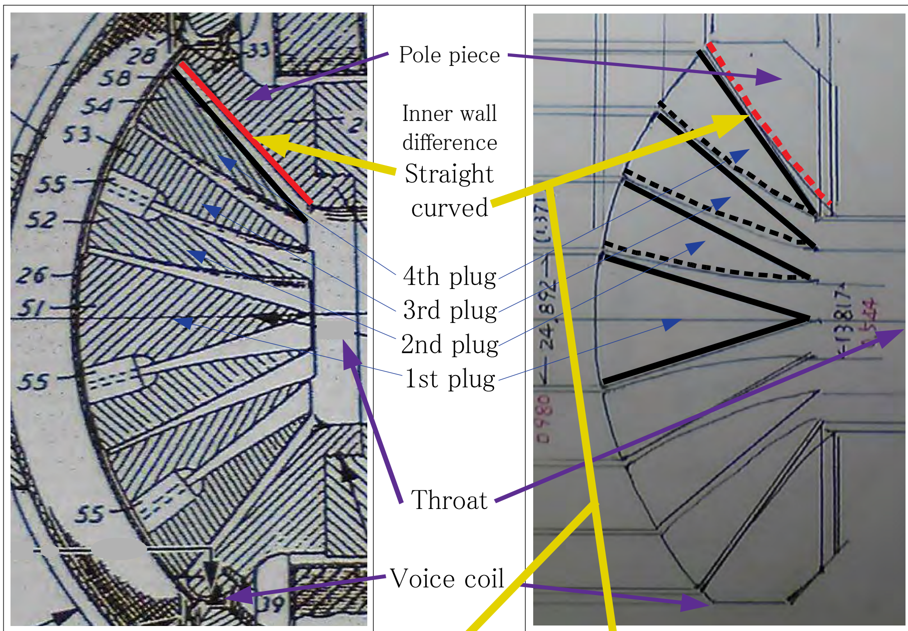
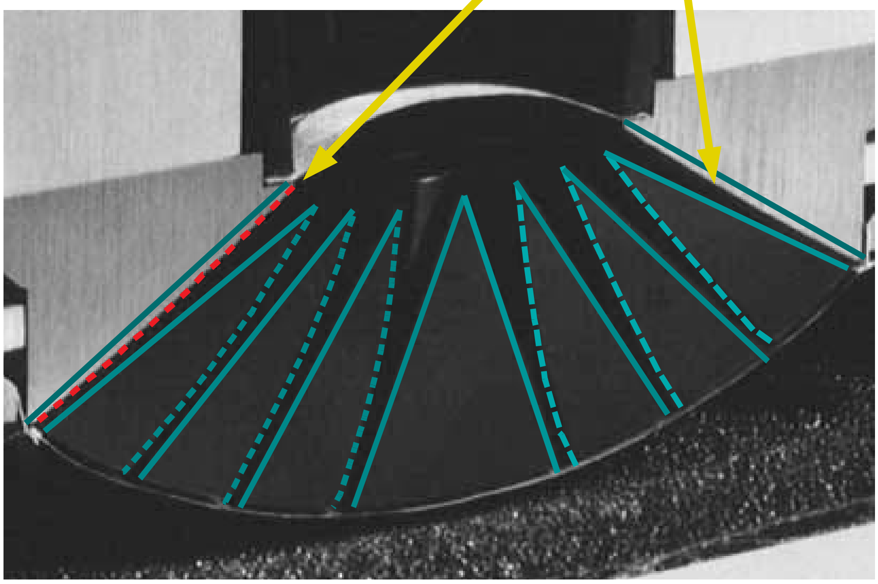
The compression drivers related to JBL- [375] include Western Electric's [WE594A] and [T530A], which Bart Locanthi made Alnico magnet at Westrex's request. This [T530A] is the same as JBL's [375]. However, looking at the cut model of [375], there is clearly a different part from [WE594A]. It overlaps with others, but I would like to explain it in detail again.



①[WE-594A] ② Lansing sketch

As described in detail in my "Lansing Study", in [WE594A] and the Lansing sketch, the cross section of the slit between the 4th plug and the pole piece on the pole piece side is different on both machines. That of ① is a straight section, but ② is a curved section (red →). This difference means a lot. The curved section allows the airflow to flow more smoothly and concentrates on one point. This figure proves that the theory that Locanthi removed the exciting coil of [WE594A] and replaced it with an alnico magnet is wrong. Looking at the cross-section photograph of the phasing plug in [375], it is close to the sketch left by Lansing.


③ [375] cut model, from Lansing Heritage

If Locanthi requested Westlex to make the [594A] permanent magnet as it is, he did not touch the phasing plug, so the left [375] phasing plug pole piece The inner wall does not have a curved shape (red dotted line) like the sketch of Lansing. The left is an enlarged photograph of the cut model of [375], but when looking from the center to the right, the cross section of 1st, 2nd, 3rd and 4th and all slits is a straight line section and a dotted line section is a curve. It is a cross section. Just like the tip of a Japanese sword. However, the point that Western [594A] in the above figure is different from [375] is that the outermost line is a straight line (blue line).
In other words, [375] is closer to the sketch left by Lansing than Western [594A]. After discovering this fact, I realized the correctness of my theory.

Regarding the above problems, Mr. Saeki's view is as follows.

[Up to now, multi cellular horn and sectoral horns have been used to improve the directivity of the high range, but the high range using acoustic lenses announced by Bell Telephone Laboratories (W.E. Kock) and Harvey (F.K. Haevey). In 1949, the speaker in Photo 5-184 was announced from a study on the improvement of directivity.
Although the progress in the middle is unknown, JBL worked on a new development project to develop a high-performance high-frequency speaker with improved directivity by applying this technology. The progress is unknown, but JBL has been working on a new development project to apply this technology to develop a high-performance loudspeaker with improved directivity.
To this end, Westrex's Flein (JGFrayne) and California Institute of Technology Locanthi have joined the project to develop a treble horn speaker with an acoustic lens. became. Bart Locanthi , who was in charge of

development, paid attention to the 594-A type horn driver that was previously used at WE as the horn driver used for the high-frequency speaker with acoustic lens, and changed the magnetic circuit of this driver from the field coil method to the alnico magnet. Improved to a permanent type. Even if they attach an acoustic lens to this driver and diffuse the energy of the high frequency sound the frequency characteristic must be flat on the axis, so they thought about improving the driver's own high-frequency characteristics by slightly raising it.
For this reason, the 594-A type voice coil, which had a diameter of 4 inches, was changed to a slightly smaller size of 3.15 / 16 inches, and the outer diameter of the roll edge was slightly increased to 4.3 / 8 inches to change the resonance frequency of the edge and achieve the purpose. High limit frequency is about 10000Hz. (Tamon Saeki, "100 years of speaker technology" 299-300P)

There is a point in the text of the above column that doesn't seem right. At the request of Westlex, if the Locathi removes the [WE594A] excitation coil and replaces it with an Alnico V magnet, the red line in the previous page must be the same as [375] and [WE594A].

Also, when the diameter of the voice coil is reduced by 1.6 mm, there is almost no change in the sound. Moreover, changing the size of the voice coil requires a redesign of the pole piece and the entire phasing plug, which is a hassle and waste. To redesign the phasing plug, it would be faster to make the whole thing separately, and Lansing made it by [284] in 1934.

Also, when making the voice coil small for the purpose of improving the high frequency characteristic, it is necessary to downsize to 3 inches to avoid distortion of the 4 inch diaphragm, as can be seen in JBL research. The distortion remains almost unchanged when the size is reduced from 100.66 mm to 999.99 mm by 0.67 mm.

The reason for this is cited below from the "Lansing Research Text".

"Ideally, the diaphragm of a dynamic speaker should have a piston movement in the same way over its entire surface.
However, since the diaphragm is not an absolutely rigid body, when force is applied, different vibrations may occur at some points on the diaphragm. This state is called the diaphragm's divided vibration, and the strain increases with it. The diaphragm of the compression driver, both aluminum and titanium, has divided vibration in most of the response band. One of the reasons is that the area of the diaphragm is large.
With a small-diameter unit such as a direct radiator type tweeter, aluminum and titanium diaphragms are capable of pistonic motion in the entire audible range. However, in a 4 inch diaphragm compression driver, whether it is aluminum or titanium, the split vibration mode is set above 4 KHz. In 1999, Doug Button began developing a new series of compression drivers. This is the later "435Be". Baton sought to solve both bandwidth and output sound pressure level issues while minimizing distortion. The goal is to develop a driver that is capable of pistonic motion in all bands and does not utilize resonance at the highest frequencies. The solution is a new diaphragm, beryllium. This is not the first example of using beryllium for a compression driver. The TAD division of Japan's pioneer has been manufacturing beryllium drivers for many years. However, the "435Be" approach and design goals were different. Baton set the diaphragm diameter to 3 inches to eliminate split vibrations. With a beryllium diaphragm of this size, the split vibration must start above 15.5 KHz. (JBL 60th Anniversary 239P)"

Mr. Tamon Saeki, the author of "100 years of speaker technology", may not have understood the principles around it. He also said, "The 594-A type voice coil, which had a diameter of 4 inches, should be made a bit smaller, 3.15 / 16 inches." [WE594A] is 4 inches = 101.6 mm. Saeki's [375] is 3.15 / 16inch = 100.0mm, and the JBL catalog's [375] 's voice coil diameter is 10.2cm = 102mm, so Saeki's "reduced 375" does not really exist.

	口径 スロート径	最大口径	許容入力 (連続プログラム)	インピーダンス	音圧レベル (新JIS)	ボイスコイル 径	マグネット 重量	磁束密度	奥行	重量
LE20	5 cm	13.7cm	35W	8 Ω	93dB(2kHz)	1.6cm	0.7kg	12,000gauss	5.2cm	1.4kg
075	7.9cm	9.8cm	20W	8 Ω	110dB(4kHz)	4.4cm	1.5kg	16,500gauss	8.3cm	2.3kg
077	7.9cm	9.8cm	20W	8 Ω	105dB(7kHz)	4.4cm	1.5kg	16,500gauss	8.3cm	2.3kg
LE175	2.5cm	11.4cm	30W	8 Ω	108dB(1kHz)	4.4cm	3.4kg	16,000gauss	9.8cm	4.1kg
LE85	2.5cm	14.6cm	30W	8 Ω	108dB(1kHz)	4.4cm	4.5kg	19,000gauss	9.8cm	5.4kg
375	5.1cm	18cm	60W	16 Ω	108dB(1kHz)	10.2cm	10.8kg	20,500gauss	13.0cm	11.8kg

Voice coil diameter 10,2cm, diaphragm diameter 10,2cm

"SANSUI" catalog issued in March 1976

<375 driver>

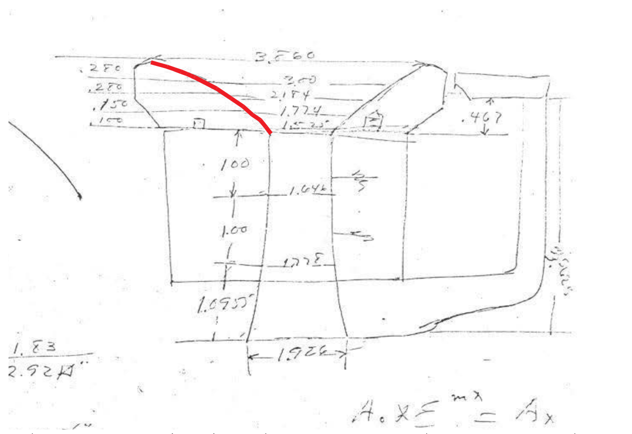
Standard price JPY 125,900-

It is the highest grade driver who has a high reputation among enthusiasts. A 10.2 cm diameter diaphragm made of ultra-thin aluminum is used, and a strong magnet realizes a sharp transient and a wide dynamic range. The 375, which reproduces purely the mid and high frequencies from 500Hz to 10kHz, is said to be one of the representatives of the JBL sound.

