

Timpani Construction paper—1993 SMU

This paper is intended as an overview of the history of timpani as instruments, the technical breakthroughs that have taken place, the reasons for these, and their effect on the repertoire. As a paper on the growth and improvement of the timpani, subjects addressing the technology will be covered. Although there were many different models manufactured, patented or produced, only ones that contribute significantly will be discussed. (Tobishek discusses the mechanics of more than fifty-one different models.)

The word "timpani" is taken from the Greek *Typanum*, meaning a vibrating membrane. It was during King Edward VI's reign in England (1551) that the name "Kettel Drom" first came to be used.¹

The first evidence of kettle drums appears on a Babylonian plaque c700BC. There are many references in varied cultures to drums shaped like kettles or goblets prior to that time. These references center around Egypt, Greece and the middle east although there are undoubtedly other cultures with similar drums. The use of a pair of kettle drums begins to appear in Europe in the thirteenth century during the Crusades. The drums were small and tightened by thongs (nakers).

Larger drums mounted on horse or camel back arrived in the west in the fifteenth century from the Ottoman Empire. These inspired the European use of Calvary kettle drums. These larger drums were put to orchestral use in the seventeenth century.

Calvary kettle drums were a great prize. They were only awarded to the most elite groups, (*corps d'elite*). Ordinary regiments could only possess them if they were captured in battle. If a regiment lost their instruments they were not allowed to replace them. The only way to regain instruments was to recapture the lost ones.

The players of these drums were equally important and held in very high esteem. They formed guilds such as the "Imperial Guild of Trumpeters and Kettle Drummers" (1623) in Germany. The members were officers and allowed to wear the ostrich feather of nobility in their hats. Members also rode near the commander in the field on beautifully caparisoned horses.² There were many rules that governed the performances of this time. Some of these rules are still in effect today (in London's Guildhall, timpani can not be used with the banquet orchestra unless royalty is officially present). These

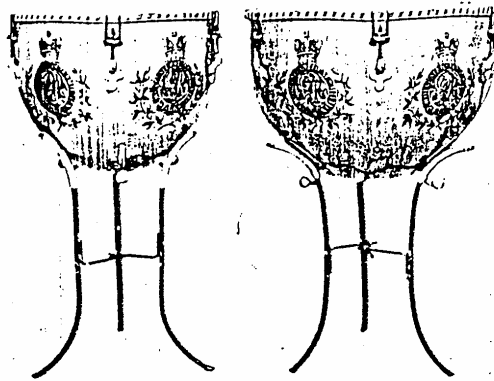
¹ Gordon B. Peters *The drummer: Man* Kemper-Peters Publications, Wilmette, Illinois 1975 pp. 41-42

²James Blades *Percussion Instruments and Their History* Faber and Faber, London @ Boston 1984 pp. 226-230

rules effected what we know of performance practices and instrument construction during that time due to the strict codes of silence assigned to these topics. Furthermore, there is no written record because everything was handed down by rote from generation to generation.

The drums were almost always played in pairs. They were treated as transposing instruments and the pitches were written C and G (with the higher drum “tenor” on the C and the lower on G “bass”). The interval of the fourth (and sometimes fifth) was most often used because of its similarity to the trumpet overtone series.

The earliest drums were of the thonged or laced variety. Screw tensioning was adopted in Germany as early as the sixteenth century. This allowed for tuning individual areas of the head separately. Also at this time counter hoops began to appear. These created a more even pressure all of the way around the vellum. With this advancement, the drums were more in tune and therefore more resonant. The screws were almost always tightened through the use of a loose key. Many of the screws had square tops like the screws of today.



Screw tensioned drums by an unknown maker

The number of these screws varied. The numbers started small and grew (at one point in the early eighteenth century there were sixteen tension screws placed around the drum). This allowed for a more accurate tuning of the entire head. However, it made the changing of pitch a laborious task and therefore the number of screws was reduced to eight.

The shells of makers could be metal or wood. Timpani, by the sixteenth century, were usually mounted with copper or brass bowls. The width of the bowl grew steadily until their maximum size (approximately thirty eight inches in diameter) was reached.

