Some Distinctive Features of Dietzgen Slide Rules

Rodger Shepherd

Introduction

This is an article about some of the distinctive features and innovations that have intrigued me in my limited experience with Dietzgen slide rules.

Before discussing these features, I feel the need to put them into historical context. It seems reasonable to assume that as a drafting and surveying supply house that competed with companies such as K&E, Dietzgen had to offer a full and competitive range of products, in order to maintain customer loyalty. In the case of slide rules, it appears that this required offering rules made by other companies. In many cases these rules were imprinted with Dietzgen's name, although they were not made by Dietzgen. Not only did Dietzgen need to match the offerings of other drafting supply houses, it probably needed to offer unique features that slide rule users of the time perceived as useful. It is these features that have intrigued me, and I seek Dietzgen rules that illustrate them.

Having proceeded from the premise that these intriguing departures and innovations were the natural consequence of a healthy drive to remain competitive, I must admit being puzzled by Dietzgen's failure to introduce duplex slide rules until 1941. As I will note below, this aberration had some interesting consequences.

The Cube Scale and Keyholes

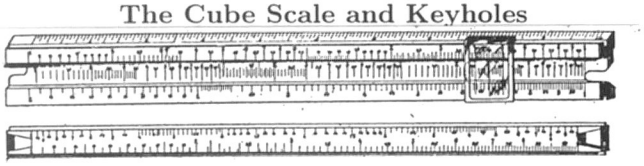

Figure 1. Illustration from an early Dietzgen slide rule manual showing the K scale located in the stator behind the slide and the trapezoidal "key holes" in each end of the slide.

Dietzgen introduced the three-cycle scale in 1904-1905, as an optional feature in the, then new, "Multiplex" Mannheim (designated Model 1762). What would currently be called the K scale was then called the E scale. In the first version of the Multiplex Mannheim the E scale was mounted on the stator under the slide. The E scale was indexed to the C and D scales, so theoretically it should have been possible to read the cube roots and cubes by simply inspecting the numbers that aligned on the E and D scales. However, the E scale was recessed 3/16" behind the D scale, and parallax could compromise the user's ability to make fine determinations of cube roots and cubes. The solution to this problem was to convert the slide into a cursor for the E and D scales. There were two distinct variations of this strategy. The first is shown in the 1905 Dietzgen slide rule user manual [1]. As is indicated in Figure 1, the ends of the slide were notched back to the indexes on the B and C scales.

Thus the indexes had depth extending to the E scale. The resulting forked ends of the slide were covered with metal plates. This approach was superseded by a "keyhole" at each end of the slide at the index of the B and C scales.

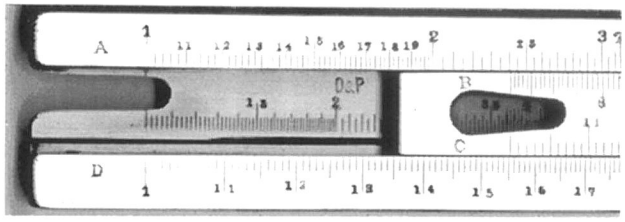

Figure 2. Left end of an early Dietzgen Mannheim with K scale on stator behind the slide. The "key holes" at each end of the slide are now rounded. A celluloid inset in the key hole has markings which were used to read the K scale. (Specimen from the collection of Henry Aldinger.)

At each keyhole, a transparent material was mounted very near the back surface of the slide, and inscribed with an index line and adjacent scale. When this recessed index was placed over a point on the E scale, the index on the C scale indicated the corresponding point on the D scale. Thus, the key holes became special cursors for reading across from the E to D scale. In practice this must have been very unsatisfactory, because the key hole permits the user to see only about 1/2" of the E scale, and it is difficult to get oriented to the E scale and its markings in the region of interest. The view that this arrangement was unsatisfactory is also supported by its short life cycle. By 1907, the key holes were gone, the cube scale had been relocated to the under edge of the stator (displacing the centimeter scale), and a special index tab had been added to the cursor for reading the cube scale.

The Self Adjusting Stator

The slide rule sections of early Dietzgen catalogs are quick to call attention to, what must have been, a vexing problem with the Mannheim slide rules of that time, i.e., differential expansion of the wood could cause the slide action to become stiff. Diezgen offered a series of three solutions to this problem. The first two were devised to make the contact between the upper stator and the slide self adjusting, i.e., dependent on spring loading which could yield in response to expansion of the slide or stator. The first such mechanism resulted in a product that was the called the Mack Improved Slide Rule. In the Mack rule, the stator was spit longitudinally directly under the slide. In such slide rules this split is easily

seen when the slide is moved to one side. The top and bottom halves of the stator are maintained in alignment by three pins that cross the split. The two halves of the stator are maintained in contact with one another by a "number of small springs" that run parallel to the alignment pins. This feature appears first in the 1902-1903 catalog, which provides the following illustration.