DRIVERS TRANSDUCER

In the Lansing Sketch, which is similar to JBL [375], Lansing specifies a curvature for the curve of the pole piece inner wall. In addition, since 3 digits after the decimal point are specified in detail, it is considered that this is not a design drawing but an actual measurement of the compression driver that he made.

Also, the numerical curve designation of this inner wall has a great meaning as "proof that it is not a straight cross section". The LANSING HERITAGE photos are hard to read, but let's explain the numbers in inches and millimeters.



The numerical value that specifies the curve of the inner wall of the pole piece is written. Throat exit diameter is specified as 1.926 inches.

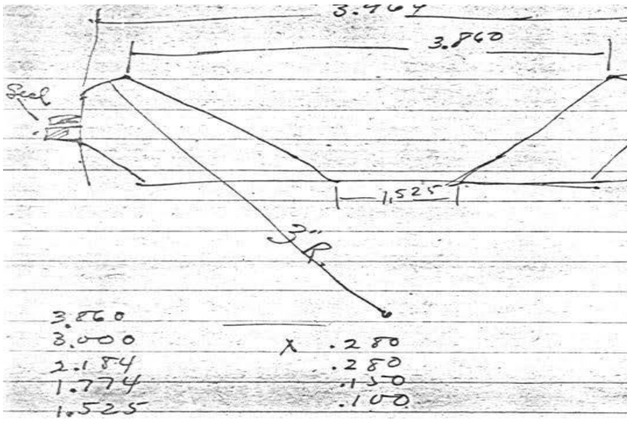


Illustration of pole pieces. The radius of curvature of the diaphragm is 3 inches. Below is the numerical value of the inner wall curve of the pole piece.

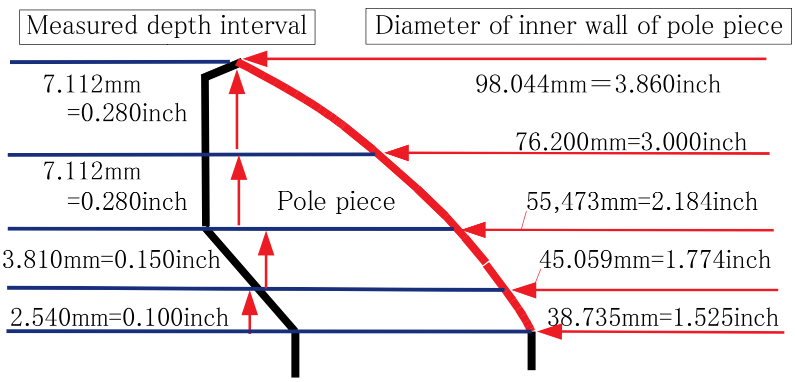
The Lansing sketch specifies that the throat inlet diameter is 1.525 (1.522) inches, the maximum pole piece inner diameter is 3.860 (3.864) inches, and the outer diameter is 3.964 (3.962) inches, but these numbers are in parentheses. Slightly different than [WE594A].

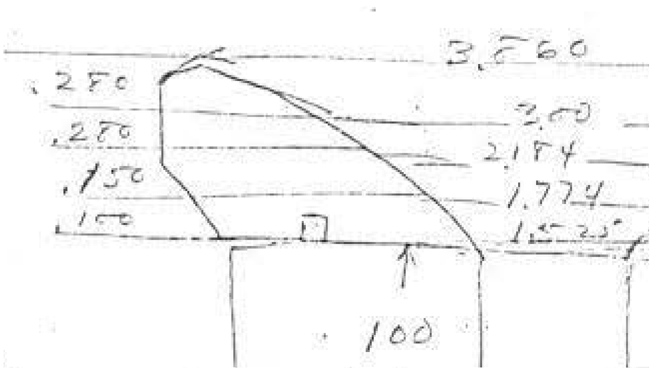
The curve of each slit cross section is an exponential curve that exponentially expands from the diaphragm toward the throat.

It has the drawback that the sound wave does not exponentially spread only in the outermost circumference in the conical cross section of the outermost circumference slit like [WE594A].

That point was revised in the sketch of Lansing.

The depth vs diameter of the pole piece inner wall cross section written by the Lansing in inches.





Curve of inner wall cross section of phasing plug by mysterious sketch

As a result of the above evidence, Burt Locanti's [T530A] in Westrex was most likely Lansing's secretly built [375] model. Moreover, there is a question why Lansing didn't make this public, but it seems that he was sticking to the two-way system. Further, this [375] is a more improved version of the [WE594A] phasing plug, adding aerodynamics smoothness. Therefore, JBL [375] is an improved version of [WE594A], and is certainly superior in principle.

James Bullough Lansing ⑱ The mystery of 375 Vo.2

Jim Lansing

James Bullough Lansing 1902-1949

The founder of JBL, who is said to be the "speaker's father" and is believed to have developed the prototype of the compression driver. J.B. Lansing, Lansing Manufacturing Company, and Altec Lansing Corporation, three major speaker manufacturing companies, have developed important units. Instinctively acquired acoustic engineering, and learned wisdom and techniques and had excellent technology. General scholars arrive at the essence through numerical research and theoretical consideration, but Lansing, who had not even received higher education, had a perfect scenario in which he could see everything in his brain. He had the ability to complete it. At the same time, he had his ears listening to the distortion in the music, and was a rare existence as if he were born for a speaker.

Kenneth Decker

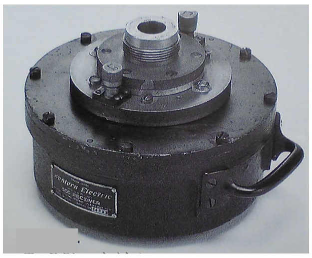
Kenneth Decker 1894-1938

Established Lansing Manufacturing Company in 1926 with Lansing, the son of a jeweler, a close friend of Mrs. Grenna's father Andrew Peterson. Eight years older than Jim, he was in charge of sales as the company's chief financial officer and contributed significantly to the company's achievements. Despite being a reserve officer in the U.S. Army Air Corps, on December 10, 1938, an airplane he had piloted crashed during a practice flight and died suddenly. He freed Lansing from the messy business problems, devoted himself to engineering, and contributed to the film industry with tremendous momentum for 15 years, but the death of him immediately caused business difficulties. Therefore, the new company of ERPI was forced to acquire and merge. You can see how big his presence was for the company and Lansing.

Bartho Locanthi

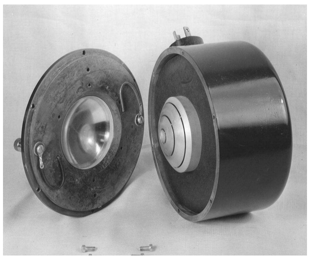
Bartholomew Nicholas Locanthi Ⅱ 1919-1994

Born in New York. He studied physics at the California Institute of Technology (CIT) in Pasadena and earned a Bachelor of Science degree in 1947. After graduation, he remains in college for research on analog computers. According to his apprentice Shozo Kinoshita, Locanthi visited JBL when Lansing was alive and said, "Your speaker is not capable of satisfactory bass reproduction." Lansing replied, "Okay, make it whatever you want." He seems to have been in and out of the JBL ever since. After the death of Lansing, he officially joined the company and was in charge of the development of the LE series, and later became the Vice President of Technology. After leaving the company, he worked as a consultant for Gauss and Pioneer, and was a genius engineer who developed [TD4001] at TAD. Dr. John Flein of Westlex Co., Ltd. has been recognized as a talent, and has also developed the company's theater product [T530A].



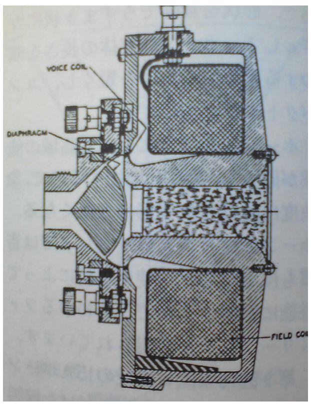
[WE555] 1926

[WE594A] 1933

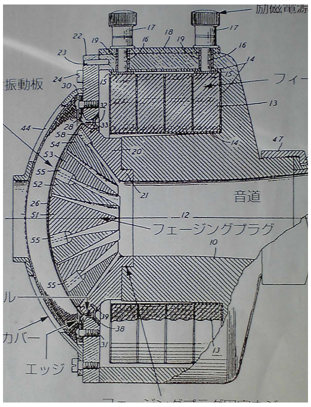


[Laising-284] 1934

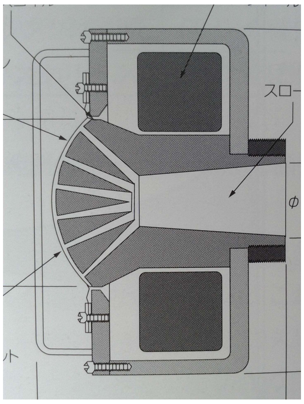
[T530A]=[375]1953



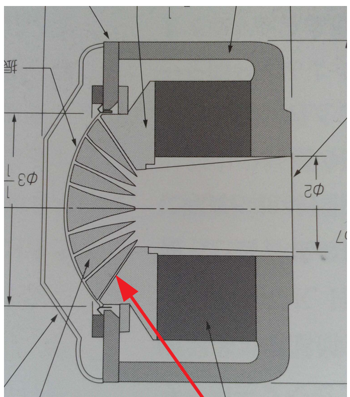
① Developed in 1926 [WE555] Electromagnet, Diaphragm diameter = 2inch, Slit: Single,"World's first driver"



② Developed in 1933 [WE594A] Electromagnet, Diaphragm diameter = 4inch, Slit: Quadruple, "Wide range system"

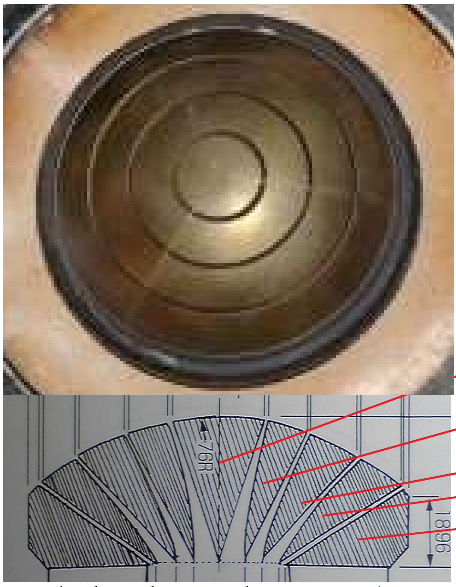


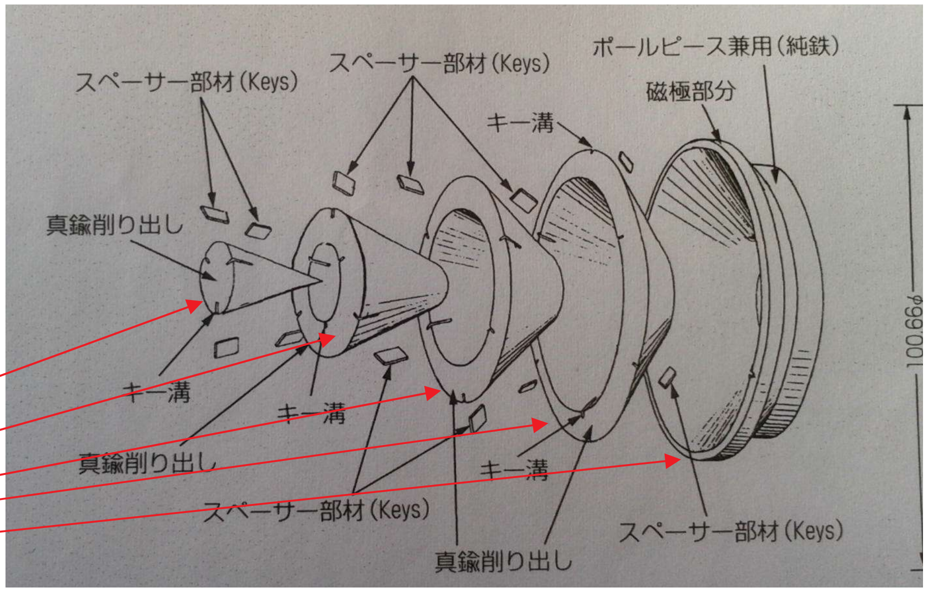
③ Developed 1934 [Lansing-284] Electromagnet, Diaphragm diameter = 3inch, Slit: Triple,"Shalahorn system"



