A HISTORY OF THE BASS TUBA AND ITS USE IN THE SYMPHONY ORCHESTRA

THESIS

Presented to the Graduate Council of the North Texas State College in Partial Fulfillment of the Requirements

For the Degree of

MASTER OF MUSIC

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Andrews, Texas
August, 1950
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CHAPTER I

INTRODUCTION

The Problem and Purpose of the Study

Of all the various musical instruments used in the modern symphony orchestra, perhaps less is known and less is written concerning the bass tuba than any other. The writer has found that in most histories of musical instruments and books on orchestration, with few exceptions, the bass tuba is dismissed after a paragraph or two, whereas other instruments are given chapters and even volumes. Perhaps this is because the bass tuba is a relatively new instrument in the symphony orchestra; perhaps it is because there is more material available on other instruments; or perhaps it is because some authors do not consider the bass tuba as being an important instrument in the symphony orchestra. Ebenezer Prout says:

The student must not forget that the tuba is not a regular constituent of the orchestra, in the same way in which the trombones are. It will therefore be inexpedient for him to write a part for it in his scores, unless he is certain of being able to get it if his work is performed. Besides this it is very seldom indispensable and, with a little skill he will be able to get quite sufficient color and variety without it.¹

If the reason for devoting so small a space to the bass tuba is the latter, the writer does not feel that it is justified.

¹Ebenezer Prout, The Orchestra, I, 239.
In the opinion of many composers and authors there is a definite place in the symphony orchestra for that instrument. This is shown by the fact that many of the great composers include a part for the bass tuba in some of their scores.

This study has been prepared for the purpose of showing the development of the modern bass tuba through all stages, from its earliest ancestors to its present form. Also by the use of examples, it is hoped that the treatment of the instrument in selected orchestral works will show in some ways how it has and can be used.

Other instruments, that are occasionally referred to as tubas, will be mentioned only that certain parts may be clarified. This includes such instruments as the baritone, the tenor tuba, the Wagner tubas, and others. Instruments that have contributed only indirectly to the development of the bass tuba will be referred to also but will not be covered in detail.

Sources of Material

The material for this study was secured from the following sources: (1) music histories, (2) books on orchestration, (3) books on instrumentation, (4) books on instrument construction, (5) periodicals, and (6) instruction books for the bass tuba.
CHAPTER II

PREDECESSORS OF THE BASS TUBA

The Cornett

Many years and perhaps centuries before man attempted the manufacture of musical instruments of his own design, the horns and tusks of various animals were used for the purpose of making sounds and signals. These horns and tusks, conical in shape, were hollowed out to form an air passage. Both ends of the horn or tusk were open, the small end being shaped into a crude mouthpiece. Occasionally the instruments were fitted with a separate mouthpiece, usually made of ivory or bone. It is needless to say that the sounds produced by these instruments were very crude as were the instruments themselves. From this beginning one can trace the development of the lip-reed instruments.

Among the first wind instruments to appear in Europe was the cornetto or medieval cornett. It has been known in England since the late tenth or early eleventh century. It probably appeared in Europe in the fourteenth century. The cornett was known in Germany as the zink or ziken, in France

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1 Nicholas Bessaraboff, Ancient European Musical Instruments, p. 159.
as the *cornet a bouquin*, and in Italy as the *cornetto curvo* or the *cornetto muto*. The instrument was in the general shape of an animal horn and was usually made of wood, although occasionally ivory was used. The oldest existing specimens of the cornett appear to date from the sixteenth century and later. The cornett was made in two shapes, curved and straight. The straight was known as the mute cornett and the curved was known as the ordinary cornett. Of the two the curved or ordinary cornett survived for the longest period of time. This was probably due to the difficulty of playing the mute or straight cornett. Praetorius (1619) classifies the cornetts as follows:

(a) The curved *cornettino* or *klein discant Zink*, with a compass of two octaves from $a'$ to $a'''$.  
(b) The curved *cornetto curvo* or *Recht (gemeine) chor Zinck*, with a compass from $a$ to $a''$, and a possible extension one tone downwards or several tones upwards when in the hands of specially skilled players. This was the ordinary "black" cornett.  
(c) The straight *cornetto diritto* or *Gerader Zinck*, with a detachable mouthpiece, and a compass similar to (b).  
(d) The straight *cornetto muto* or *Still Zinck*, a similar instrument, but without a detachable mouthpiece; sometimes made a tone lower in $g$, and provided with a little-finger-key which carried the compass down to $f$.  
(e) The curved *cornetto torto*, *Cornon* or *Grosse tenor Zinck*, shaped like an $S$ with a compass from $d$ to $d''$, and an additional hole and open key for the little finger, extending the compass down to $c$.  

