



The face of the Bent, correctly engraved.

# Toc, Alpha, Omega, Tic, Pi, Tic, Epsilon, Tic

by Albert W. Demmler, Jr., *Michigan Gamma '50*

LIKE most who swing the Bent, I am a curious individual. It must be admitted that, while I have often looked at it, I never paid much attention to its cap. My initiation memories told me that it was synonymous with the year E. H. Williams, Jr., founded our Association at Lehigh University.

In 1976 I began work with a colleague who was a former mathematics professor, Dennis Simanaitis. During one of our chats about shoes and ships and sealing wax, I inquired about the ancient Greek numbering system since, unlike the Roman or Arabic systems, few of us have had occasion to learn it. I knew that they had used letters of the alphabet as numerals, but little else. Dennis brought me up to date on the general system and, after a bit of excavation, we found an outline of the manner in which larger numbers were represented.

Knowing that the symbols on the cap should work out to be 1885, we began to check it through. Easiest source for the engravings was my Bent and, as nearly as we could estimate, the symbols were alpha, pi, gamma, and epsilon. To make a long story short, we could get nowhere either right to left or vice versa. We were unsure of the meaning of the diacritical marks and uncertain of the actual letters in their archaic forms. We were also doubtful about which calendar system was being used.

After this intellectual fiasco, I wrote Bob Nagel to learn the real answer. To my chagrin, he indicated that Dr. Williams was a Greek scholar prior to becoming an engineer, and that he had moved to the Great Graduate School in the sky in 1933. The general numbering concept was essentially the same as that with which we had already struck out. In any case, I indicated that I had become intrigued by failure at so simple a problem, and said that when I found the solution I would prepare an article of sorts for the magazine. Little did I realize where it would lead—or how embarrassing the solution might prove when found.

I tried, sporadically, to progress a bit further via other mathematician friends and local library facilities—to no avail. Finally, I concluded that I was never going to solve my nagging problem without resorting to outside help. I called the University of Pittsburgh and was directed to Prof. Edwin D. Floyd of its Classics Department, who found the problem interesting and agreed to help me as much as possible.

I wanted to send him as accurate and as large a representation of the Bent as possible. I found a large, clear picture of an outdoor model in the magazine, and sent him a Xerox copy of the photo. I soon received his response, and what I find to be an excellent solution for the problem. What disturbed me on reading his letter was my inability to understand how Dennis and I, with

even our rudimentary knowledge of the Greek system, had failed to come up with the same solution two years earlier. It wasn't until I looked at my standard Bent that it struck me! *Mine was wrong, and I suspect that the majority of readers will find themselves in the same situation.* A Greek typographical error seems to have been made, presumably after Founder Williams was no longer with us to proofread the jewelry, and it seems to have been perpetuated. As a coup de grâce, I telephoned my Dad and had him examine his Bent. He said that his second symbol was clearly of the croquet wicket form, not the recent capital pi.

Even an understanding of how such an error could have been made involves some Greek epigraphy. One must also recall, from initiation days, that our Founder deliberately chose the most archaic possible letter forms. Our Bent (as opposed to recent keys) indicates the following from left to right, if one looks carefully: a small comma-like mark at the very lower left, an alpha as the first major character, an omega, an apostrophe or diacritical mark, a pi, another mark, an epsilon, and finally another mark. The reversal and slanting of the epsilon is uncommon, though not unknown. The character next to the right is a pi—though it looks just like a more modern capital gamma, and is unlike the pi of  $\tau \alpha \gamma$  on the sill of the Bent. This was a bit of a shock since, as a Michigan Gamma initiate, the modern capital gamma looked essentially like what was really this older pi symbol. The omega looks like a croquet wicket, and unlike our modern ohmic symbol ( $\Omega$ ), but cannot be confused with any other Greek capital in its general characteristics. (In one of its evolutionary stages a form very like an upside-down U with a slight slant to the upper left had been used, with little of the more modern necking.) This may be a unique form according to our classicist friend, Dr. Floyd, but it may also be that it is much easier to engrave than the curvilinear modern capital omega would be. You will note that there are no curved lines engraved on the face of the Bent—only on its reverse side. The upper "tic" marks simply note the columnar places of the symbols or denote that they are numeric symbols rather than alphabetic ones, while the lower mark indicates multiplication of the alpha value by a thousand.