④ Make a mistake and make a straight line, Note 1[T530A] =[375] Permanent magnet, Diaphragm dia-meter = 4inch, Slit: 4 layers , "Change WE594A to permanent magnet"

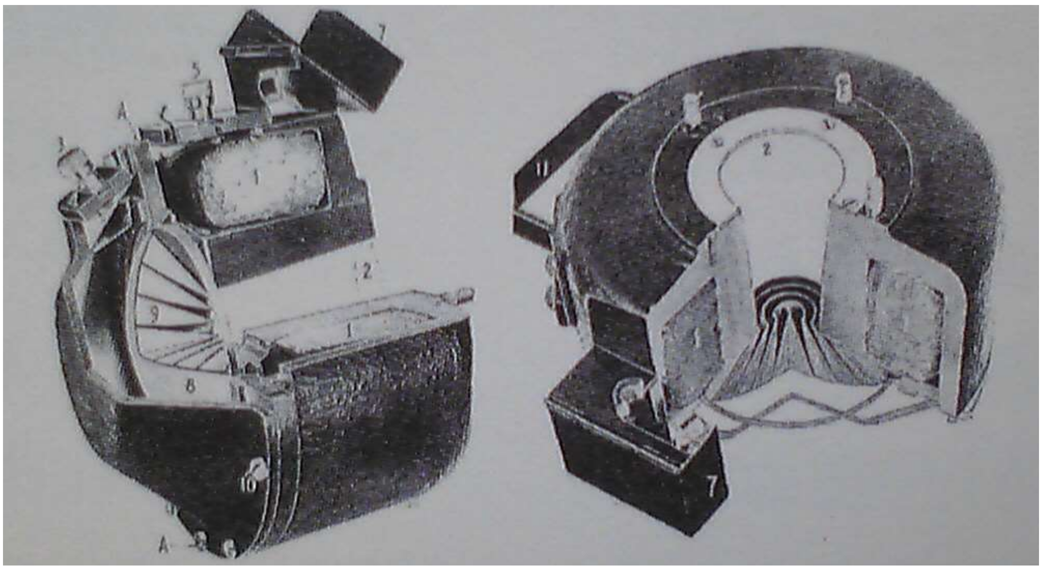
Note 1: ④ is quoted from "100 years of speaker technology", but the inner wall cross section of the pole piece is drawn as a straight line like [594 A] although [375] is originally a curved line.
This is probably because I imagined that [375] would also be a straight line because the inner wall of [WE594A] was a straight line and only the magnetic circuit was changed.


A plug photo and cross section



Exploded view of 4 slit phasing plug of W594A (from MJ radio and experiment)

In recent years JBL- [375] and Altec Lansing- [299], the phasing plug that affects the sound is made of plastic. This seems to be the purpose of reducing the manufacturing cost, but since it is the most important part for sound, it was originally made of non-magnetic brass. As a result, it was difficult to mold and it was finished by casting and turning. In the case of [WE594A], the cross section is finished with an exponential curve with a quadruple ring slit. Musical vibration generated from the diaphragm is guided from each slit to the throat, where it is compressed to about 1/10 in volume and flows to the horn. When the sound waves split for each slit merge at the throat, if the phase of the sound waves at each part goes out of order, the high-frequency characteristics are impaired, so the lengths of the slits must be exactly the same. This high-pressure airflow has a wide directivity and long reach at the stage where it is exponentially diffused and decompressed by the horn. However, since the duralumin diaphragm (diaphragm) with a diameter of 100 mm has a large area, extra vibration called split vibration is added at each part, and it is necessary to suppress the high frequency output from the distortion. At that time, the demand for high-frequency characteristics at the time of talkie reproduction was ideally around 15,000Hz, but in reality 10,000Hz was difficult. Therefore, it is common sense to use 4-inch diaphragm drivers such as [WE594A] and [375] for the mid range of 3Way with tweeter.


A phasing plug with a cut model of [WE594A] similar to [375]

The smaller the diaphragm, the better for the loudspeaker to reproduce high frequencies, but the narrower the dynamic range. On the other hand, a large voice coil or diaphragm is required to produce a loud sound. Due to these acoustic engineering principles, a small secret was required to reproduce high frequencies with a large-diameter diaphragm. The compression drive that locks the sound generated by the large diaphragm into a small room is advantageous. The person who invented this mechanism was Jim Lansing. We will not forget this crucial fact.

In the horn driver, the performance in the high range is determined by the characteristics of the driver due to the relation of distortion, and the performance in the low range is determined by the cutoff frequency of the horn. Therefore, the driver's performance is accompanied by the problem of how to reduce distortion. In this case, when listening to music, the distortion hinders the delicate sound of a string instrument or a woodwind instrument.

Of course, it is necessary to consider the balance with the amplifier, but the developer of the transducer says that the ear that distinguishes this area is very important, but this ability is surprisingly rare. Looking back on my experience with the 5-channel multi-amplifier system, the difference between 3 Way and 5 Way seems to be different in the weak parts of classical music and the nuances of musical instruments. For example, when [T925A] that reproduces up to 40,000Hz is added, there is a clear difference in the growth of violin and cymbals. However, 3Way for the 375 series and 2Way for the 175 series are good for playing fundamental music. The same applies to the case of ultra-low frequencies. This is a problem related to this, and in high-volume reproduction, the auditory sense enters an abnormal region, so conversely, it may be advantageous to have a smaller number of units.

In the previous article, I described the comparison between [WE594A] and [375] and the driver drawn in the mysterious sketch left by Jim Lansing, but I examined it from the perspective of Lansing at that time.
In 1934, when he designed [284], according to the materials at the time, he made several drivers with different diaphragm sizes and compared them, and chose 2.84 inches. Originally, he was aware of distortion when listening to the ERPI wide-range system at the Knickerbocker Hotel, so he probably intended to design a new one without improving [WE594A] from the beginning.

However, when the Schaller horn system ended successfully, the icon of [601] also succeeded, and when the time of the hustle for manufacturing depending on the order of these playback devices passed, the [WE594A] itself again. It seems that the modification was started.

Its history was with the huge film industry, but unfortunately his fellow Kenneth Decker's sudden death in 1939 forced Lansing to focus on poor management on the verge of bankruptcy and move to Altec Lansing
Five years later, he relaunched his own company, but at some point he re-compressed the 4-inch diaphragm. His study of Compression Driver is evidenced by his "mysterious sketch." And, as long as that "mysterious sketch" remains, it is not strange that the real thing exists. Moreover, when I hear the story of the driver Lansing made by Ross Schneider, I can not help feeling it strongly. The following is incorporated from the text.

> What emerges from this hand-drawn figure is the ongoing mystery of Jim Lansing. This speculation has been the subject of much debate in recent years. Ross Schneider made the following episode about the assembly of Ampex's first prototype of the Todd AO sound system.
> The prototype required 10 independent speaker systems, the largest of which used the just-developed [375] compression driver. Schneider remembers that Thomas could not have the required number [375] by the time the prototype was completed. As a makeshift measure, Thomas installed two large compression drivers, saying they were "made by Jim Lansing."Thomas thought these two drivers were very important to JBL, so if you could get a replacement from JBL, be sure to give them back to me. , I was very reminded.
> Unfortunately, nothing is known about what happened to this driver after that. Ross Schneider suspects that the two drivers may not have been returned. Other than this episode and the sketches above, there is no evidence that Jim Lansing actually made the 375's precursor driver. Therefore, it remains a dizzying fascinating mystery. (JBL 60th Anniversary 196P)

However, in the "Kingdom of the Tube" magazine, No. 54, a driver that seems to be the column written above was posted. Isn't this the Lansing driver that was lost?

		
Was it the basis of the "mystery sketch"?	4 inch 4 slit plug	Roll edge diaphragm

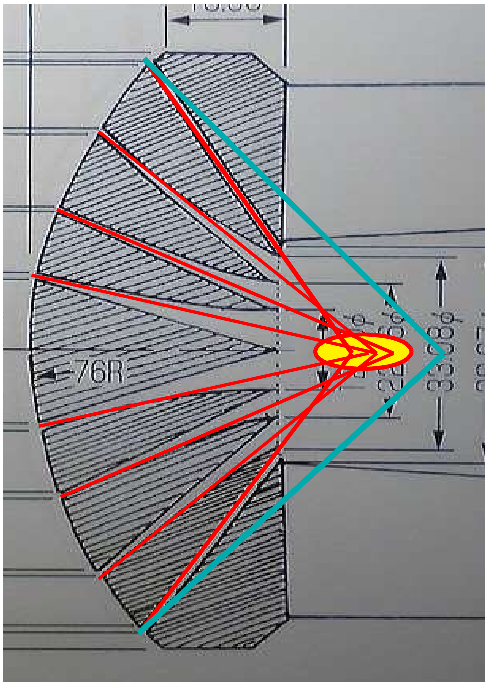
Altec Lansing [594-8C] Prototype Compression Driver ("The Kingdom of Tubes", Vol.54-Autumn 2009)
The appearance of this machine is apparently like Altech's "288-8G" driver itself, but there is a tape handwritten as "594-8C Proto Type" on the back cover, and the throat opening is 2 inches in diameter. Is becoming Also, the diaphragm contains the same 4 inch diameter as the "594A" receiver, the edge is a roll edge type, and the three bolts standing for attaching the horn are the same size as the "288" driver. However, the position is set on the outer peripheral side. This is imaginable, but I wonder if Altec tried to develop a permanent magnet version of the "594A" receiver. (Yuzo Doi)

I was wondering if the story I had imagined had taken on a fairly realistic level, but the idea that I was secretly prototyping [375] during the Altec Lansing era was denied. .. The 288-8C is 1966, so Lansing cannot be involved. But if you measure this driver and compare it to the Lansing driver I've drawn in the inches to millimeters, you might see something.
However, in the JBL era, [375] is made. Evidence of this is in the following response from JBL to the magazine's question.