To make the cornett, an outline of the instrument was drawn on a piece of wood. The wood was then split and a conical half-bore was hollowed in each piece. When the bore was  

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completed, the two pieces of wood were placed together again and held with a type of glue. Usually the wood was covered with a piece of leather which was to add strength and beauty. Occasionally the end of the tube was protected by a band of silver or brass. The ordinary curved cornetts were about two feet long and had a bore of less than one-half inch at the small end which increased gradually to about one inch at the large end. This instrument had a range of about two octaves. The cornetts generally curved to the right-hand side slightly, but pairs that were made to match curved in opposite directions.4 After the instrument was shaped and put together, six finger holes were drilled in the upper side and one thumb hole in the bottom. The thumb hole was slightly above the upper finger hole. On the straight cornett there was an additional hole for the little finger.5 The fingering of the cornett was somewhat similar to that of the contemporary recorder. It gave a diatonic succession of tones that corresponded to the major scale. A good embouchure was required to adjust the intonation of the instruments. The lips had to either be compressed or relaxed as needed. "Intermediate semitones were produced by the usual forkfingerings, and there is little doubt that the cornett players of old used the half-opened

4Ibid., p. 265.
finger-holes in the same way as did the players on the woodwind instruments of the same period."\(^6\) Figure 1 shows the range of the ordinary cornett in A, given by Speer (1697).

\[\text{Fig. 1. -- Range of the cornett or zink in A, as given by Speer (1697).}\(^7\)

Often the cornett was fitted with a detachable mouthpiece. When this was the case the mouthpiece was usually made of ivory, horn, or wood. The mouthpiece was of the cup-shaped type that is used only on brass instruments.

There seems to be some disagreement among writers as to the tone quality of the cornett. H. W. Schwartz says: "Not only were they cheaply made, but they were noted for their poverty of musical qualities. Constructed of wood and covered with leather, their tone was colorless, coarse and windy."\(^8\) Jeffrey Pulver says: "Its tone, according to most contemporary writers was bright and pleasing when the instrument was well played."\(^9\) Vindung (1511) pays little attention

\(^6\)Carse, op. cit., p. 266.
\(^7\)Ibid., p. 337.
\(^8\)H. W. Schwartz, op. cit., p. 233.
to the instrument, but Artusi (1600), Praetorius (1619), and Mersenne (1636) all say favorable things about the instrument. Roger North (c. 1728) states that "it is seldom well sounded."

During the fifteenth and sixteenth centuries the cornett became the most popular wind instrument in Europe. It was heard in military bands and church choirs and was considered as being one of the most important wind instruments of that time. The cornett was used in some scores of Gluck, Handel, and Bach. Gabrieli, in his Church Symphonies, Cesti, Rossi, and Monteverdi, in their operas also used it to some degree. Almost always in these scores it was used as the treble instruments with a group of trombones. Near the end of the seventeenth century, the cornett began its decline and soon dropped from sight. Figure 2 shows an adaptation of cornett writing from Gabrieli's *Sonata Pian e Forte*. The original full score includes:

First choir: cornett (zink), two alto trombones, one tenor trombone.

Second choir: violin, two tenor trombones, one bass trombone.

Fig. 2.--Example of cornett writing. Gabrieli, *Sonata Pian e Forte*, measures 1-5.

10 Carse, *op. cit.*, p. 267. 11 Ibid.
Gluck's *Orfeo* (1762) seems to have been the last time the cornett appears in a score.12

The Serpent

Although a Canon of Auxerre named Edme Guillaume, is usually given credit for the invention of the serpent, in or about 1590, there is some doubt that this is true. Curt Sachs, in his *Real-Lexikon der Musikinstrumente* (1913), states that serpents existed in Italy prior to this date and he gives Guillaume only the honor of having introduced the serpent into France.13 Abbe Lebeuf's *Memoires Concernant l'Histoire Ecclesiastique et Civile d'Auxerre* (Paris, 1743) is the source of the statement that Canon Guillaume found how to make a large cornett in the shape of a serpent.14 Although there are instruments thought to be of Italian origin and said to have been made before 1590, there has been no definite date established on them. In any case the instrument seems to have been more popular in France than in other countries.

In the inventory of musical instruments kept at the Castle of Ambras in the Tyrol (1596), there is an entry of wind instruments called Schlangen ("serpents"), viz. a bass, two tenors, and two discants. These may be identical with Guillaume's so-called invention; on the other hand the cornets, especially those of lower pitch were sometimes ornamented with a snake's head as a bell.15

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13Bessaraboff, *op. cit.*, p. 163.
Mersenne (1636), gave the serpent credit for both strength and gentleness; Kircher (1650) confirms the fact that the real home of the serpent was France.\textsuperscript{16} In France and Belgium the instrument was used, throughout the eighteenth century, in the churches to support the voices in the Gregorian Chant.\textsuperscript{17} It was not until sometime during the eighteenth century that the serpent became established in Germany. In the early nineteenth century it became established in England. Near the close of the eighteenth century the serpent was placed in the military band.

