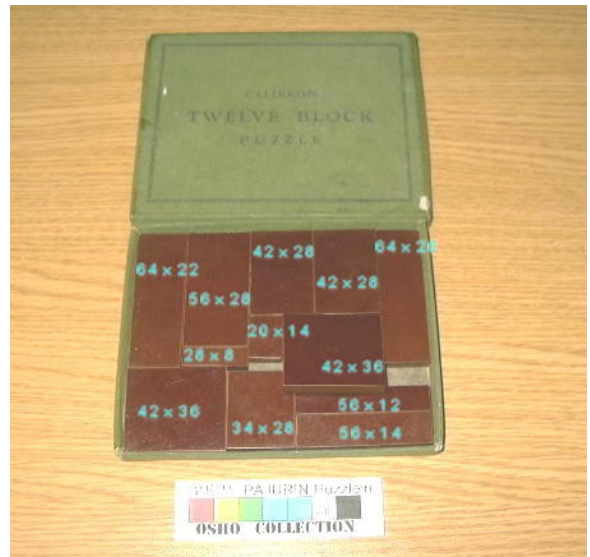# The Mystery of
The Calibron Twelve Block Puzzle
by George Miller and Nick Baxter
G4G12 Atlanta, 2016

Background

This story starts in 1933 when the manufacturing company Calibron, run by Theodore Edison, youngest son of Thomas Edison, published a Bakelite puzzle named *Calibron Twelve Block Puzzle*, also known as the *Calibron 12*. As we will find out, this was a subtle and well thought out puzzle used in a marketing effort to spread the name of Calibron. It was presented in a rectangular box with 12 red pieces and one black spacer piece. The challenge was to arrange the 12 red pieces into a solid rectangle of unspecified dimensions. There is only one way to do this and it is very difficult.

Fast forward sixty or seventy years, the puzzle has become somewhat rare, reportedly having sold less than 200 units. One collector lucky enough to own a copy is Osho (Naoyuki Iwase), a well known collector from Japan who publishes photos of his puzzle collection online. In the case of the *Calibron 12*, he also included hand-measured dimensions of the pieces

The original *Calibron Twelve Block Puzzle*, from the Osho Collection

(in millimeters), so that others could reproduce the design for their personal enjoyment. But as is typical for puzzles of that age, pieces go missing, instructions get misplaced, etc., and thus some of the original subtlety of the *Calibron 12* puzzle was unknowingly lost in this presentation.

Recent Reproductions

In 2010, Pavel Curtis was commissioned to reproduce the *Calibron 12* in laser-cut Acrylic, using Osho's dimensions (found on Rob Stegmann's Puzzle Page) as a guide. Soon Pavel started advertising and selling the puzzle commercially and generously etched the dimensions on each piece, taunting the solver to think that such information might actually be useful!

Not to be outdone, in 2012, Creative Crafthouse, also started publishing the same puzzle with the same dimensions using laser-cut hardwoods with a side slot for storing one of the larger pieces (see below). In this case, they knowingly provide a spoiler by giving away an important part of the challenge: showing the correct rectangle for the solution.

Calibron 12 from Pavel's Puzzles

Calibron 12 from Creative Crafthouse

JCC/Strijbos Variation – with reversible edge

In 2014, Jean-Claude Constantin also reproduced the design under the name *Werkzeugbrett* (or *Tool Board*). This design was enhanced in 2015 by Wil Strijbos, adding a reversible edge to the tray and an extra challenge, to figure out which one of the 12 pieces to remove and then pack the now smaller rectangle with the remaining 11 pieces.

In an online puzzle forum post, Dominik Münch describes the JCC version of *Calibron 12*. He includes the dimensions of the pieces, but having given the puzzle away prior to the post, he could only measure the pieces in pixel units from a scanned image. An anonymous reader, known only as Bobson, scaled and rounded Münch's pixel measurements to get a simplified and compelling new set of measurements.

In the meantime in the Gathering for Gardner community, Jerry Slocum's exchange paper from G4G3 (1998) included a transcription of the original instructions as well as measurements of the pieces, this time in inches with two digits of accuracy.

As it turns out, these four sets of measurements are very close, proportionately, and they all appear to give the same unique solution, roughly. But it turns out they are all different. Who's right?

Rediscovery and Analysis

Last year, a Spanish puzzle collector, Primitivo Familiar Ramos, acquired three copies of the *Calibron 12*, all in virtually new condition with original instructions and spacer pieces. He discovered two astounding facts.