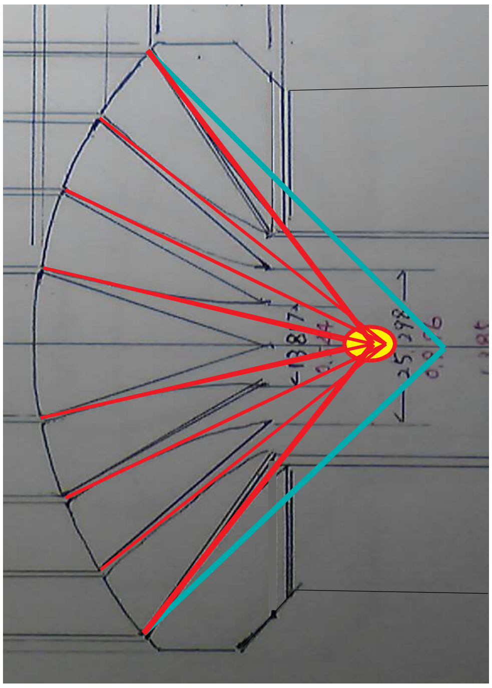
The unit that was founded in 1946 until the death of Lansing was "D130, 175, 275, 375 driver unit and D208" according to the reply from JBL.
("Sound Recopal" magazine, May 1981 issue: Explore the charm of JBL sound! 58P)

Inside the JBL in 1981, [375] was aware that Lansing made it, not Locanth's.
I would like to repost and explain the improvements in Lansing Sketch (as I mentioned in other articles)

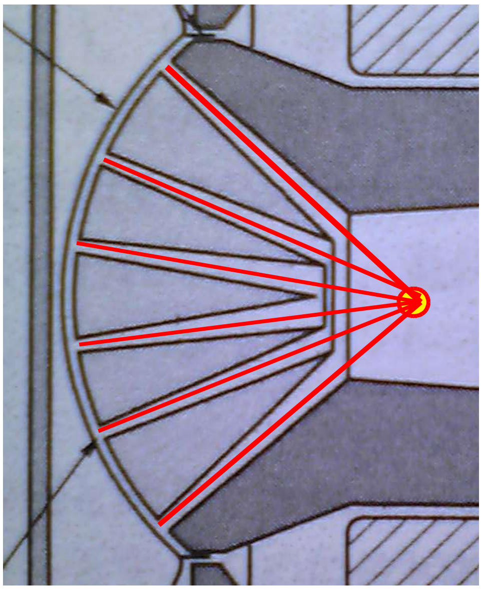
Advantages of [Lansing-284] and improved [WE594A] [375] = [Mysterious sketch]



①[WE594A] 1933
The world's first 4-inch diaphragm compression driver equipped with a modern phasing plug, but the focus of the slit is not concentrated. The angle of incidence of the slit is not perpendicular to the diaphragm (blue line is the vertical line from the diaphragm).



② Mysterious sketch = JBL- [375] 1954
The improvement from [WE594A] is that the cross section outside the slit on the 4th lap was changed from a straight line to a curved line, so the focus of the air flow that passed through the outermost peripheral slit moved to the back and became closer to other air flows. I came close to the one point. The blue line is the vertical line from the diaphragm.



③ Lansing-[284] 1934
The focus of each slit is concentrated at one point. Moreover, since the incident angle of the slit is almost perpendicular to the diaphragm and the distance of each slit is the same, it is an ideal design in which the compression is concentrated and strengthened at one point by the phase, time alignment, and sound pressure. Moreover, the distortion was banished by reducing the diaphragm diameter to 2.84 inches.

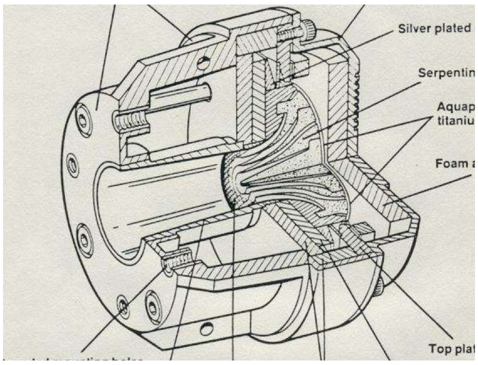
The above figure is the shape of the cross section of the annular slit of the phasing plug (phase equalizer). (1) In the cross section of [WE594A], the incident angle becomes more slanted than the diaphragm, rather than the outer ring / slit, and the airflow spreads slightly back and forth in the throat. However, in [375] of ②, each air flow gathers closer to one point than [WE594A] because the outermost slit is made exponential. This is an improvement on Lansing in that the mysterious sketch of the roots of [375] is superior to [WE594A]. However, compared to [284] of [3], which is a one-point-concentrated type, the two do not have the same focus. Then, it is considered that the Lancing of the Schaller horn system came to consider the coincidence of the vertical line (blue line) from each diaphragm slit and the actual focus of the air flow. It is considered that the improvement of the lancing was that the airflow from each slit was aligned to one point and that the airflow was strengthened by making the cross-sectional angle from the diaphragm into the slit vertical.

However, there was a slight mystery here. Apart from the evolution from [WE594A] to [284], Lansing chose to evolve from [WE594A] to [375]. In my guess, he tried to improve the flow of the air flow of [WE594A], but the distortion due to the large diameter does not disappear, so he should have abandoned the use of 2 way of [375]. However, in 2Way, he may have noticed that changing the cross section of the [801] phasing plug from a straight section to a curved section would be better. As a result, [D175] is born. In other words, it has become clear that Lansing left behind the [D175] series as a better driver than the [801] series.

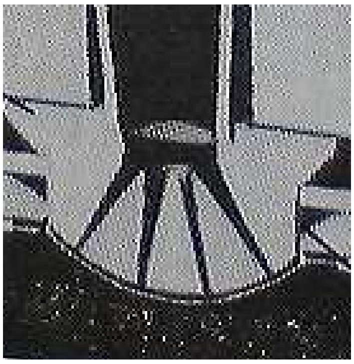
James Bullough Lansing ⑲ A mystery about [375] Vol.3

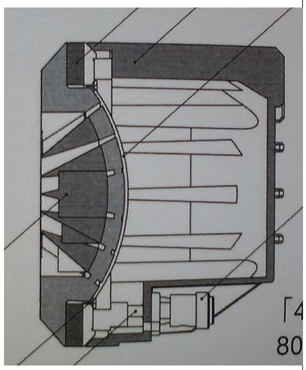
The compression driver's phase equalizer, or fencing plug, is an important component that causes air vibrations generated by diaphragm vibrations to flow through the slits to the horn, but there are several types of shapes.

Typical examples are (1) Exponential (curved section) slit, (2) Conical (straight section) slit, (3) Radial (radiation) Shape) slit, ④ hole slit, ⑤ coherent wave slit.

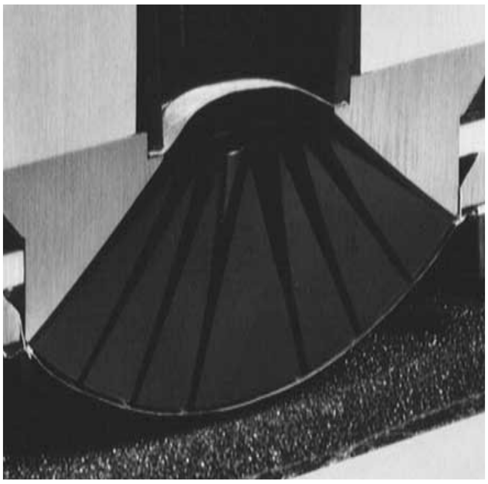


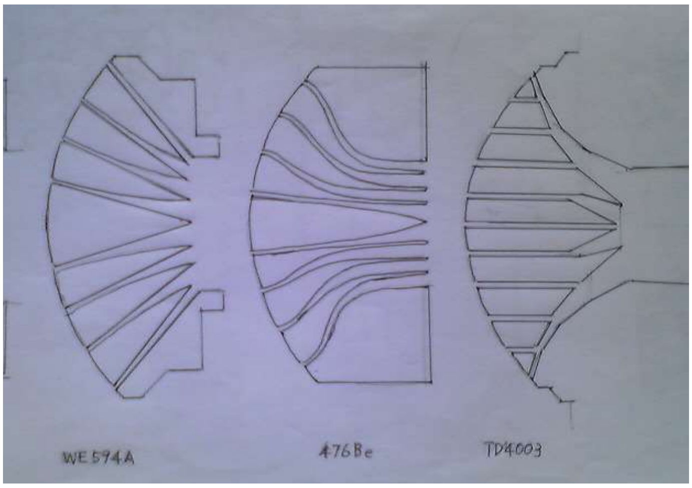
⑤ JBL 475Nd


① JBL LE85

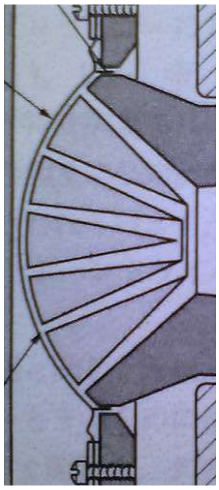

② JBL 435Be


② ALTEC 802


① JBL 375



① WE594A ⑤ JBL 476Be ? TAD TD 4003


② Lansing 284

Among them, [WE594A] that first used multiple rings was the exponential slit of ①, but [284] developed a year later was the conical slit of ②. Actually, this time, I would like to talk about these two relationships and [375] and the new driver.

When Jim Lansing designed [Lansing-284], he had most of the information about [WE594A] at hand. Rather, he was familiar with it because it was his own design. He knew the structure and the work, and even the flaws. On top of that, he was listening to the distortion at the Knickerbocker Hotel, so He should have been working on an improvement plan for [WE594A], and it seems that part of it had already been discussed with Dr. Blackburn.

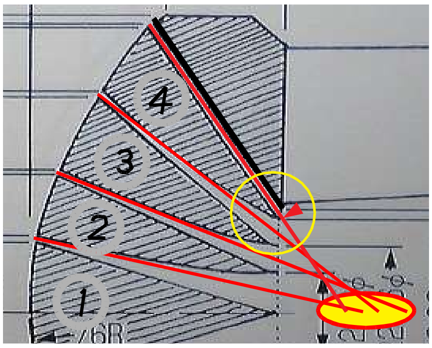
Upon entering the Shaller project, he conducted various experiments to remove distortion and reduced the diaphragm diameter to 2.84 inches. Up to this point, anyone can understand. However, the problem was that I changed the phasing plug that affects the sound. At the time, the reason for developing [Lansing-284] at the Schaller Project in a short period of time was to make it in time for the box office of the movie industry. At that point, Lansing might not have perfected the shape of the phasing plug in his head. Therefore, it may have been a conical slit of ② that is easy to cut. Still, compared to [WE594A], I think that he was satisfied that he was able to significantly improve the divided vibration and extend the high range by downsizing.

Another idea is that Lansing sells the prototype of [WE594A], so we may have dared to avoid the curved section in view of WE's patenting.

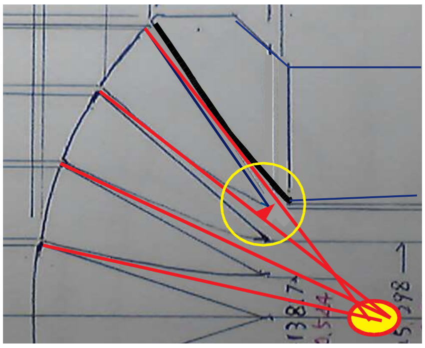
Initially, I evaluated only the improvements in [284]. However, Lansing chose conical slits such as [284] and [601] as an evolution system from [WE594A], but later adopted exponential slits [375] and [D175]. It seems that Lansing still emphasized the exponential slit, or wanted to improve it. From [WE594A], you can see from

the "mysterious sketch" that you have been focusing on trying to improve distortion in addition to making it smaller. In a sense, [WE594A] has been completed, but
what does it mean to improve it further? Let's take a closer look.

Although it overlaps, it is an important place, so I would like to expand the slit diagram and reconsider.