The serpent was the true bass instrument of the cornett family, although there was a bass cornett in G that had a range of about two octaves.\textsuperscript{18} The serpent probably received its name from its grotesque shape, which resembles a squirming snake. This shape was probably the result of trying to make a bass cornett in a form that would reduce the instrument to a convenient size and also place the finger holes within reach of the player. In about 1540, which was fifty years before Guillaume was credited with the invention of the serpent, Afranio of Ferrana, Italy, invented the bassoon shape.\textsuperscript{19} It was not until two hundred years later that the serpent was changed to this shape.

\textsuperscript{16}Carse, \textit{op. cit.}, p. 268. \textsuperscript{17}Ibid. \textsuperscript{18}Galpin, \textit{op. cit.}, p. 224. \textsuperscript{19}Schwartz, \textit{op. cit.}, p. 234.
The serpent was usually made of wood, but occasionally metal, either brass or copper, was used. If straight, it was approximately eight feet long, but when curved it was compressed to about three feet. The tube proper makes three U-shaped bends, and has one final curl which ends without any extension of the bell. The tube which is usually wood has a conical bore which ranges from seven-sixteenths to one-half inch in diameter at the small end. The bore increases gradually to four or four and one-half inches at the large end. At the small end a bent brass "crook", a cup-shaped mouth-piece, usually ivory, was inserted.\(^2\)

The early serpents had six finger-holes which were in two groups of three. These holes were to be closed by the three middle fingers of each hand. The holes for the left-hand were just above the third U-bend, while those for the right-hand were on the fourth branch near the final curl.\(^2\) The finger holes were approximately one-half inches in diameter and were about one and three-fourths inches apart from center to center. Often the finger-holes on nineteenth century serpents were lined with ivory. The instrument was made in joints. Transverse sections of pieces of wood were hollowed out and then glued together. After all the joints were placed together the instrument was covered with leather.

\(^2\)Carce, *op. cit.*, p. 270.

Occasionally it was strengthened with metal bands. The walls of the instrument were about one-fourth of an inch thick.22

The serpent was held vertically in front of the player, with the lower end reaching slightly above his knees. To hold and finger the instrument: "The hands are passed through the convolutions to the front of the tube, away from the performer; the weight of the whole is supported on the upper edges of the two fore-fingers, and grasped by the two thumbs which are kept at the back of the instrument."23 When the serpent became an accepted member of the military band, it was evident that a more convenient and safer way of holding the instrument had to be developed. The bends of the tube were compressed and the lower end was held slightly to the right of the player so that the instrument did not interfere with his legs. The grip was eased somewhat by hanging the instrument from a strap around the player's neck; also the right hand was placed under the tube, which reversed the fingering for that hand.24

Mechanically the instrument was very imperfect and the player must have relied on his own dexterity and on the strength of his embouchure to a large degree. As an example of this imperfection the placing of the tone holes is given.

22Carse, op. cit., p. 270.


From the mouthpiece to the first finger hole was forty-four inches, but there was only about four inches between the next three; it was thirteen inches to the next group of three and from the last hole to the bell was thirty-one inches. Later keys were added to improve this imperfection.25

The fundamental note of the instrument is generally recognized as being C two octaves below middle C. Berlioz states: "The serpent is in B♭; consequently, it must be written for a whole tone above the real sound, like the ophicleide in B♭."26

Mahillon explained that the customary pitch used in French churches in the eighteenth century was a tone below normal, and that the notation was therefore a tone above real sounds. This probably explains why Berlioz and others state that the serpent is in B flat, meaning that it must be treated as a transposing instrument sounding a tone below the written notes.27

The earliest serpents had a range of approximately two octaves, but Berlioz shows the range to be about three octaves. Figure 3 shows the range of written notes and sounds of the instrument as given by Berlioz.

Fig. 3.—Range of written notes and sounds of the serpent.28

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26Hector Berlioz, *A Treatise on Modern Instrumentation and Orchestration*, translated by Mary Cowden Clark, p. 177.
Mersenne gives the serpent a range of seventeen diatonic notes from eight foot D upward and he intimates that the intervening chromatics may be obtained by half-stopping.\textsuperscript{29} Jeffrey Pulver states: "The range extended from just over two octaves (de Felice, \textit{Encyclopedie}, 1772) to four octaves (Lichtenthal, \textit{Dizionario della Musica}), but the latter referred, of course, to the late specimens of the instrument and quite exceptional performers."\textsuperscript{30} Figure 4 gives the range of the serpent. It is taken from an early nineteenth century French instruction book. It is for keyless serpent or \textit{serpent ordinaire}.

\begin{center}
\includegraphics[width=0.5\textwidth]{range_of_keyless_serpent.png}
\end{center}

\textbf{Fig. 4.--Range of the keyless serpent}\textsuperscript{31}

It seems the fingering differed according to the instrument and skill of the individual player. Also the compass differed with the player. "One French tutor carries the downward compass four semi-tones below the fundamental, the five lowest notes being produced with all finger-holes closed;"


\textsuperscript{30}Pulver, \textit{op. cit.}, pp. 52-53.