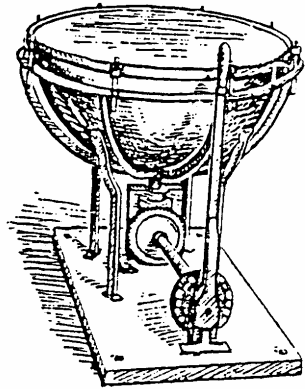
The size could not increase any more because there were no skins to fit a larger diameter. The average large size settled at approximately thirty two inches. The smaller drum's diameter was twenty eight to twenty nine inches. This made the low notes possible (any pitch below an F was difficult to produce).

The repertoire began to expand the range of the instruments. The large size of the drums made it difficult to produce notes above a D. Eventually smaller drums of twenty four and twenty inches were added to the timpanist's set-up. The addition of these drums was slow because of tradition, and space in the hall or pit.

At this point it should be mentioned that the construction of timpani was, at best, a cottage industry. There were as many different styles as there were drums. Mass production was not realized until the end of the nineteenth century. Patterns were followed, but each drum was considered a work of art and subtle or large differences could be affected on each drum.

In 1812, Gerhard Cramer made the first significant advance towards the rapid tuning of the kettle drums. Cramer, became interested in the concept of mechanical tuning due to the increasing demands of the "new music " being played by the Munich court orchestra. Together with a locksmith from the court metalworking shop named Traub, and the royal armorer and metalworker, Pittky, he made his first set of drums.³ Unfortunately, there are no existing drawings or diagrams of these drums. There are some brief descriptions in contemporary documents that refer to the first machine-tuned timpani. The kettle was affixed to four metal legs that were then attached to a wooden base. The counter hoop was attached to a parallel ring below it. The ring had eight (coinciding with the eight tuning rods) legs that curved in the same fashion as the kettle. These legs met at their ends and had a threaded hole at the meeting place. This ring was, in a sense, the top of a cradle that could be raised or lowered by the turning of a bolt in the threaded hole at the bottom. This bolt was turned through a series of levers that led to a vertical lever coming up from the wooden base.

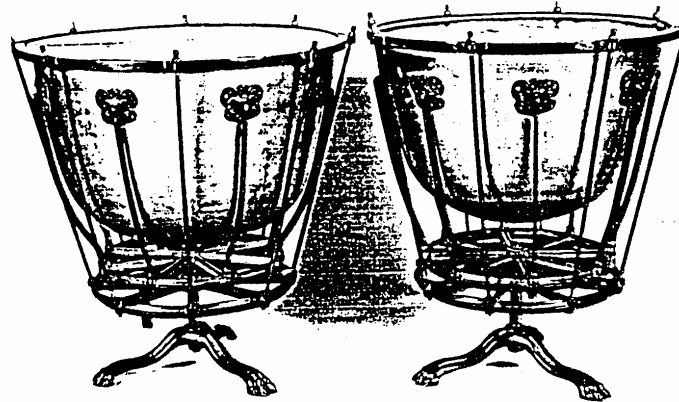
³Edmund A. Bowles *Nineteenth-Century innovations in the Use and Construction of the Timpani Percussionist* , Official Publication of The Percussive Arts Society 1982 Vol 19 n2 pp 38-41



Drawing of a machine drum believed to be made in Gerhard Cramer's design

In Amsterdam, musician-inventor Johann Stumpff engineered a rotating type of machine drum around 1815. Again, there are eight tension rods. They are attached to a web like metal ring located below the kettle. Directly above this "ring" (later to be called a spider), is a similar ring attached to the eight legs supporting the kettle. The bottom ring is threaded. Below both rings is a tripod support. Up from the tripod extends a long bolt. It passes through the threaded spider (ring) and is attached to the top spider. As the bowl and counter hoop are rotated, the counter hoop is raised or lowered (according to which direction it is turned) and the bowl stays at the same height. The variety of tension placed on the counter hoop offers the variety in pitch. This model was very popular because of its simplicity and light weight. The individual tension rods still allowed for inconsistencies in the head and the even pressure on the counter hoop created an even tone.⁴

⁴Edmund A. Bowles *Nineteenth-Century innovations in the Use and Construction of the Timpani* Percussionist , Official Publication of The Percussive Arts Society 1982 Vol 19 n2 pp 41-44