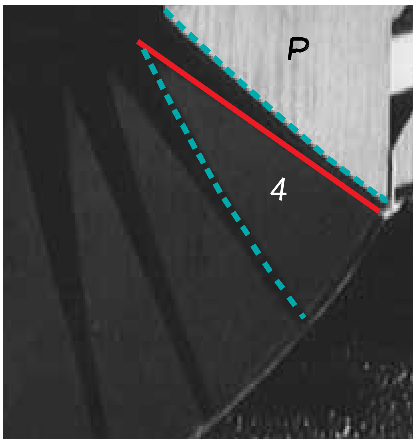
[WE594A]slit airflow


Im praved slit [375]

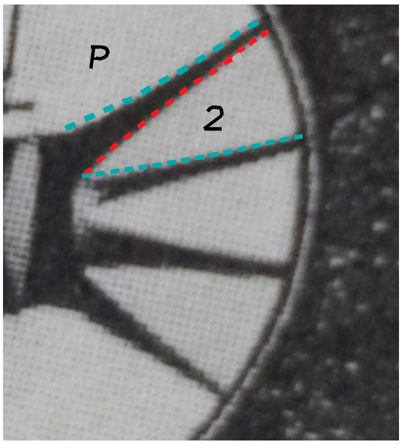
In [WE594A], the focus of the air flow of each slit passing through the slit was scattered and not concentrated, but the point improved by Lansing in the sketch is that the pole piece inner wall cross section (black line) was changed from a straight line to a curve The focal point of the airflow that has passed through the outermost peripheral slit moves to the back of the throat, approaches the other airflow, and gathers at almost one place. This is an improvement in JBL [375]. The yellow ring is aligned with the tip of the 4th plug so that the airflow centerlines of both can be compared.

Looking at the figure above, I think that it is more doubtful why the cross section of the inner wall of the pole piece of [WE594A] was made straight unlike the other surfaces. Since the curvature of each plug and the position of the tip of each plug were clearly specified in the "mystery sketch," I drew the drawing accordingly. Then, the 2nd, 3rd and 4th plugs were also slightly different, and the focus of the air flow was gathered from [WE594A] as shown in the above figure. The quadruple slits now have the same shape.

The first figure in this article is an enlargement of each figure drawn from the text of the Lansing study, and it was revealed that the cross-section of JBL LE85 was enlarged to make it difficult to understand in a small figure. According to it, [WE594A] and [375] have the same exponential slit, but one side is conical (straight line). However, [LE85] is curved on both sides. This is a big discovery! In other words, isn't this the ultimate slit that Lansing reached last?



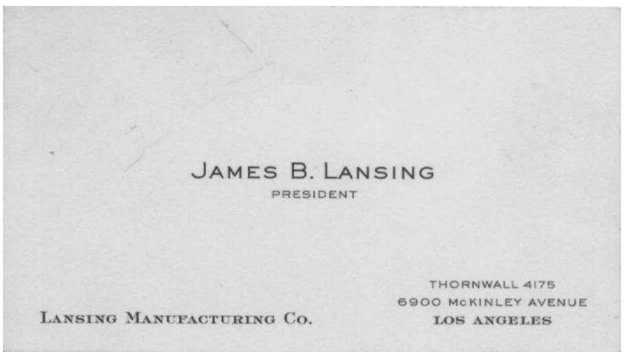
JBL-[375]Cut model



JBL-[LE85]Cut moder

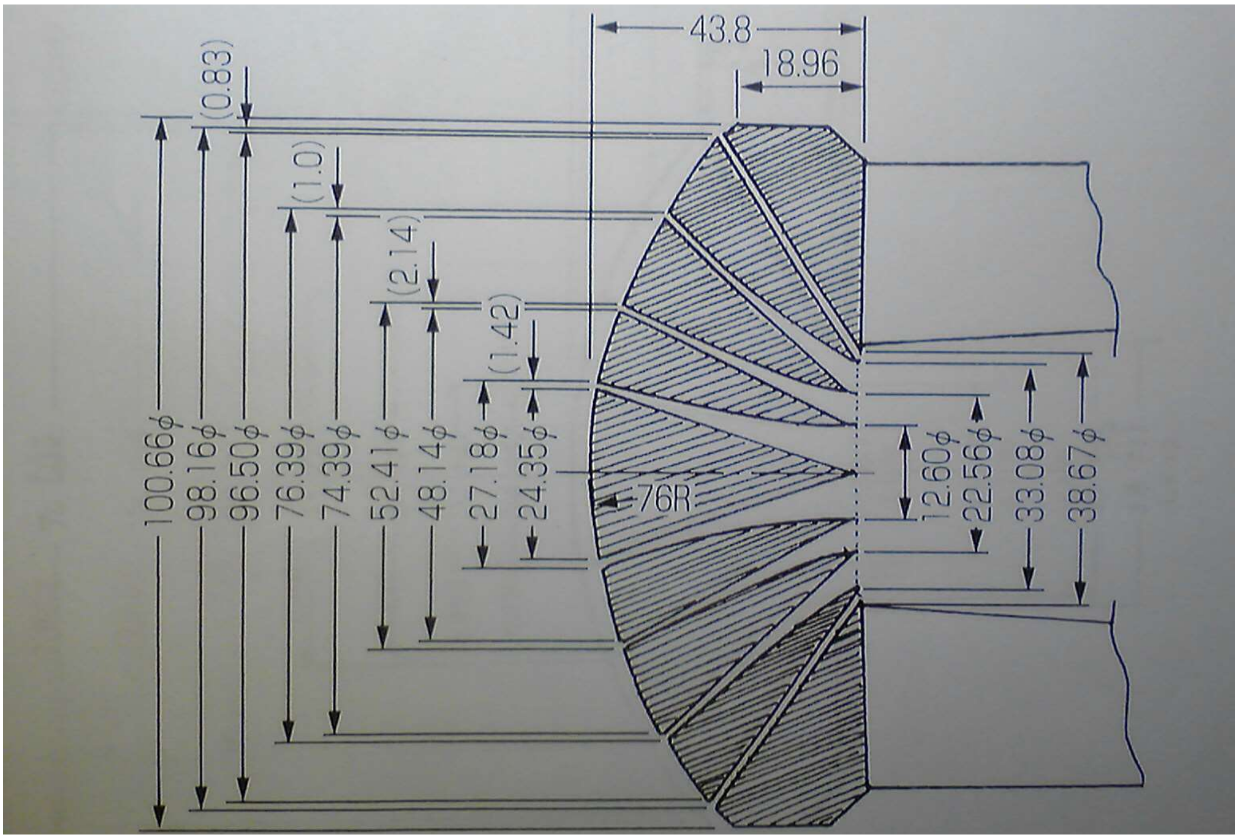
[LE85] has almost no photograph showing the inside of the plug. Only the 1975 JBL catalog final page "horn driver cross section" I tried to expand strongly. Then, the pole piece side of the 2nd plug on the right was clearly a (red dotted line) curve, compared to the 4th plug red straight line (the tip of the Japanese sword) on [375] on the left. The slit cross section was curved on both sides. So this was Lansing's answer. I wondered if he could leave [D175] at the end with something superior, but that was the answer.

Lansing seems to have judged the good or bad by listening to the music by directly turning the ideas that grew in his head into actual things, rather than drawing calculations and blueprints. In other words, I left the slit-shaped [D175] that grew up listening to music. He said it was the best compression driver. It's been 22 years in his life since he founded the Lansing Manufacturing Company in 1926. Therefore, "you will be punished if you think that 375 is best". There is no other driver like this in the world. It is generally thought that the more slits the airflow can send to the slot faster, but it seems different. According to one theory, the smaller the number of compression driver rings, the better the phase. Therefore, [WE555] is said to have good sound. Also, the smaller the diameter of the diaphragm, the less susceptible it is to split vibrations, and the [LE85] diaphragm is44.45 mm (1 3/4 inch) and can reproduce well up to about 20,000 Hz. He often says that the sound is better when the tweeter is attached to the driver that extends the high range than when the tweeter is attached to the driver that does not grow in the high range. ..

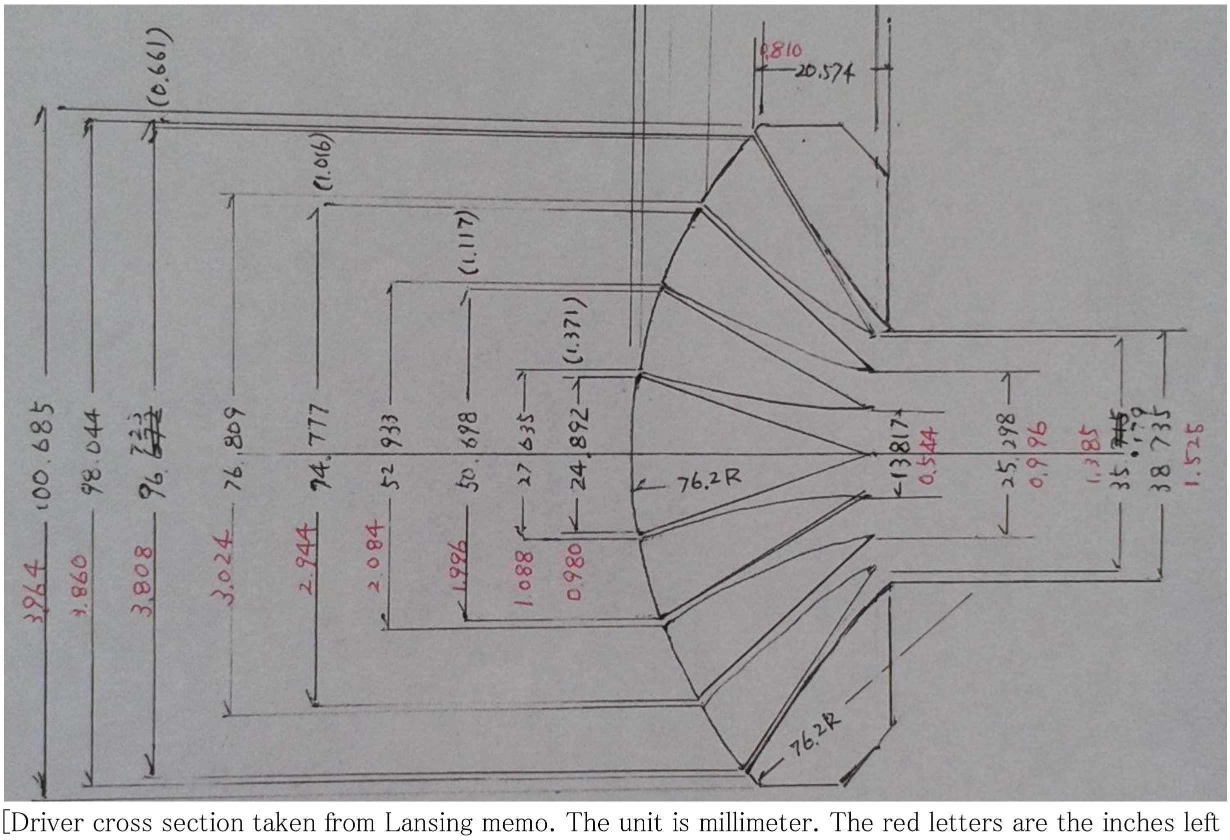


The growth of the low range can be compensated by the ability of the woofer and the power of the amplifier like Tal-lo(Barrel speaker unit on Concorde Sakuma-san).

For me, I feel like I finally came up with the answer. The man who died under the skies of California when I was 11. He smiles for me in my heart now.