\textsuperscript{31}Carse, \textit{op. cit.}, p. 338.
others allow only two extra low notes, but all agree that no finger-hole was to be opened till the scale rose to the next degree above the fundamental."32

During the last part of the eighteenth century and the first part of the nineteenth century as the serpent was becoming increasingly important in the military bands, many efforts were made to improve the instrument. It was given additional keys and strengthened with brass. Usually three keys mounted in brass saddles were used. The keys usually added were a key for B natural on the front of the instrument, above the upper finger-hole, and controlled by the first finger of the left hand; a key for F sharp, located between the two sets of finger-holes and worked by the first finger of the right hand; the third key was for C sharp and D sharp and is located either on the front or the back of the instrument.33 If the serpent was a four-keyed instrument it usually had a separate key for C sharp and D sharp. Occasionally the instruments were equipped with seven keys and a few had from twelve to fourteen. King George III of England was partially responsible for these additional keys. He also directed that the serpent be held horizontally instead of vertically when used in military bands.34

A few serpents were made a fifth lower than the ordinary instrument and one was constructed which was an octave lower.

32Ibid., p. 272.  
33Ibid., pp. 272-273.  
34Galpin, op. cit., p. 225.
In 1828, a French instrument maker, Coeffet, made an **Uphimonocleide**, which was a type of serpent having only one key, yet producing a complete chromatic scale.35

The tone of the serpent is practically impossible to describe. It is believed that the tones of the open notes were quite pure, but it was without the metallic ring of the modern brass instruments.36 Berlioz says:

> The essentially barbarous quality of tone which distinguishes this instrument would have suited better the rites of the sanguinary Druidical worship than those of the Catholic religion; ... Exception must be made in favor of cases where the serpent is employed, in masses for the dead, to double the terrible plain-chant of the Dies Irae. Its frigid and abominable blaring doubtless then benefits the occasion.37

Berlioz also states that it does not mix well with the other instruments of the orchestra and that for the bass of a group of wind instruments the bass tuba and the ophicleide are preferable.38 Berlioz also notes that three tones, shown in Figure 5, are more powerful than others and players must strive to overcome this as much as possible.

![Fig. 5. Three most powerful notes on the serpent.39](image)

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36Carse, op. cit., p. 275.
37Berlioz, op. cit., p. 177.
38Ibid.
39Ibid., p. 176.
In his book, *The Present State of Music in France and Italy* (1771), Burney says that he often mistook the serpent's tone for that of the organ.  

Figure 6 is an example from Mendelssohn's *St. Paul* (1836) in which he includes a part for the serpent. He also

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used it in his *Meeresstille und Gluckliche Fahrt* (1832). Several other composers of note included the serpent in some of their scores. In his *March in D for Military Band* (c. 1816), Beethoven found a place for the serpent, as well as did Wagner in *Rienzi* (1842). Handel also scored for the instrument in his *Water Music* (1715), and his *Fireworks Music* (1749).

The serpent had an active life of about three hundred years. It had a tone and technique of its own which cannot be duplicated today. A person hearing the serpent today would be amazed to learn that at one time the instrument was used to make music. Nevertheless it served as a definite link in the development of bass wind instruments.

The Bass-Horn and Russian Bassoon

In 1780 or thereabouts, according to Gerber's *Lexikon* (1792), an Italian musician named Regibo, who was then in Lille, France, designed a serpent in the shape of a bassoon. In a later edition of the *Lexikon* (1812), it was said that in 1800, a French musician, Alexander Frichot, then living in London, designed a metal serpent similar in shape to Regibo's instrument. His design was carried out by J. Astor, a London instrument maker. Frichot named his instrument "bass-horn." During the first half of the nineteenth century, many straightened serpents appeared in France, Germany, England, and Belgium. All of these instruments are generally considered

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41 Carse, *op. cit.* , p. 277.
as being bass-horns. The probable object of adopting the bassoon shape for the serpent was to make it stronger, more compact, and more suited for use in military bands. Although the bass-horn was a definite improvement over the serpent, it was used largely in military bands. The serpent continued to be used until both it and the bass-horn were replaced by the ophicleide.

During the period that bass-horns were in use, there were numerous models and their proportions of metal and wood varied. If metal was used in the construction of the instrument, it was usually brass.