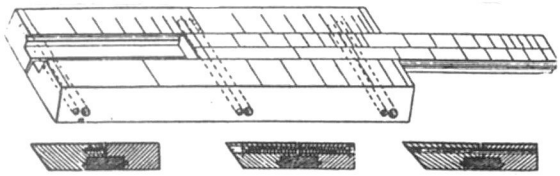

Figure 3. Early schematic of the mechanism of the "Mack Improved Slide Rule" showing pins and springs connecting the upper and lower halves of the stator.

According to the catalog a series of stops keeps the two halves from closing down more that 1/100 of an inch on the space intended for the slide. These slide rules are easily recognized. When the slide is removed and the stator halves are pulled apart, the split is very evident. A slip of paper can be passed through it, and the pins and springs can be seen crossing the gap.

A specimen of Model 1762B with keyholes (see above) clearly has this Mack mechanism and is marked "D&P Germany", suggesting that the production problems associated with the Mack mechanism may have been solved by Dennert & Papp.

The Mack mechanism appeared in subsequent catalogs through the 1912 edition, but had been abandoned by the time of the 1919 catalog.

Meanwhile, the second type of self-adjusting mechanism was introduced. The Dietzgen Improved Adjustment appeared in the 1910-1911 catalog. In this type of Mannheim slide rule the back of the stator is solid wood. However, the wooden forward extension, on which the A scale is mounted, is a separate piece that is spring loaded, so as to adapt to changes in the height of the slide.

This mechanism is best illustrated in the 1919 catalog.

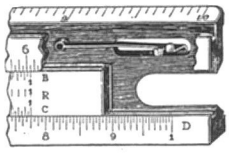

Figure 4. The mechanism of the "Improved Automatic Adjustment." Although the illustration shows only the right end of the stator, a similar spring was imbedded in the left end, too.

These rules are easy to recognize, because upward pressure on the A scale mounting will cause it to move away from the slide. This mechanism continues to appear in catalogs through 1928. By 1931, it had been replaced by a screw adjustment that had long been standard in some K&E Mannheim rules.

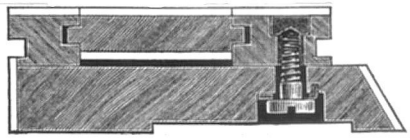

Figure 5. The slide tension adjustment that ultimately replaced the spring-based adjustments.

The "Long Slide"

Many older Dietzgen Mannheim slide rules have a slide that is about 1/4 inch longer than the stator. This means that some part of the slide is always protruding beyond the stator, and it is never necessary to "poke" the slide out of the aligned position. This extra length has been added to the right end of the slide, which suits this right-handed user. The long slide is not clearly depicted in the catalogs until 1928. However, I have a Multiplex Mannheim (Model 1762B) that has the early Mack mechanism and the long slide. The keyhole version of Model 1762B (mentioned above) does not have a long slide. This places the appearance of the long slide between 1905 and 1907.

The long slide was not unique to Dietzgen slide rules; K&E duplex rules show this feature through 1906. It is the persistence of this feature that is distinctive of Dietzgen rules. The long slide is still seen in the 1941 Dietzgen catalog.

The Br Scale

Model 1762 also introduced Dietzgen's first inverted scale, in the form of a distinctive version of the B scale. This B scale is essentially a two-cycle B scale that begins in the center and progresses in both directions, i.e., the left cycle is inverted and was designated the Br (for reciprocal).

The keyhole version of Model 1762 (mentioned above) shows this feature, placing it as early as 1904-1905. (Inverted scales must have been exciting innovations. For one thing, they permitted the multiplication of three numbers with one slide setting.) The Br scale is last seen in the 1921 catalog. That same catalog introduced

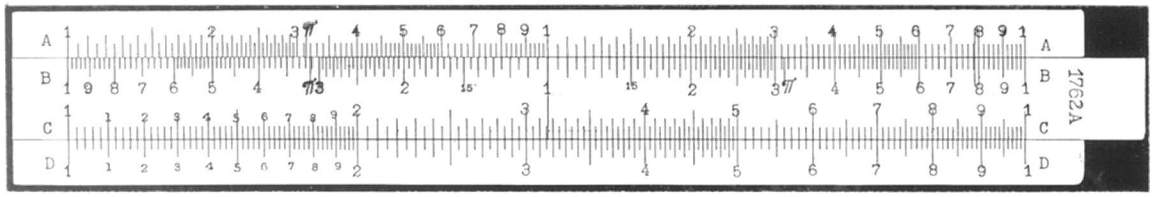

Figure 6. Dietzgen model 1762A showing the bidirectional B scale. The numbers on the left half (the Br scale) are printed in red. This slide also illustrates the "long slide" which extends beyond the stator to the right.

the Phillips slide rule, which has a conventional B scale and a BI scale (which is called the R or Reciprocal Scale).