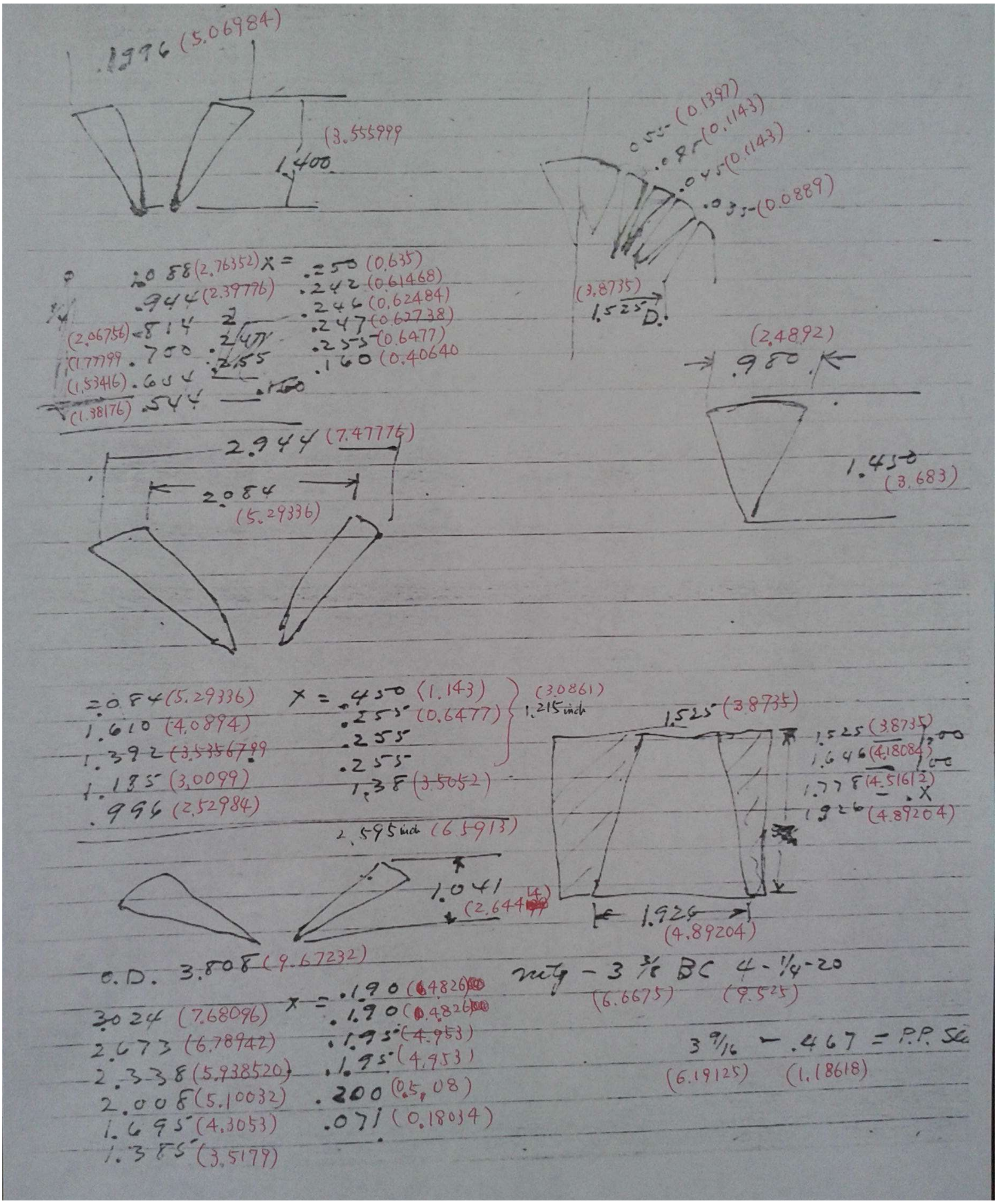
[Cross-sectional view of [WE-594A] written by Kinoshita]



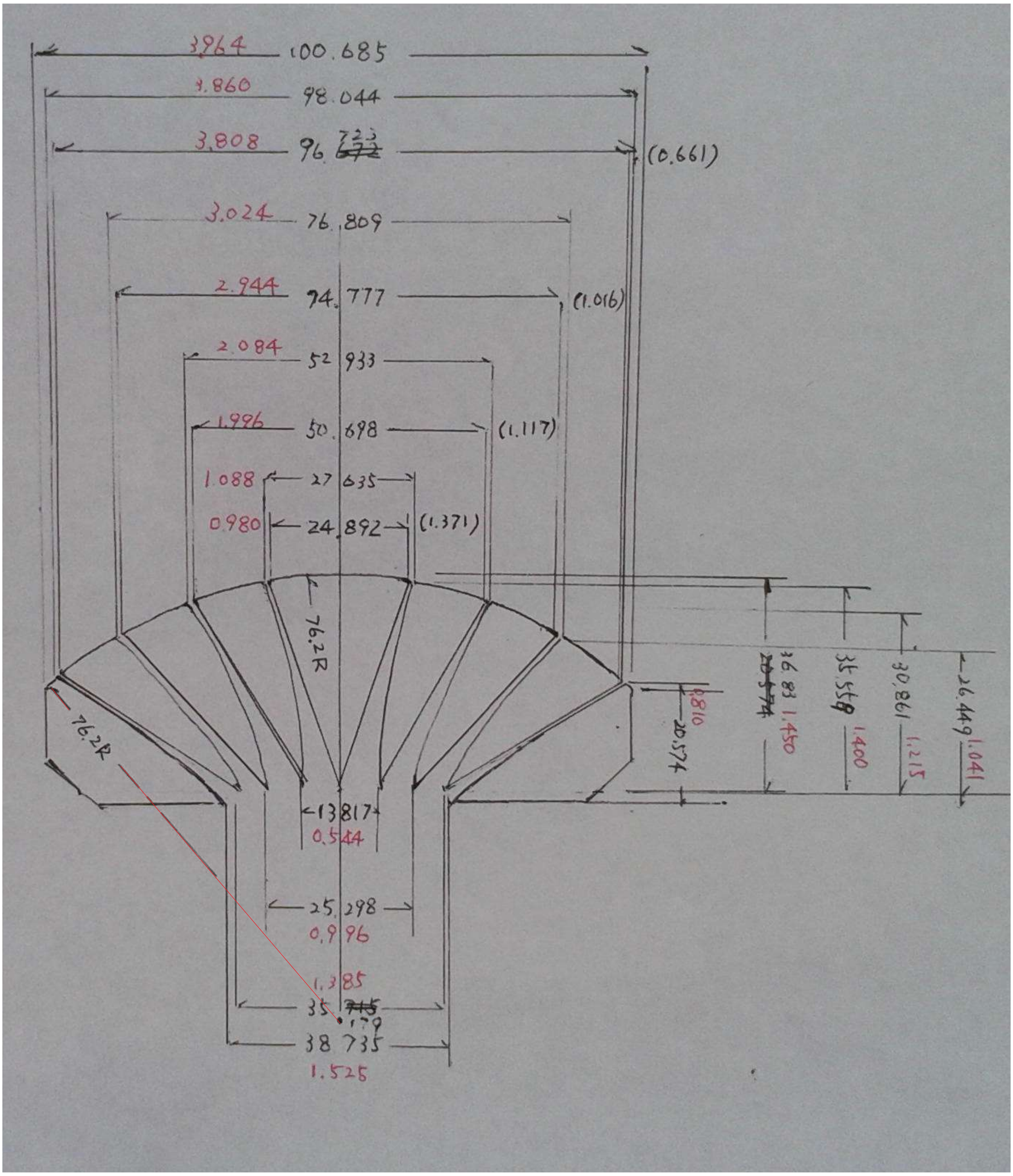
[Driver cross section taken from Lansing memo. The unit is millimeter. The red letters are the inches left by Lansing.]

In the previous article Vol.3, Mr. Tim de Palavicchini pointed out that inch should be added to the [LE85] diaphragm diameter in mm. Therefore, I added it to [Mystery of 375] Vol.3 and added cross-sectional views of phasing plugs of [WE594A] and [375]. At that time, I noticed a new difference between the two, so I would like to point it out.

I think it was around 2002, but when I printed and scrutinized a design note for Jim Lansing's 4-inch driver from LANSING HERITAGE, I found out the dimensions of each component in detail. Therefore, I started by reproducing the cross-sectional view in full scale based on the values in this memo.



[Black letters are Lansing letters, and red letters are converted by Fujimori to cm. Based on this number, I have transcribed the following figure.]

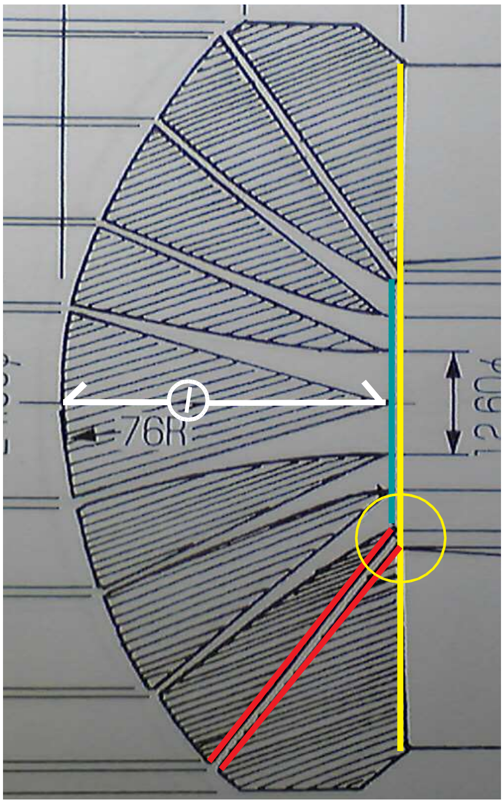


[Driver cross section taken from Lansing memo. The unit is millimeter. The red letters are the inches left by Lansing.]

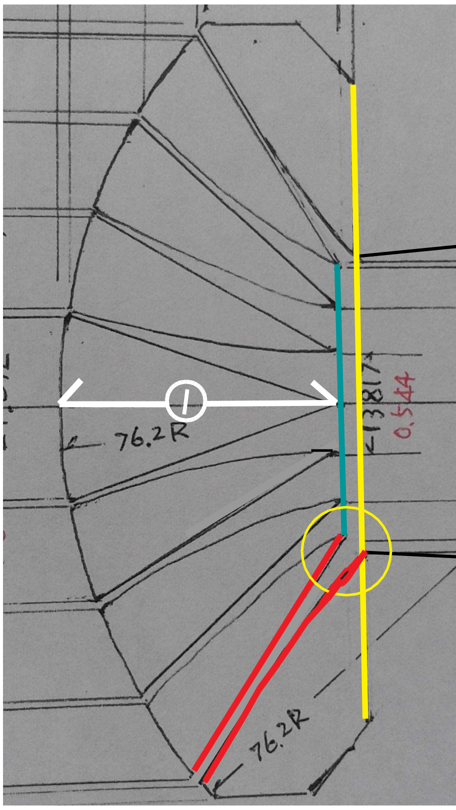
The number I wrote was in inches, so when I multiplied it by 2.54 and turned everything into centimeters, I was able to reproduce 100% of the shape and size of each part from the notes he left behind. The drawings are conveniently drawn in millimeters. The full-scale drawing had the advantage that it could be drawn as-is without conversion. This figure and [WE594A] did not have the same number.

What's more, Lansing writes a sketchy note with up to three decimal places. When I saw this, I intuitively thought that it was not a blueprint of the driver, but a memo of the actual object. Moreover, it was obvious that the magnetic circuit of [WE594A] was not replaced with Alnico 5 because the dimensions of both were different. Then, it can be inferred that the compression driver written in this memo is not a remedy for the flaws of [WE594A], but a new record. Therefore, I compared the two well. The result is the following difference.