Although there was never any standard design for the instruments, they may be roughly divided into two groups or types: the "English bass-horns," and the "Russian bassoons." The English bass-horn was made of two straight tubes emerging in a narrow V-shape from a small butt. The Russian bassoon was made of two parallel tubes which were either partially or wholly bored in the same piece of wood. The instruments used in England were usually metal and of the V-shaped type, while those used on the Continent were wood and of the bassoon type. The bore of both the instruments was conical, and both ended with a wide bell. Generally the bass-horns retained the finger-holes of the serpent. The two groups of finger-holes were on the more narrow of the two tubes. Most of the instruments were provided with additional keys, usually three.

42 Ibid. 43 Ibid., p. 278. 44 Ibid.
or four, but on some of the most advanced instruments, every note hole was controlled by a key. Generally the Russian bassoons have a regular bassoon-butt from which emerges a bell-joint and wing joint. Some of the others are not jointed and vary in several ways. Although the career of these instruments was short, there were a surprising number of designs and shapes. Many of the instruments were designed so that the bells looked like fantastic serpents’ heads. Probably the best of all these models was Streitwolf’s Chromatisches Basshorn (1820). It has a much better bore and ten keys that made it possible to play with the same ease in all tonalities.

Like the serpents, the bass-horns and Russian bassoons were generally made in C two octaves below middle C, although some were in B flat, some in low E or F and some in D or E flat. Generally the bore was not as wide as that of the serpent. The fingering for the bass-horn was the same as for the serpent and the keys were the same as those on the three and four keyed serpents, although they might be operated by different fingers.

There seems to be more information regarding Frichot’s instrument than there is regarding Regibo’s. By 1806, Frichot was settled in France and he presented his instrument in Paris having renamed it basse-cor, but it was patented

45Ibid.

46Curt Sachs, The History of Musical Instruments, p. 422.
(French patent No. 404, December, 1810) under the name basse-trompette.47

Choron, in 1813, gave some astounding particulars about Frichot's instrument, which by then seems to have been renamed Tromba. This all-metal bass-horn had six finger-holes and four keys, and was credited with a compass of four and a half octaves, fully chromatic, from A to d'''. It could be used as a bass, a tenor, an alto or a treble instrument, and could combine all the advantages of a serpent, a trombone, a horn and a trumpet in its wonderful self. Choron, however, explains that no one player could be expected to cover all of that extended compass, and that for the low register a serpent mouthpiece, for the middle register a trumpet mouthpiece must be used.48

As to the tone, the bass-horn and Russian bassoon both seemed to resemble the serpent. The open notes were the purest and most resonant. Berlioz has the following to say of the Russian bassoon:

It's a low instrument of the serpent kind. Its timbre has nothing very characteristic, its sounds lack steadiness and consequently precision in tune; and, in my opinion, it might be withdrawn from the family of wind instruments without the smallest injury to Art.49

Forsyth says:

The intonation was imperfect, and the tone quality may be judged from the fact that when the Ophicleide came in the Bass-Horn went out. . . . No tear has been shed over the disappearance of the Fagotto a la Russe.50

The tone was powerful but dull and penetrating.51 Berlioz gives the general range of the instrument as shown in Figure 7.

47Carse, op. cit., p. 280. 48Ibid.
49Berlioz, op. cit., p. 177.
50Cecil Forsyth, Orchestration, p. 176.
51Richard Hofmann, Practical Instrumentation, translated by Robin H. Legge, IV, 52.
Berlioz states that some instruments, though they are exceptional, go down to C and up to high D, as shown in Figure 8.

As compared to the serpent the bass-horn had a relatively short career in musical circles. When the superior ophicleide came into being, both the serpent and the bass-horn were forced into retirement. During this short life, the bass-horn and Russian bassoon were confined almost entirely to the military band. Rarely was it allowed in the church or the orchestra. One notable exception to this is Sphore’s 9th Symphony which includes a part for bass-horn.

The Ophicleide

The ophicleide was invented in 1817 by Jean-Hilaire Astée, known as Halary, a brass instrument maker of Paris. In that year he submitted a group of conical, keyed brass instruments.

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52 Berlioz, op. cit. 53 Ibid.
to the French Académie des Beaux-Arts. In 1821, the instruments were patented (French patent No. 1849, March, 1821). According to Carse, the group consisted of the following:

(a) **Clavilube.**—Keyed bugles in high F or E flat, also in 4 feet C or B flat, made in trumpet-form.

(b) **Quinticlave.**—Alto ophicleides in 6 feet F or E flat, made in bassoon-form.

(c) **Ophicleide.**—Bass ophicleides in 8 feet C or B flat, also contrabass in F, made in bassoon-form.

The clavilubes had already been patented in 1811, by M. Dumas. The quinticlave or alto ophicleide lasted only until it was replaced by the valved tenor horns. But the bass ophicleide was almost immediately successful. It found its place in both military bands and orchestras. Before the middle of the century, it gave way to the tubas in Germany, but in England, France, and Italy, it lasted into the third quarter of the century.