Rotary drums of the Stumpff type

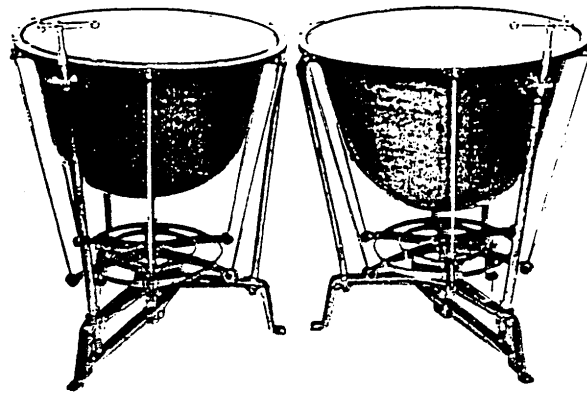
There were a couple of drawbacks to this model though. The first was that the rotating of the head changed the beating area. (With calf heads, some believe that the best beating spot is the skin from the back and not the belly.) Also, the rotating required the use of both hands. This caused the player to have to put down his mallets momentarily and therefore, he could not tune while playing. Still, these drums were often purchased in the Netherlands and the Rhine area.

The next significant advance in timpani technology came in 1836 with the timpani of Johann Kasper Einbigler.⁵ These drums were easier to tune than previous models and provided a better tone. The tone was most improved by the fact that the bowl (kettle) was suspended by struts at the top of the bowl. (This differed from previous models with the legs attached to the side of the bowl.) The bowl was now free to resonate. The struts (three), attached directly to the tripod support at the bottom. Similar to Stumpff's design, there were eight tension rods attached to a single spider. The spider was attached to an arm under the tripod. This arm was raised and lowered by a threaded vertical tuning crank.

These timpani were a technical break-through. There was no internal machinery to interfere with the sound waves. It has already been mentioned that the resonance was further increased by the support coming at the very top of the bowl. And, the tuning mechanism was very quiet. This would allow for tuning in very soft passages of music (previously the noise would have been too disruptive). Mendelssohn himself was very

⁵James Blades *Percussion Instruments and Their History* Faber and Faber, London @ Boston 1984 pp. 277

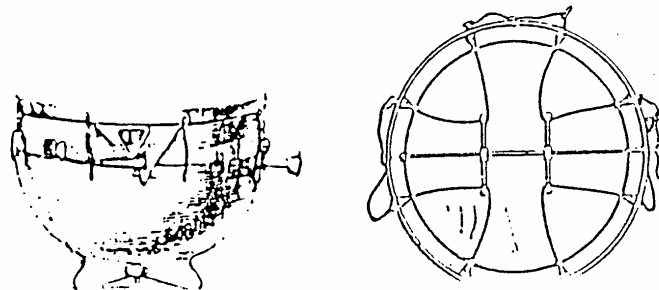
impressed by these timpani.⁶



Modern German machine drums with the Einbigler-type tuning device

At this time in England, Cornelius Ward was also experimenting with timpani construction. His timpani had two threaded T bars inside them. These T bars were attached to an endless cable that went in and out of the shell through a series of pulleys. This cable also attached to the counter hoop. As the T bar was turned from outside the shell, the tension on the counter hoop was increased or decreased. This model was difficult to use physically because the machine was not efficient enough.

This was overcome in his next model which replaced the T bars with a rack and pinion design. Both models were not able to compensate for inequalities in the calf head due to their lack of individual tension rods. Still, the later model was sold well into the nineteenth century.

