the hairline crosses the **CI** (N) scale. This worked example admirably shows the cleverness of the special **LOG RED** scale. In his article Nestor points out that the second **NORM RED** specialist scale is only there as a transitional aid to get wire-drawing engineers accustomed to working with logarithmic cross-sectional area reduction percentages. Nestor is also somewhat dismissive of the **LI** (L0G) reciprocal scale. He states it is not needed for any reduction related calculations but was included in the layout to make other general calculations possible.

Finally, as is often the case with ALRO metal-cased circular slide rules, a paper data sheet was pasted inside the lid. For the model PIRET the data sheet is a multi-column table showing for *Wickman Wimet Die* sizes 4/10 to 36 the equivalent wire gauge in circular Mils and mm according to six international standards.

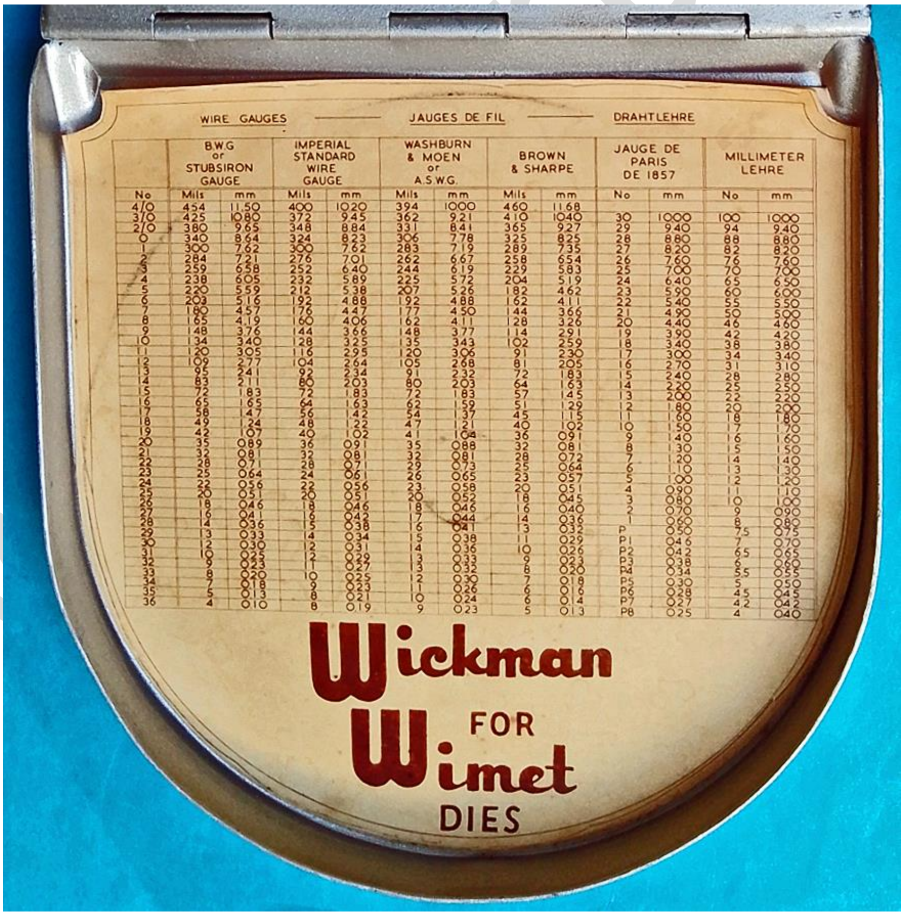

Fig. 10: Data sheet showing die size equivalents for *Wimet Dies*

The name *Wickman* refers to a defunct UK-based *A.C. Wickman Ltd*., a machine tool specialist that became part of the *John Brown Group* [11]. *Wimet Dies* was a division of *Wickman*. This ALRO model was probably only made for a few years from 1950 and possibly only ever made-to-order, as suggested by the customisation for the company *Wickman*.

Epilogue

The model PIRET has one last anomaly. Despite being manufactured by ALRO, it could only be ordered exclusively through Nestor Piret from a private address (possibly Nestor's family home) in Beek en Donk [3]. When, in 1959, ALRO switched to concentrating on printed plastic cards, slide charts and rulers they set up and sold, for the first time, through a German-based subsidiary. But otherwise ALRO never sold through a subsidiary. Sadly it is not known why ALRO agreed to such an unorthodox selling strategy for the model PIRET. When Nestor wrote about his slide rule in the trade journal, ALRO or *Van Thiel's Draadindustrie* are tellingly not mentioned. Equally there is no record of the PIRET design ever being patented. Slide rule makers paid external experts to design their specialist models. Faber-Castell had over 40 specialist models and chose to pay their external experts a royalty on every sale. ALRO had just a couple of specialist models. So it may have been simpler for ALRO to allow Nestor to collect his designer's fee directly as part of the charged retail price.
Many types of calculating aids were developed for the Wire Industry. However, I believe only five makers produced specialist wire-drawing slide rules:

- **A.G. Thornton**: a combined drum and linear model specially commissioned by *Spencer Wire Company Ltd.* [12]
- **Aristo**: specially commissioned linear models 90103 and 10081 [13]
- **Faber-Castell**: pocket-sized linear model specially commissioned by *NV Philips' Gloeilampenfabrieken* [14]
- **IWA**: linear model 09102 [13]
- **ALRO**: circular model PIRET

In 1978 self-confessed "wire friend" Hermann Heuel published an instruction "bible" for the Aristo and IWA wire-drawing slide rules [13]. In it Heuel explains in detail how many more factors involved in wire drawing were calculated using these slide rules. Heuel also makes reference to Nestor Piret's earlier and more basic "*Reductimetre*" design.
Now I have found the Holy Grail for ALRO is my quest fulfilled? No, not really as two other models listed in the ALRO brochure from 1950, the 101 and the 10 RL, have also never been seen! However, the strong suspicion is these two slide rules never made it into production.

Acknowledgement and Bibliography

I am grateful to fellow collector **Andries de Man** for providing helpful leads, reconstructing the article from the *The Wire Society* and for creating the online simulation.

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