First of all, the first thing I did was change the magnification of the copy of the [WE594A] cross-section drawn by Mr. Shozo Kinoshita to the actual size, and reproduce the wrong aspect ratio correctly, the same screen as the sketch reproduction on the right This is what I copied above.
Looking at the figure below, you can see the difference in depth between the two phasing plugs. It can be seen that the distance that the air flow passes through each slit is designed to be shorter at [375]. · ·
The difference between [WE594A] and [375] is that the cross-section of the inner wall of the pole piece indicated by the red line is a straight line or an exponential curve, as was often pointed out in the previous article. The phases of the air flow when they merge at the throat are aligned, but further improvements can be seen in this paper.



[Cross-sectional view of [WE-594A] (actual size) written by Kinoshita]



[Sketch = [JBL375]? Full-scale cross section of]

Lansing improvements in [375]
[What I noticed this time is the difference in the length of the 1st plug indicated by the white line. The length of ① from the diaphragm side (left end) to the right end of the 1st plug is 43.8 mm in [WE594A], while [375] is 36.83 mm, so it is 6.97-mm shorter (-15.9%).
The difference of slightly less than 16% is represented by the difference in depth between the tip of the plug group (blue line) and the tip of the pole piece (yellow line). Along with the difference in shape, Jim Lansing is the main improvement to the [WE594A] phasing plug. It can be considered that the high frequency characteristics are improved by this. The small difference in size between the two is not a big difference, but the difference in the inner wall of the pole piece and the plug length is a big difference that affects the sound.]

Considering the improvements made by Lansing, I think that the fact that the shape of the inner wall of the pole piece has been changed has made it possible to spread the airflow in the same manner as other slits.
Also, by shortening the slit length that was pointed out this time, the air flow will gather in the throat somewhat earlier, so the compression time will be slightly shortened (16%).
Did you expect the effect of shortening the trumpet pipe? .. Is this a change in tone closer to the Flugelhorn than the trumpet?
In any case, you can see that suppleness is added to the peaky [WE594A].

However, in the 1940s, duralumin was a lightweight and strong material in the 1940s, and there was nothing better than this. I think the high range was limited to 10,000 Hz due to the distortion of the 4-inch diaphragm made of duralumin material.
Therefore, Lansing, which 3Way dislikes, may have secretly sealed [375], which he secretly developed. Still, there is a section that was developing the 075 for 3Way for future JBL. If you look at the model number of the device he developed, you can guess the circumstances at that time.
JBL drivers are changing their initial numbers to [075], [175], [275], [375]. The ones modified by Locancy have the LE prefix, and conversely, for consumers without LE, it can be considered Lansing's own work. By the way, looking at the order of release date, it is D175: 1948, T530A / 375: 1953, 275: 1958, LE75 / LE85: 1960, LE175: 1965.
Forty-five years ago, after re-challengeing audio with JBL's LE15A + LE85, I began to study the life and achievements of James B. Lansing with mysterious ties. At that time, it was said that he produced most of the speakers that were behind the scenes of a movie screen. However, in 2000, former Mitsubishi Electric

engineer Mr.Tamon Saeki said, "Lansing made the 284 with the technology of a compression driver that was repaired in the subcontracting era of Western Electric." "WE555 and WE594A are Wente from Bell Labs. ″Toulus made and patented it.″ Because of this, I've been so sad that I couldn't sleep at night. Certainly, the US Patent Office records the names of E.C.Wente and A.L.Thuras, who belonged to Bell Telephone Laboratory. However, it was a certain common sense for the company that bought the driver prototype to apply for a patent in the name of an employee. So in the 1950s and 80s, audio magazines also published articles in honor of Lansing's accomplishments.
When all of the seniors at that time died, that is, when there were no witnesses, Me.Saeki said, `` I didn't listen to audio superstitions or exaggerated stories, and after hard work. In order to bring out the many technologies that were almost buried in the history, we aimed to bring out the technology developed by the company and the materials and patents by the developers themselves, and to dig this out, aiming to bring out many speaker technologies. I wrote the book ″100 Years of Speaker Technology″ with the concept ″I wrote the technical records of the times in the references.″
Knowing the story about Lansing that ″The Western driver was developed by Lansing,″ and then dare to bring up the patent record and despise Lansing, there is no word.
It can be said that this is a kind of violence that exploits weaknesses.
He prioritized the patent record, which was just the cause, and repeated the claim to overthrow the true genius, Lansing, which is rare in speaker history.

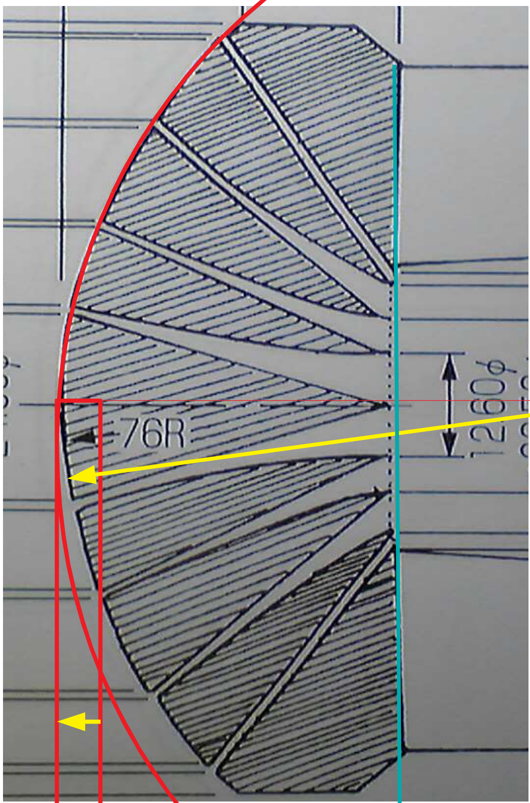
So I wrote my sentence ″James Bullough Lansing″.
In January 2020, my friend M recommended that ″this research is valuable for future generations, so why not put it on my home-page″?
The sequel reached 20 manuscripts.
In the meantime, there was cooperation such as the collection and translation of materials by Mr. M.
In addition, it has been promoted under a number of collaborations such as proofreading important texts and providing ideas. I would like to thank Mr. M for his kindness, and at the same time, I hope that this sentence will catch the attention of music lovers and JBL enthusiasts.

I wrote this article on Windows 10 using LibreOffice6.0
When viewed at a magnification of 106 on a PC, the size of the drawing is almost the same as the actual size.

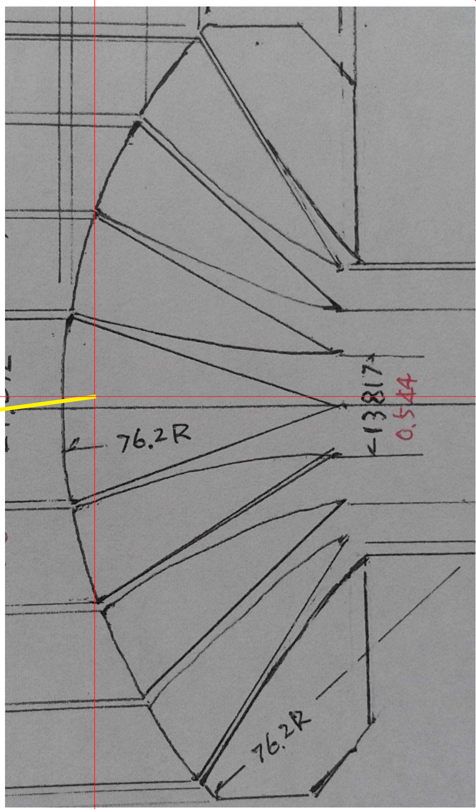
After finishing this article (vol.4) and posting it on Mr. M's home page, a new problem was discovered. I corrected the aspect ratio of Kinoshita's figure on the previous page and extended the figure 5.5 mm in the horizontal direction to obtain the specified plug length, but I noticed that the roundness of the diaphragm surface appeared to change. Therefore, I moved the cross-sectional view to page 3 (next page) due to the drawing, and put the correct red circle of 76R on Kinoshita's figure and overlap it. By extending Kinoshita's figure sideways, the radius of the diaphragm surface (radius) Has become smaller. When the figure of Fujimori on the right is applied to this large circle, it fits perfectly.

By stretching the Kinoshita diagram horizontally, the central part is about 3mm higher than it actually is. The diaphragm cross-section radius of [WE594A] is 76 mm, and the specification of the Lansing memo is 76.2 mm which is similar to that, so the curve of the drawing was visibly different, although it hardly changed. So I tried to check how much it was different from the correct curvature, but as a result, the conclusion was drawn that if you put the Paulpie side of Kinoshita diagram about 3 mm forward and follow the red circle, it is the real thing of [WE594A] It was supposed to be a cross section.
-This figure is probably drawn for the purpose of entering the numerical values measured by Mr. Kinoshita when measuring [WE594A], and it is possible that the aspect ratio was not taken into consideration.

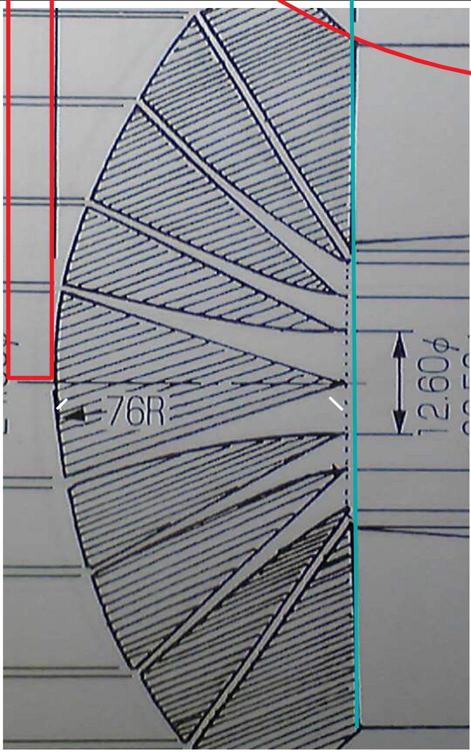
The reason for moving the figure to the next page is that if you add a red circle with a frame over it after drawing it on a PC, the red circle will fly by any means. It disappears or moves to another page. So I was forced to move to the next page.