The Phillips Slide Rule

This Dietzgen Mannheim is noteworthy, because this one slide rule includes three of the features mentioned above, i.e., the Dietzgen Improved Adjustment, the long slide, and the R scale. The Phillips is first seen in the 1919 catalog, and is last seen in the 1941 catalog.

The Dietzgen Frameless Cursor

The Dietzgen frameless cursor first appeared in the 1919 catalog about the time that K&E was offering a similar feature. In contrast to the K&E frameless cursor, the Dietzgen version was not adjustable. This appears to have presented no problem, until the Dietzgen frameless cursor had to be adapted to the duplex slide rule. For some reason Dietzgen was surprisingly slow in offering duplex slide rules, and they appear for the first time in the second version of the 15th edition of their Catalog, which appears to have been printed in 1941.[1] The frameless cursor, that was adapted for the early Dietzgen duplex rules, is innocuous appearing, but the inner structure is distinctive. Each lens has two grooves ground into the front surface. These grooves are perpendicular to the hairline, and only 2mm from the upper and lower edges of the lens. The cursor bar mechanism engages in these grooves. The result is a cursor which is very difficult to adjust and reassemble.

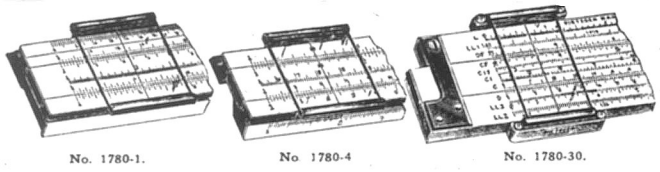

Figure 7. Versions of the Dietzgen frameless cursor. The metal at the upper and lower edges engaged with grooves in the glass. Mannheim versions were not adjustable. The version for duplex slide rules was difficult to reassemble and to adjust.

The Micromatic Duplex

Sometime between 1956 and early 1959, Dietzgen offered the Micromatic Adjustment in its log-log decitrig and vector duplex slide rules. These slide rules are recognized by two features. First, there are four screws securing the adjustable part of the stator instead of the usual two. Each pair of screws engages with a small cylinder that rests on a spring imbedded in the stator. The cylinder is slightly longer than the thickness of the stator. As a result of this, the adjustable stator "floats" in a spring suspension. Pressure on the left end of the ajdustable stator will confirm it is free to move very slightly. The second distinctive feature is a small adjustment screw in the right end of the adjustable stator. This adjustment screw can be used to force the adjustable stator to shift very short distances (i.e. realign) to the right or left.

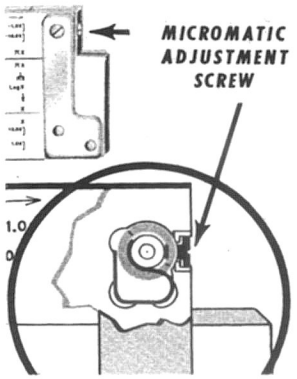

Figure 8. The mechanism of the Micromatic Duplex. This feature was intended to permit fine adjustments in the alignment of the stator.

The Micromatic Adjustment was advertised as "... the most important improvement in slide rule construction in 50 years." It was intended to revolutionize the final alignment of the stator and automatically to eliminate binding of the slide "caused by changes in temperature and humidity". (This, as we have seen, was a familiar theme with Dietzgen.) Although the Micromatic mechanism is ingenious, it may have been "over built". I have disassembled one of these rules, and I found that the springs are extremely strong. In fact, in one of my specimens, the ends of the adjustable stator are breaking down (literally exploding) from the stress. Anyway, it appears that this feature did not live up to the high expectations, and it was discontinued in September 1959.

The Microglide Duplex

The Micromatic duplex was replaced in September 1959 by the Microglide duplex. This slide rule featured a white Teflon interface between the stator and the slide. My experience with this feature is positive. As one might expect, these slide rules have a very smooth action. I do not know the ultimate fate of this innovation.

The Double Tongue and Groove

I have an intriguing all-metal 10" Dietzgen Mannheim that was made in Germany. The metal is a heavy alloy with a dull steel appearance. I suspect that this rule was made after World War II. The interesting feature of this rule is the stator-slide interface. It consists of two tongues that protrude from the slide and engage in two grooves on the stator. This is schematically illustrated below.

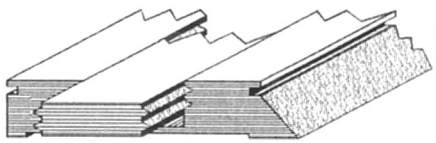

Figure 9. Schematic cross-section of the double tongue and groove slide and stator interface seen in a few metal Dietzgen rules.