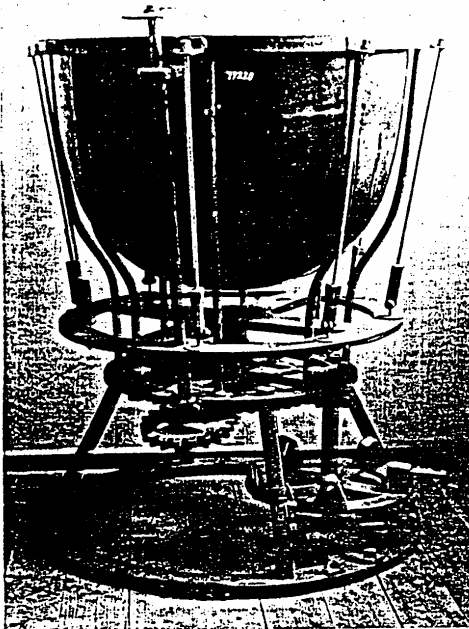


Drawing of the cable tuned drum invented by Cornelius Ward

⁶Edmund A. Bowles *Nineteenth-Century Innovations in the Use and Construction of the Timpani Percussionist*, Official Publication of The Percussive Arts Society 1982 Vol 19 n2 pp 46-48

The first foot activated tuning device appeared in 1840. August Knocke, a gunsmith from Munich, was the inventor.⁷ His design reverts back to the two ring design. (One stationary, and the other raised and lowered to change the pitch.) A series of gears was assembled that ended with a ring to be turned by the performer's foot. This ring took the place of the vertical tuning lever (although there was also a vertical tuning lever for fine tuning that could still be turned by the hand of the performer). These drums had free floating bowls and the first crude tuning gauges. (These were related to the turning of the gears. Since calf is not an exact or consistent medium, and iron is, the accuracy of these gauges is questionable.)

Knocke's machine drums were used in a number of German orchestras. Most notably, the court theater in Munich (*Koniglich Bayerisches Hoforchester*).⁸ It is possible that Wagner's entire *Ring of the Niebelung* was composed with these timpani in mind. In 1851, at the Great Exhibition in London, the drums received an Honorable Mention. At the German Industrial Exhibition in Munich (1854), they won a medal of honor.

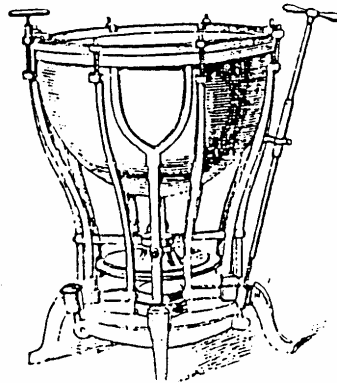


Foot activated machine drum invented by August Knocke

⁷James Blades *Percussion Instruments and Their History* Faber and Faber , London @ Boston 1984 pp. 278

⁸Edmund A. Bowles *Nineteenth-Century innovations in the Use and Construction of the Timpani Percussionist* , Official Publication of The Percussive Arts Society 1982 Vol 19 n2 pp 51-54

The next drums of note were the Pfundt/ Hoffmann drums. The Pfundt/ Hoffmann drums were the product of several modifications upon the Einbigler drums. These changes were the result of suggestions by Ernst Gotthold Pfundt, Carl Hoffman and Friedrich Hentschel. (Pfundt was the timpani virtuoso of his time.) It is difficult to surmise which suggestions were made by whom (each man making his own claims).⁹ The modifications included a larger kettle supported by forked braces attached to the very rim of the bowl. Also, all of the iron assembly was made heavier and sturdier for better support. The supports were connected by reinforced cross beams. The thin spider was replaced by a massive solid disk. A thick vertical axle attached the disk to the rocker arm.



Pfundt/ Hoffmann machine drum

The drums were honored with Honorable mentions at both the Vienna World Fair in 1873 and the Dresden Trade Show in 1875. These drums had several selling points. Two of which are that the kettle, supported at the rim, received almost no tension. This enabled it to be hammered much thinner (increasing resonance). The strength of the spider and base was so improved that the screw mechanism had far less inertia to overcome than previous models. This made fine tuning much easier. Bowles says, "Their contribution was a single, threaded crank acting upon a threaded lever that controlled the armature to which the tuning rods were attached. More significant was the fact that this simple device multiplied the force transmitted to the base plate by the tuning crank, making for a far more efficient and powerful mechanism."¹⁰

⁹Edmund A. Bowles *Nineteenth-Century innovations in the Use and Construction of the Timpani Percussionist*, Official Publication of The Percussive Arts Society 1982 Vol 19 n2 pp 55-58