Armed with the original version, the Creative Crafthouse version, and a digital caliper, Ramos discovered minor discrepancies between the two versions, and then reached out to various people in the puzzle community looking for an explanation. What we eventually confirmed is that none of the previously documented measurements were correct. Ironically, the most indirect measurement was the most accurate: Bobson missed just one length by 2% rounding error!

But only Osho's dimensions actually work to precisely assemble a proper rectangle with no holes, meaning that all of the equivalent edge combinations are properly aligned (both
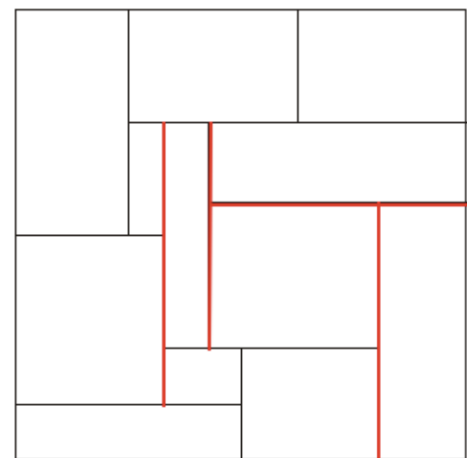

Osho – Moved Edges

sides of the 10 internal compound seams must be equal with no gaps).

To illustrate the subtle differences, above is the solution using Osho's dimensions, indicating in red the edges that are placed ever so slightly differently from the original solution. It's clear that this is just one of an infinite number of possible lookalike puzzles, where compound edges can be moved at will.

The errors inherent in the other measurements are more profound, causing the puzzle to be insoluble (in the absolute precise sense). For example, the Slocum measurements, which are the most consistently accurate, produce a "solution" with small holes, both internally, and making gaps around the outer edge, as indicated in the diagram in orange. The dimensions, despite their apparent precision, simply don't add up.
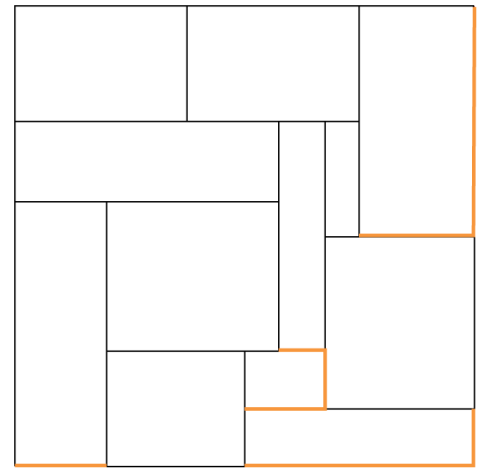

Slocum – Alignment Holes

The following table shows the accurate millimeter measurements from Ramos, the base integer units they represent, and then the other four sets of measurements with relative error (scaled as appropriate).

	Units		Ramos (mm)		Iwase (mm)				Dominik Münch (pixels)				Bobson				Slocum (in)			
1	7	5	19.88	14.20	20	14	2.0%	0.0%	234	164	2.1%	0.2%	1.4	1.0	0.0%	0.0%	0.8	0.6	-1.6%	-1.6%
2	10	3	28.40	8.52	28	8	0.0%	-4.8%	327	94	-0.1%	-4.3%	2.0	0.6	0.0%	0.0%	1.1	0.3	0.2%	-1.6%
3	12	10	34.08	28.40	34	28	1.2%	0.0%	397	327	1.1%	-0.1%	2.4	2.0	0.0%	0.0%	1.3	1.1	-0.1%	0.2%
4	15	10	42.60	28.40	42	28	0.0%	0.0%	491	327	0.0%	-0.1%	3.0	2.0	0.0%	0.0%	1.7	1.1	-0.4%	0.2%
5	15	10	42.60	28.40	42	28	0.0%	0.0%	491	327	0.0%	-0.1%	3.0	2.0	0.0%	0.0%	1.7	1.1	-0.4%	0.2%
6	15	13	42.60	36.92	42	36	0.0%	-1.1%	491	422	0.0%	-0.8%	3.0	2.6	0.0%	0.0%	1.7	1.5	-0.4%	-0.2%
7	15	13	42.60	36.92	42	36	0.0%	-1.1%	491	422	0.0%	-0.8%	3.0	2.6	0.0%	0.0%	1.7	1.5	-0.4%	-0.2%
8	20	4	56.80	11.36	56	12	0.0%	7.1%	655	140	0.1%	6.9%	4.0	0.8	0.0%	0.0%	2.2	0.5	-0.7%	0.6%
9	20	5	56.80	14.20	56	14	0.0%	0.0%	655	164	0.1%	0.2%	4.0	1.0	0.0%	0.0%	2.2	0.6	-0.7%	-1.6%
10	20	10	56.80	28.40	56	28	0.0%	0.0%	655	327	0.1%	-0.1%	4.0	2.0	0.0%	0.0%	2.2	1.1	-0.7%	-0.7%
11	23	7	65.32	19.88	64	20	-0.6%	2.0%	750	234	-0.4%	2.1%	4.5	1.4	-2.2%	0.0%	2.6	0.8	-0.5%	-0.3%
12	23	8	65.32	22.72	64	22	-0.6%	-1.8%	750	258	-0.4%	-1.5%	4.5	1.6	-2.2%	0.0%	2.6	0.9	-0.5%	-0.5%