As did the bass-horns and Russian bassoons, the ophicleide began to appear in many sizes and shapes. Almost all of them were made of metal, but a few wooden specimens exist. Eventually there were six or seven types of the instrument. There were basses in B, B flat, and C, contrabasses in E flat and F, and there were the alto ophicleides in F and E flat.

The ophicleides were superior to the serpents and bass-horns. It was possible to make the note-holes larger because

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55Ibid.  
they were covered with keys instead of by the fingers. Because of this, the size of the holes was adequate for the wide bore that was typical of the ophicleide; also the holes could be spaced more evenly along the tube.

The ophicleide has a wide bore which is conical throughout. At the narrow end the hole is about seven-sixteenths of an inch wide, and the tube widens until it comes to the bell which measures from seven and one-half to nine and one-half inches across. The mouthpiece is metal and fits into a narrow detachable coil that is inserted into the narrow end of the down-tube. The coil can be adjusted for tuning. The down-tube and the up-tube are joined by a U-butt or bend at the bottom. The two tubes are about one-half inch apart and parallel.57

The early ophicleides had nine note-holes. Six of the keys were on the wide tube and three were on the narrow tube. The mechanism devised to work the keys was fixed so that it came together in two groups, one for each hand. The right hand which operated the lower group, controlled four keys. The little finger of the left hand was not used. All the note-holes except the largest, which was about a foot from the bell, were covered by closed keys. When this one key was closed it lowered the harmonic series of the instrument one semitone. If the instrument is in C, it would give about eight open notes based on the fundamental, (eight feet C) when no key was

57Carse, op. cit., p. 287.
touched, but when the large key was closed, the ophicleide gave a harmonic series based on B, a semitone lower. ⁵⁸ There was a key on the back of the instrument for each thumb. The nine-keyed instrument gave a series of ten fundamentals in chromatic succession. F sharp and G sharp were not included, however, these could be produced by playing a semitone higher and closing the large open key. On the later instruments, twelve fundamentals could be sounded.

The following shows the series of harmonics or open notes which, with their fundamentals, gave the instrument a complete chromatic scale covering a compass of just over three octaves (the seventh note of the harmonic series is not included; it is out of tune with the scale and, moreover, is quite unnecessary):

No keys, seven open notes of the series on C.
First key closed, seven open notes of the series on B.
Second key opened, six open notes of the series on C sharp.
Second and third keys opened, six open notes of the series on D sharp.
Fifth key opened, two open notes of the series on E.
Fifth and sixth keys opened, two open notes of the series on F.
F sharp key and sixth key opened, one note (fundamental) F sharp.
Seventh key opened, one note (fundamental) G.
G sharp key and seventh key opened, one note (fundamental) G sharp.
 Eighth key opened, one note (fundamental) A.
Ninth key opened, one note (fundamental) B flat. ⁵⁹

There were alternate fingerings for some of the notes, particularly those in the upper register. Differences in some fingering charts suggest that fingerings of some notes varied with the player and with the instrument. ⁶⁰

As stated before, most of the ophicleides were made of metal, but a few were made of wood. When the instruments were

made of metal, sheet brass was used. The joints were strengthened by stays and sleeves. The ophicleide was a rather fragile instrument, it was easily crushed. The keys and their mechanism were easily damaged. The mouthpiece was usually of brass but occasionally ivory was used. It was about one inch or slightly more across the cup, which was either conical or slightly cupped. Caussinus in his *Méthode*, recommends that two-thirds should be placed on the upper lip and one-third on the lower lip.\(^61\)

The alto ophicleides, which are in F and in E flat, have a range of three octaves and one note. They are written for the treble clef. Berlioz gives the following (Figure 9) as the range of the written notes and the actual sounds of the alto ophicleides in F and in E flat:

![Figure 9](image)

*Fig. 9.—Ranges of the alto ophicleides in F and E flat.*\(^62\)

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\(^{61}\)Ibid., p. 291.  \(^{62}\)Berlioz, *op. cit.*, p. 175.
The bass ophicleides were usually in the keys of C or B flat, but a few were in A flat. Their parts were written in the bass clef. Figure 10 gives the written notes and actual sounds for the bass ophicleides in B flat and in A flat.

![Fig. 10. Ranges of the bass ophicleides in B flat and A flat.](image)

The double-bass ophicleides were in the keys of F and E flat, a fifth below the bass ophicleides in E and in B flat, and an octave below the alto ophicleides in F and in E flat. Figure 11 gives the written notes and the actual sounds for the double-bass ophicleides in F and in E flat:

![Fig. 11. Ranges of the double-bass ophicleides in F and E flat.](image)

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63 Ibid.

64 Berlioz, op. cit., p. 175.
The ophicleide had a very powerful and resonant tone, much more resonant than that of the serpent. Possibly one reason for this was that the ophicleide was usually made of metal, whereas the serpent was usually made of wood. Figure 12 is an example of the ophicleide part in Mendelssohn's overture to *A Midsummer Night's Dream*.