¹⁰Edmund A. Bowles *Nineteenth-Century innovations in the Use and Construction of the Timpani Percussionist*, Official Publication of The Percussive Arts Society 1982 Vol 19 n2 pp 60-64

The last great innovation of the nineteenth century was that of Carl Pittrich. The Dresden model was patented in 1881. At first it was manufactured as a tuning device to be added to existing Pfundt/ Hoffmann style drums by Ernst Queisser. Later Paul Focke manufactured the complete drum assembly in Dresden. Bowles states "The Dresden model differed from its predecessors in employing a foot pedal, ratchet, and mechanical couplings as a tuning device, changing the entire mechanism into an eccentric for converting the semicircular motion of the pedal into the reciprocating motion of the base plate up and down." The pedal had a heavy counter weight at the top and was attached to a rod at the bottom. This rod was attached through a series of couplings and gears to the rocker arm. On the pedal was a clutch that could be engaged or disengaged with the sideways motion of the foot. When disengaged, the pedal was free to be adjusted to the desired pitch. Once that pitch was reached, re-engaging the clutch would keep the pedal (and the pitch) stationary. Again there was a tuning gauge (controlled by linkage to the pedal).

This was the first model where the pitch could be changed reliably by the foot while the hands were engaged in performance. This allowed the player to correct intonation without interrupting his playing. Also, the tuning gauge could be adjusted prior to each performance to insure a more precise indication of what pitch was about to sound.

Pfundt/ Hoffmann Kettle drums with the Pittrich pedal tuning device installed

Machine drums and their improvements had a profound effect on composers. The increasing ease of tuning during a performance allowed for the use of timpani in many instances previously unthinkable. The timpanist was no longer relegated to the pitches tuned at the beginning of the movement. Edmund A. Bowles has provided a chart that

illustrates composers' latitude in the length of time allotted for a pitch change.

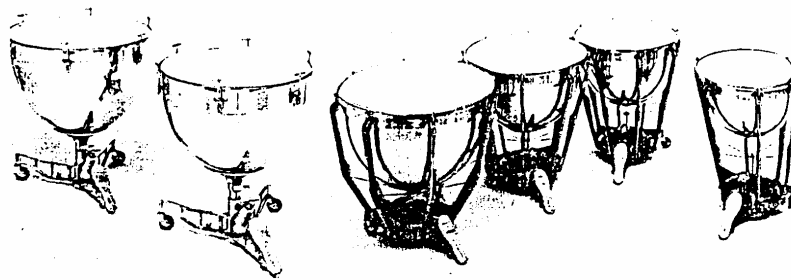
Lengths of Time for Changing Pitches of Timpani in Various Works

Weber	<i>Der Freischutz</i> , overture	A to G	70 sec.
Berlioz	<i>Symphonie fantastique</i> , 5th mvt.	C# to C	50 sec.
		35. to G	25 sec.
Schumann	Symphony No. 4 in D minor, 1st mvt.	D to Db	23 sec.
		and A to Ab	
		Db to E and Ab to A	30 sec.
Mendelssohn	<i>Elijah</i> , no. 16	Eb to E	5 sec.
Thomas	<i>Mignon</i> , Overture	Bb to A	4 sec.
Verdi	<i>Aida</i> , act 4	A to B	6 sec.
Wagner	<i>Die Gotterdammerung</i> , act 3	D to Eb	7 sec.
		and G to Bb	
Bruckner	Symphony No. 5 in Bb, 4th mvt.	B to C	6 sec.
Verdi	<i>Otello</i> , act 1	E to D to C	Instantaneous
Mahler	Symphony No. 3 in D minor, 1st mvt.	E to F	2 sec.
		and A to Bb	
Strauss	<i>Til Eulenspiegels lustige Streiche</i>	C to C#	Instantaneous
D'Indy	Symphony No. 2 in Bb, 4th mvt.	B to Bb to	Instantaneous
		A to Ab	

These are just some of the examples of the nineteenth century. The existence of

machine timpani was again noted in Strauss' *Burlesque for Piano and Orchestra* where there is a quick change from A to Bb to A. Strauss instructs that these three notes are only to be played if machine drums (*chromatische pauken*) are available.