Table 1. Original base units, and relative error for various measurements

Ramos' second discovery is actually much more exciting than uncovering some minor measurement errors, something that no one in recent documented history had known: Calibron actually produced *three* different versions of the puzzle! The 12 red puzzles pieces are always the same, but each type came with a differently sized black spacer piece, either 5x4, 10x2, or 20x1 units. Furthermore, the box was sized to perfectly fit the 12 puzzle pieces and any one of the spacers in a 45x36 (or 1620) unit rectangle (where the puzzle solution formed a 40x40 square).
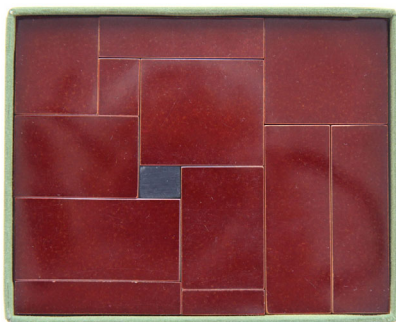
| 5 x 4 Spacer | 10 x 2 Spacer | 20 x 1 Spacer |

Thus in any of the three cases, the puzzle could be presented and stored flat and firm, as shown above, and never giving away the dimensions of the solution. In each case, the storage configuration was slightly easier than the puzzle itself, allowing for multiple assembles: 32 assemblies using the 5x4 spacer, 72 assemblies using the 10x2 spacer, and 104 assemblies using the 20x1 spacer.

So now we know that the *Calibron Twelve Block Puzzle* is not just a haphazard assembly of 12 rectangular blocks that just fit together uniquely. Rather, it is actually a very clever collection of pieces that intentionally assembles in four different but related ways, and was designed at a time long before BurrTools! It turns out that Theodore Edison was perhaps just as great an inventor, or at least as great a puzzle designer as his father!

The Last Mystery Solved?

The source of the sizing confusion is still something of a mystery—why are the precise dimensions of the pieces so irregular? If they were in whole millimeters, then Osho's measurements would likely have been accurate; and if they were reasonable fractional inches, then Jerry Slocum could have nailed it. Why instead are the "correct" measurements in hundredth of a millimeter?!

One intriguing hypothesis is that the puzzle was originally designed using the base units from Table 1, and then scaled so that the solution would be a very normal 4-inch square. But for some reason, perhaps the Bakelite fabricators worked in metric, the dimensions had to be converted to millimeters. And instead of applying the correct conversion of 2.54 cm/inch, a careless typo or bad handwriting resulted in 2.84 cm/inch being used instead. If this had happened, the resulting piece dimensions would be *exactly* the irregular dimensions that Ramos discovered!

Acknowledgements

Web References
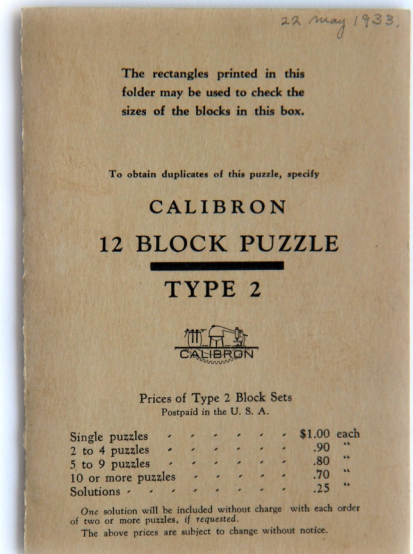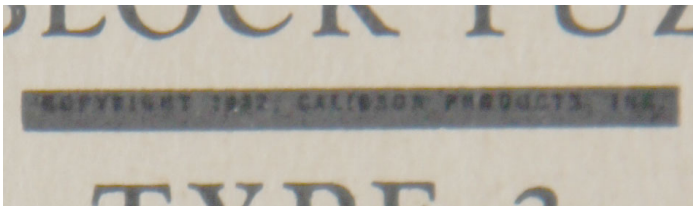
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