![Allegro di molto](image)

Fig. 12. -- Example of the ophicleide part from Mendelssohn's overture to *A Midsummer Night's Dream*, measures 62-66.

Wagner scored for the ophicleide in the overture to *Rienzi*. Figure 13 is a section of the ophicleide part taken from that work.

![Allegro energico](image)

Fig. 13. -- Example of the ophicleide part from the overture to Wagner's *Rienzi*, measures 1-4.

Meyerbeer in his *Les Huguenots* also scored for the ophicleide. Figure 14 is taken from that work.

![Andante](image)

Fig. 14. -- Example of the ophicleide part in Meyerbeer's *Les Huguenots*.

65 Hofmann, op. cit., p. 53.

Verdi scored for the ophicleide in several of his works including his Requiem Mass. Figure 15 is from the "Sanctus" of this work.

Fig. 15.--Verdi, Requiem Mass, "Sanctus," measures 33-37.

When Berlioz wrote Damnation of Faust, in the section known as the "Hungarian March," he scored for both the ophicleide and the tuba. Figure 16 is an example of the two instruments playing in unison.

Fig. 16.--Berlioz, Damnation of Faust, "Hungarian March," measures 127-129.

During its life, the ophicleide was used by many composers, but when the piston valve was invented in 1815, the doom of the instrument was sealed, although it still held its place in the orchestra until the latter part of the century. Probably the last time the ophicleide was included in a score was in Klose's symphonic poem, Das Leben ein Traum (1869).
CHAPTER III

THE BASS TUBA

The invention of the valve probably influenced the construction of the bass tuba more than any other single factor. There seems to be some dissension as to who actually invented the valve and in what year it was invented. Curt Sachs states that it was invented about 1815 by Bluhmel in Silesia and Heinrich Stolzel in Berlin.¹ Adam Carse who quotes Wilhelm Wieprecht (1802-1872), who knew both Bluhmel and Stolzel personally, says the valve was invented in 1816 or 1817. Also according to Carse, it has never been accurately ascertained whether Bluhmel or Stolzel actually invented the valve.² Ulric Daubeny says that in about 1813, Bluhmel invented the valve and sold it to Stolzel. He also gives Bluhmel credit for inventing the rotary valve in 1827.³ Actually it may never be known exactly who invented the valve and when, but there is little doubt that it was either Bluhmel or Stolzel.

The first indication that a valved instrument in the bass tuba register existed, appeared in 1828 in a price list published by Stolzel in Berlin. This list included a

¹Sachs, op. cit., p. 426.
³Ulric Daubeny, Orchestral Wind Instruments, p. 17.
"Chromatisches Basshorn oder Basstrompete in F oder Es." 4

Nothing else is known about the instrument. The first time that the instrument appears under the name "bass tuba," is in 1835. That year Wilhelm Wieprecht, supervisor of music in the Prussian army, suggested, and Johann G. Moritz, a Berlin music instrument maker, constructed a bass tuba. 5 The instrument was quite different from the bass tuba as we know it today. It was in the key of F and had five valves, two operated by the left hand and three, by the right hand. The valves lowered the open notes of the instrument as follows:

1st valve--one tone.
2nd valve--one semitone.
3rd valve--two tones when combined with the first valve.
4th valve--one and a half tones when combined with the first valve.
5th valve--a perfect fifth. 6

Not long after Wieprecht and Moritz constructed their first bass tuba, they devised a new instrument that had either three or four valves. This instrument was given the name "bombardon." In 1842, Adolphe Sax, who had patented his saxophones in 1840, produced a family of instruments known as saxhorns. 7 The lowest of these instruments was in E-flat and was named saxhorn contrebasse. It was one tone lower than the Wieprecht-Moritz tuba. The Wieprecht-Moritz tuba was

4Carse, op. cit., p. 303.
5Sachs, op. cit., pp. 429-430.
6Carse, op. cit.
7Schwartz, op. cit., p. 239.
adopted by German army bands and the saxhorn was adopted by the French army. After that, the bass tubas became important in the band and began to take the place of the keyed ophicleide in the orchestra, although the bass tubas were called ophicleides several years after their invention.\(^8\) According to Curt Sachs:

The contrabass tuba (called BBb bass in bands) is tuned to the lower fourth of the bass tuba. Its pitch is \(\text{C}\) in orchestras, and \(\text{B}\) in bands; the harmonic fifth is \(\text{C} - \text{G}\), the range \(\text{F}\), to \(\text{C}'\) (or a tone lower): a fourth valve advances the lower limit by a major third. It was invented ten years after the bass tuba (the first model of which had an additional valve that threw the instrument into contrabass \(\text{C}\)) by V. F. Cerveny, a noted Bohemian maker of brass wind instruments.\(^9\)

From 1835 to 1850, instrument makers in Germany, Prussia, Austria and France, produced a number of different types of bass and contra-bass tubas. Usually these instruments were either in \(\text{E-flat}\) or \(\text{F}\) and they had from three to six valves. At first, the valves were all of the piston type, but a little later these gave way in Germany and Austria to the rotary valve where they have been standard up until the present time. The French instrument makers continued to use the piston type valve.\(^{10}\) Except on the French horn, the piston valve has been standard in France, England and America up to the present time. A few bass tubas with rotary valves are now being constructed in these countries.