The Ludwig Drum company began making a spring suspension pedal in 1921. The tension of the head is balanced against the spring of the pedal. The spider has been replaced by a series of rods attached to the tension screws. Ludwig manufactured 32, 30, 29, 26, 23, and 20 inch drums in this style. The universal model comes with a detachable base. (This again improves on the drums mobility.) The professional model features a free floating bowl and the tension rods are inside of the bowl.¹¹

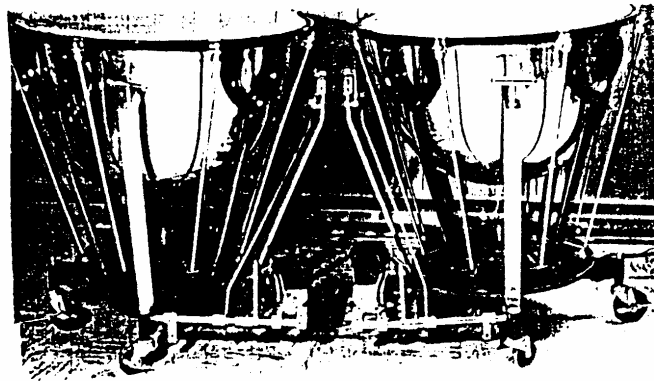


Ludwig Universal Timpani (left) and Ludwig Professional model Timpani (right)

The Hinger Touch-Tone Corporation improved on the Dresden model by making several adjustments. First, the entire kettle can be rotated without disturbing the head to allow the player to find the best beating spot. Also, the motion of the pedal is controlled by foot movement (like the Ludwig and many of its contemporaries) not leg movement. The teeth of the clutch are much smaller than the Dresden models. This greatly reduces the need for the fine tuning handle. They are also mounted on rotating plates, so that the sound is enhanced by the vibrations going back through the drum instead of being lost into the floor.¹²

¹¹James Holland *Percussion* MacDonald and Jane's, London 1978 pp. 21-25

¹²James Holland *Percussion* MacDonald and Jane's, London 1978 pp. 21-25



Hinger timpani

The next critical breakthrough in timpani sound was the invention of the plastic (Mylar) head (c1950). Mylar, a form of polyethylene terphthalate, does not change with the weather. It is a constant width and thickness. The sound is not as warm or full as calf skin, but the consistency and ease of care have helped to make it very popular.

There are many different types of timpani being manufactured today. They all owe something to the technology of the past. As always, the technology continues forward. Today's innovations include the replacement of grease with high-tech lubricants among other things. (This cuts down on creaks caused by dry, old oils or oils that attracted dirt.)

The advances of timpani have been great. Presently they are in a state of being refined to a high degree. Tuning has been refined to very small increments. Gauges are very accurate (mylar heads do not fluctuate in pitch). Tone produced, is very rich yet still very clear. And, articulation can be achieved through the endless amount of mallets now available. Timpanists will always be mechanics to some degree, because as improvements are made, new flaws (although smaller) appear. The repertoire is increasingly difficult and the quest for the perfect sound never ends. As always, there is still no substitute for an excellent player.

James Blades *Percussion Instruments and Their History* Faber and Faber , London @ Boston 1984

Edmund A. Bowles *Nineteenth-Century innovations in the Use and Construction of the Timpani* Percussionist , Official Publication of The Percussive Arts Society 1982 Vol 19 n2 pp 6-75

James Holland *Percussion* MacDonald and Jane's, London 1978

Gordon B. Peters *The drummer: Man* Kemper-Peters Publications, Wilmette, Illinois 1975

T. D. Rossing *Acoustics of Timpani* Percussionist , Official Publication of The Percussive Arts Society 1982 Vol 19 n3 pp. 18-31

G. H. Larrick *A Study of the Timpani Parts in Beethoven's Symphonies* NACWPI Journal 1985 Vol 33 n 1 pp. 12-29

G. H. Larrick *A Study of the Timpani Parts in Beethoven's Symphonies* NACWPI Journal 1985 Vol 33 n 3 pp. 4-19

G. H. Larrick *A Study of the Timpani Parts in Beethoven's Symphonies* NACWPI Journal 1985 Vol 33 n 4 pp. 13-22