Sectional view of [WE-594A] after modification Drawing by Mr. Kinoshita



From Lansing Design Memo = [JBL375] Drawing by Fujimori

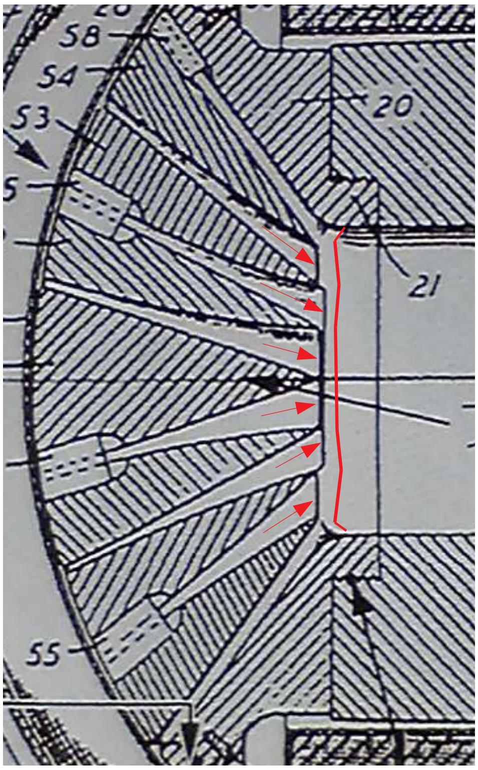


Sectional view before modification

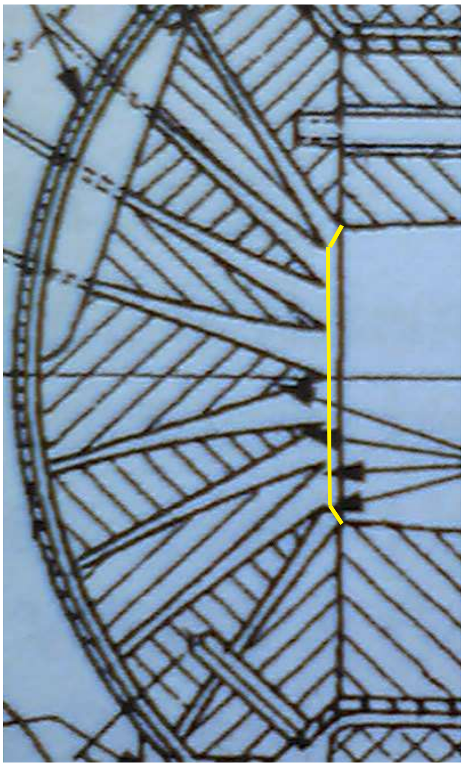
The aspect ratio is wrong [WE594A] The cross-sectional view is corrected and the upper one is, and the lower one is uncorrected (red frame can be compared).
However, when a circle with a radius of 76 mm was placed on the cross section, the distortion in the above figure became clear.

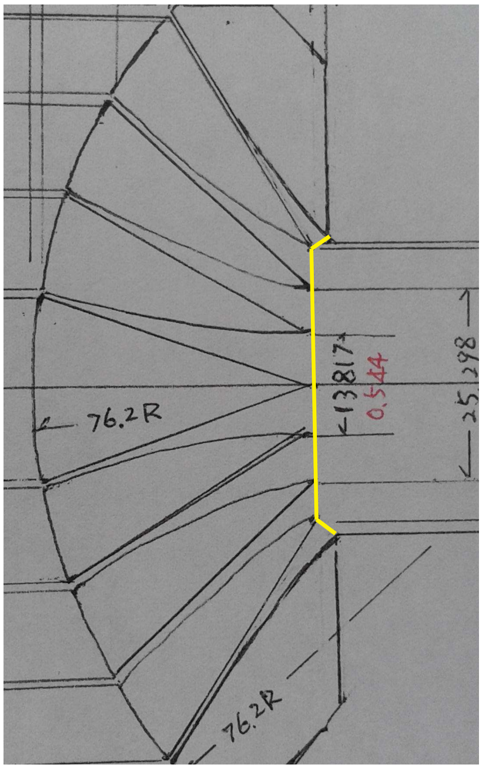
James Bullough Lansing Study ㉒ A mystery about [375]. Vo.5

By studying the details of phasing plugs, I have realized that the problem is profound. This time I would like to talk about the length of the phasing plug.



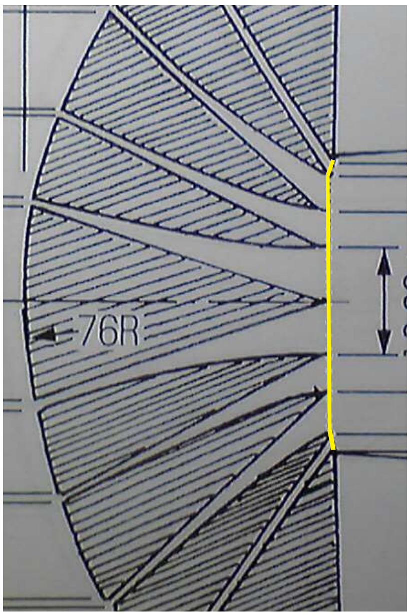
① WE594A patent application diagram


② Sectional view of WE594A manufactured product

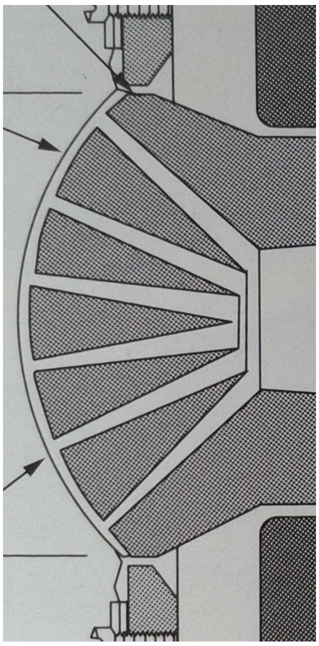


③ Drawing by Fujimori from the notes of Lansing

The cross-sections of the above three sheets have appeared frequently in this paper, but the length of the tip of the phasing plug to the exit to the throat is different from the four. Of particular note is ①. I tried to draw a line connecting the plug tips. Since ① goes in and out intricately, the line is staggered about 3 mm to the right. This is because the original drawing has the edge of the plug visible on the other side. I moved the red line to the right so that I could see this line. The red line allows you to see the entrance and exit. The prototype of [WE594A] submitted by Wente and Thuras has a different plug from [WE594A] ② manufactured later



④[WE594A] Shozo Kinoshita measurement diagram


⑤ Lansing [284]

You can see the state of the plug tip of ① by looking at ⑤. Each plug has a ring shape and only the cut surface is drawn in the sectional view taken in the middle, but ① and ⑤ show the actual condition of the cylindrical plug. According to it, the plugs of ① have the same length in Nos. 1 and 2, and the number 3 is slightly protruding. No. 4 has a tip deeper than Nos. 1 and 2, and the corner of the pole piece is as close as possible to the exit. It is unclear why such a situation was created, but it is interesting. Was it uneven in the calculation, or was it different when measured in combination? In fact, each plug is made and assembled, and spacers are inserted in three places of the slit to make a uniform ring-shaped gap. Although it will come out a little in the inserted state, the diaphragm side will be cut by lathe processing, so even if the diaphragm side is finished flush, it will be judged by an amateur whether the outlet side will have some unevenness Outside of. Because it seems impossible to make irregularities by calculating. That said, the applicant for the [WE594A] patent may not know it. ① was a measurement drawing, not a design drawing.

In the case of the section [284], the tips of the plugs are naturally lined up in an arc, which is beautiful without complaint. However, the unevenness of the plug tip of ① is impossible in physics. If it is to control the turbulence of the air flow due to the difference in the shape of the No. 4 slit, the straight line ② cannot be explained.Therefore, the conclusion drawn from this is that

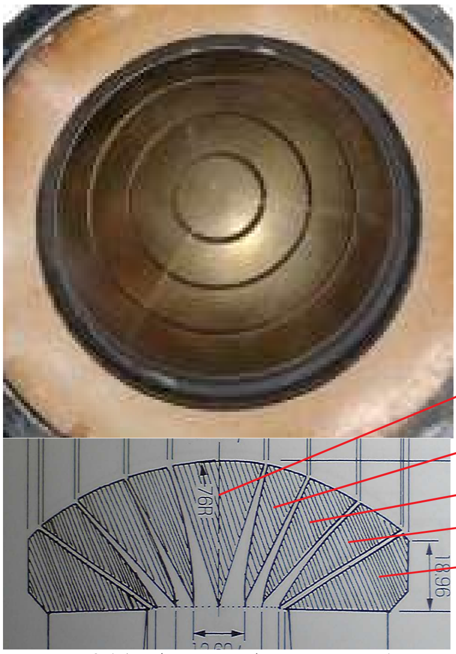
In the case of the [284] cross section, the tips of the plugs are naturally lined up in an arc, and they are so beautiful that they cannot be complained. However, the unevenness of the plug tip in (1) is impossible even if you look at the physical laws. If it is to control the turbulence of the air flow due to the difference in the shape of the No. 4 slit, the straight line ② cannot be explained. Therefore, the conclusion drawn from this is that

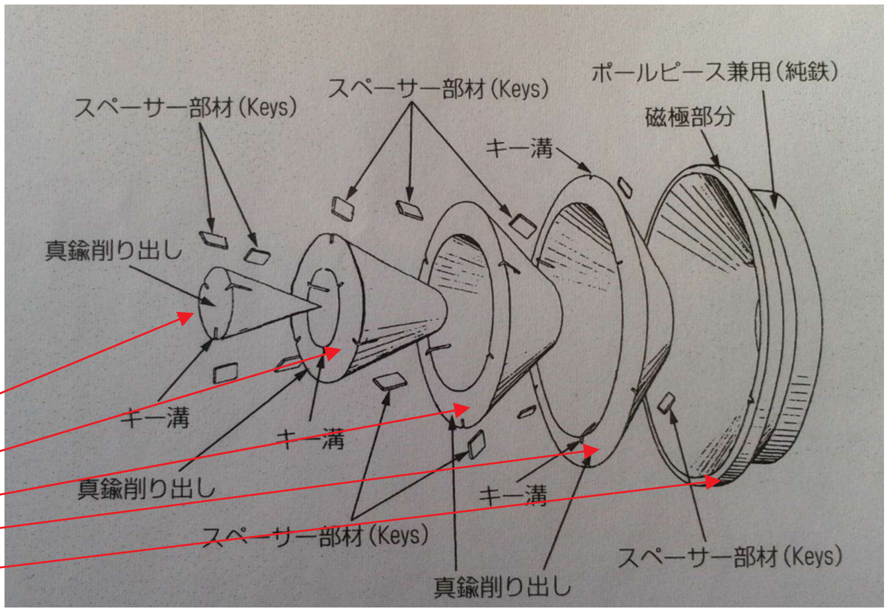
The prototype of [WE594A], which was applied for a patent in 1933, was not the one that Wente and Thuras thought or made. They disassembled the actual product, measured it, and I just accepted the explanation and filed a patent application.

It means that. At least that's how it was fixed in me.

The above explanation was difficult to understand, so I would like to add it and explain it in detail. A phasing plug with a 4-ring slit is made by casting four plugs and lathing them together, but inserting a spacer in the gap and hammering in. The calculated gap is "Lansing Memo", and the widths of the slits seen from above are 1.371 mm between the first and second slits, 1.117 mm between the second and third slits, and the third and fourth slits. The distance between them is 1.016mm, and the distance between the 4th plug and the pole piece is 0.661mm. If you put a spacer and adjust it, the actual product will have an error of several percent.

The diaphragm side of the plug is fixed at a position where the diaphragm does not come into contact with the plug at the time of amplitude and is not too far apart so that the gap with the diaphragm becomes uniform. The adjustment is made uniform by lathing. That is, it can be inferred that the tip of the plug is slightly uneven at the time of manufacturing. The figure that looks exactly like that is the drawing attached when the patent application in ① was applied. Therefore, I came to the conclusion, "It was neither what Wente and Thuras thought or made. They just disassembled the actual item, measured it, accepted the explanation, and applied for a patent." It will be.


WE594A photo and cross section



Exploded view of 4 slit phasing plug such as W594A (from MJ radio and experiment magazine)

In the photo above, there are three radial stripes, which are spacers. This spacer acts as a "stuck bar", and the ring-shaped slits are arranged at regular intervals. After fixing the position by fitting the wooden frame on the throat side of the slit, insert the spacer from the diaphragm side, hit it with a mallet and push it in until it is firmly fixed, the one fixed entirely is the tip of the plug It is unavoidable if there are slight irregularities in the parts. However, it is safe to say that it is the job of an amateur who does not know fluid mechanics to measure such an object and write it in a patent application drawing. The idea that two Bell Labs Dr. may have been aware of the "special plug theory" is not possible as long as ② exists.