Al Demmler is the son of Al, Sr., Pennsylvania Beta '19. He began his college studies with a liberal arts degree from the University of Chicago before transferring to the University of Michigan where he earned his B.S.E., M.S.E., and Ph.D. in Metallurgical Engineering. He joined Alcoa Research Laboratories as research engineer in the physical metallurgy division in 1955, entered the financial arena in a sales capacity in 1968, and spent some time in executive search work before returning to the fold. Since 1976 he has been associate engineering editor of *Automotive Engineering*, monthly magazine of the Society of Automotive Engineers. He also belongs to Phi Lambda Upsilon and Sigma Xi (both of which avoid Greek numerals).



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	<u>X1</u>	<u>X10</u>	<u>X100</u>
1	A	I	P
2	B	K	$\Sigma$
3	$\wedge$	L	T
4	$\Delta$	M	Y
5	F	N	$\Phi$
6	F	$\equiv$	X
7	Z	O	Y
8	H	$\Gamma$	$\Omega$
9	$\otimes$	Q	T

IN the Arabic number system which we use daily, any given sequence of digits can represent a number, i.e., transposition of digits will represent a typographical error, but the result will still be a satisfactory numeral within the system. Though not quite so flexible, many Roman digits can be disordered, yet yield intelligible numerals, e.g., MCMXLIV and MMCLXVI—to take an extreme example of gibberish.

The Greek system is substantially different, and perhaps better in that it can catch a certain percentage of typographical errors within the system. Fortunately for us, we were never forced to use it for calculations. The system uses 27 characters to express the numbers from 1 to 999. These are the 24 letters of the Greek alphabet, plus three archaic letter forms. The system can also indicate numbers by using the diacritical marks mentioned. The basic symbols are shown above, in an archaic style of lettering, where 6, 90, and 900 use the obsolete wau, vau, or digamma, koppa, and sampi characters, respectively.

It can now be seen that  $\text{ΑΠΤ}^{\text{Σ}}$  represents 1885, but that  $\text{ΑΠΤ}^{\text{Σ}}$  represents nonsense, since the modern Greek pi in the "hundreds place" would have no valid meaning. Not only would it be redundant with respect to the immediately following—older—form of pi, it would also have to be a "tens-place digit" and not one of the suitable "hundreds-place" symbols.

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With 1 8 8 5 working out this way, why the original error? It seems that at some point an engraver could not believe the croquet wicket shape of the archaic omega—or his hand slipped—and the top was extended or the verticals were moved inwards and the second character became a modern capital pi ( $\Pi$ ): indeed, a typographical error in gold, a sign of "real class." Were "Red" Matthews still with us, I'm sure that he would have been horrified by both the error and its continuance. [His successor certainly is.—R.H.N.]

Had I hand-copied my own key onto a piece of paper for Prof. Floyd, we might still have the enigma—not yet having noted the arithmetical "nonsense." The large photograph of a Bent made from a basic Association source was the key to finding that the modern pi on the key should have been a stylized omega, and that what was first presumed to be gamma was an archaic pi.

Hopefully, a continued lack of classical scholars in the Association will not prevent us from maintaining "typo-free" Bents from now on.

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Apparently, the error on Tau Beta Pi's official keys, noted by Dr. Demmler and researched to an indisputable conclusion, goes back about 35 years. In that time some 175,000 people were initiated into Tau Beta Pi and not one, until Al Demmler got curious, raised a question about the engraving on the front of the Bent cap. To Al's question, "Can't engineers read Greek anymore?" the answer must be "No." The kind of man that Founder Williams was, Greek scholar and engineer, doesn't come along very often.

Tau Beta Pi's jeweler has been instructed to correct the characters on the cap on future Bents. He does this by correcting the die from which the keys are struck. Members' last names, chapters, and classes are engraved on the backs of the keys on order from Tau Beta Pi's central office.

R.H.N.