This arrangement is very finely engineered, and the slide rule action is amazingly smooth. The disadvantage,

[1]The insert provided with this issue notes that different versions of the 15th edition were printed in 1938, 1941 and 1946.

which may have been fatal, is that the grooves are so fine that they become clogged with debris easily, and cleaning them is tedious.

Conclusion

In many respects Dietzgen slide rules were typical for their time. However, some Dietzgen rules included unique and intriguing departures in design, making such rules of interest to the alert collector.

References

1. Rosenthal, L.W., *Mannheim and Multiplex Slide Rules,* Copyright by Eugene Dietzgen Co., 1905.

Acknowledgements

The author is indebted to Henry Aldinger for making available a keyhole version of Model 1762B, the 1905 manual by L.W. Rosenthal, and the 7th Edition of the Dietzgen general catalog (1904-1905). Bruce Reichelt provided an important Dietzgen memorandum about the Micromatic and Microglide slide rules. Robert Otnes provided access to many Dietzgen catalogs. Bruce Babcock prepared Figure 9. Bobby Feazel suggested some very helpful editorial changes.

Dietzgen Patents, Runners and Log-Log Scales

U.S. Patents Found on Slide Rules Sold by Dietzgen

Patent Number	Inventor	Date Filed	Date Issued	Subject of Patent	Assignment
606,388	J. G. D. Mack	Feb. 8, 1897	June 28, 1898	Slide rule construction	Assigned to Dietzgen
677,817	E. Thacher	Feb. 27, 1900	July 2, 1901	Engineer's slide rule	1/2 assnd. to Scofield
694,258	J. H. C. Dennert	July 25, 1901	Feb. 25, 1902	Slide rule construction	Assigned to D&P
767,170	L. W. Rosenthal	March 4, 1904	Aug. 9, 1904	The Br scale	Not assigned
879,237	O. L. Baumbach	Feb. 2, 1907	Feb. 18, 1908	Slide rule construction	Assigned to Dietzgen
2,170,144	L. M. Kells et al	April 17, 1937	Aug. 22, 1939	Trig. layout	Assigned to K&E
2,285,722	L. M. Kells et al	April 7, 1938	June 9, 1942	Trig. layout	Assigned to K&E
2,407,338	August H. Krelling	August 17, 1944	June 17, 1947	Full Vision Indicator	Assigned to Dietzgen
2,634,912	Clarence P. Davey	May 1, 1951	April 14, 1953	Framed Full Vision	Assigned to Dietzgen

Robert K. Otnes

Dietzgen Patents

It is interesting to note that while there are a number of patent dates and patent numbers on Dietzgen slide rules, several of these patents were not the property of the company. As can be seen from the above list, one was assigned to Dennert & Pape, two to Keuffel & Esser, the Thacher patent was held by Thacher and Scofield, and the Rosenthal patent was held by Rosenthal himself.

Additionally, one Dietzgen slide rule has *D.R. Patent No. 173660* stamped on it, this being a German patent held by the firm Nestler.

As noted in the table, three of the patents were for mechanical aspects of the rule: keeping the slide tight, relative adjustment, etc. These are discussed in the preceding article by Rodger Shepherd.

The Scofield-Thacher *Engineer's Slide-Rule* is described in a previous issue of this *Journal* [5]. Technically, it is not a Dietzgen rule. It was probably not made by Dietzgen, but rather supplied by Scofield. However, it was in the Dietzgen catalog for many years, and thus should be included in the list. The rule is relatively crude, having its scales printed on paper on the face of the rule, and an outline of instructions on the edges of the rule, also on paper. It is rare.

The patent of Leon Walter Rosenthal is basically for the Br scale, also mentioned in the preceding article. Like the scales on the Scofield-Thacher, it allows three numbers to be multiplied in one setting. I have a 20-inch rule with this arrangement, which would have been very convenient in use. It is interesting to note that this patent is titled *Engineer's Slide-Rule,* indicating its relationship with the Scofield-Thacher rule which, as noted above, was its contemporary and also sold by Dietzgen.

The two patents belonging to K&E apparently are related to the *Deci Trig* feature. That is the method whereby, on the S and T scales, divisions between degrees are divided decimally, rather than in a minute and second scheme. The term *Deci Trig* is specifically stamped on the rules bearing this patent number.

The two patents for runners are relatively late compared with those by K&E. K&E had filed for a patent on their "Improved Runner" November 11, 1933, which was awarded as number 2,086,502 on July 3, 1937. This, with minor cosmetic changes, was the K&E standard model up to the end of the slide rule era.

While I doubt that I have found all Dietzgen patents related to slide rules, the above list should be of some help in dating the Dietzgen rules.

Dietzgen Runners

Six Dietzgen runners are illustrated in this section. This is by no means the totality of runners on the many different slide rules sold by Dietzgen. Dietzgen used the terms "runner" and "indicator" interchangeably, sometimes in the same catalog.