\(^8\)Carse, op. cit., pp. 303-304.

\(^9\)Sachs, op. cit., p. 430.

\(^{10}\)Carse, op. cit., p. 304.
Soon after 1850 Adolphe Sax introduced his new pistons indépendants to the E flat contrabasses of his saxhorn group; this system required six shortening-valves, each of which could only be used separately. In spite of the theoretical perfection of this system, the idea was never generally favoured.\textsuperscript{11}

On tubas made during the second half of the nineteenth century, the arrangement and purpose of the valves varied with different players and instrument makers. If the instrument was the three-valve type, the valves added the following tones: first valve, one tone; second valve, one-half tone; third valve, one and one-half tones. If a fourth valve was added, it was sufficient to lower the pitch a perfect fourth. If a fifth or sixth valve was added, it might be to lower the pitch a perfect fifth, or it might be used to compensate for intonation when the other valves were used in combination. On some of the instruments, the third valve added tube length that gave a major third instead of the usual minor third. Generally the valves were used to carry the scale down to or below the fundamental, or to compensate for intonation or transposition.\textsuperscript{12}

During most of the nineteenth century, the bombardon and the bass tuba were considered as being different instruments. Berlioz gives each one of them a separate paragraph. Figure 17 gives the compass of the bombardon in F, and bass tuba in E-flat as given by Berlioz:

\textsuperscript{11}\textit{Ibid.}
\textsuperscript{12}\textit{Ibid.}, p. 305.
Some writers still make a distinction between the bass tuba and the contrabass tuba. In reality there is little difference between the two. Naturally the contrabass tuba is a larger instrument and has a larger bore. The number of valves on each of the instruments are usually three or four, which has almost become standard. There is very little difference in the range of the instruments. The bass tuba can play a few notes higher than the contrabass tuba, while the latter can play a few notes lower than the bass tuba.

Bessaraboff goes so far as to break the tubas down into four groups:

<table>
<thead>
<tr>
<th>Bass</th>
<th>Bass Tuba in F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bass Tuba in E-flat</td>
<td>Contrabass Tuba in BB-flat</td>
</tr>
<tr>
<td>Sub-bass</td>
<td>Sub-bass Tuba in EE-flat</td>
</tr>
<tr>
<td>Sub-contrabass</td>
<td>Sub-contrabass Tuba in CC</td>
</tr>
<tr>
<td></td>
<td>Sub-contrabass Tuba in BBB-flat</td>
</tr>
</tbody>
</table>

The earliest contrabass tubas in C or B-flat appeared about 1845. Since that time the B-flat (sometimes known as the BB-flat) tubas, usually with three valves, have occupied

13Berlioz, op. cit., p. 176.
an important place in the band and have been used in some symphony orchestras. Larger instruments have been made. Probably the first of these was Sax's saxhorn bourdon which was in EE-flat, an octave below the E-flat bombardon. Carse says that the limit of usefulness is reached with the BB-flat bombardon because the human ear will not distinguish sounds produced at a slow rate.15

The upright form of the tuba and the helicon, a circular instrument carried over the players shoulder, was probably invented in Russia. The helicon shape was imitated by Ignaz Stowasser of Vienna, in 1849.16 In the United States, the helicons have a movable bell and are called sousaphones. In 1898, C. G. Conn built the first sousaphone for John Philip Sousa. This instrument was a type of helicon with the bell opening upwards. It was not until 1908 that the bell-front sousaphones were used.17

Wagner caused a great deal of confusion among both composers and authors when he misnamed a family of instruments Tuben, since only one of the instruments was a true tuba. Actually these instruments were modified horns.18 The instruments were designed to contrast and support the trumpets and trombones and were to have a range of about four octaves.

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17Schwartz, op. cit., p. 250.
18Forsyth, op. cit., p. 151.
Wagner's idea was to write eight horn parts and to arrange the parts for his new tubas so that four of his horn players could play them. The bore of these instruments was larger than that of the horn but much smaller than that of the true tuba. They had four valves, the fourth being to compensate for intonation in the lower octave. The instruments were arranged in two pairs; a small pair in B-flat and a large pair in F. Figure 19 shows the range of these instruments in actual sounds.

The instruments were originally built in the shape of horns, but those used now resemble the saxhorns. The instruments still retain their small tubing and the funnel-shaped mouthpiece of the horn.

19 Ibid. 20 Ibid. 21 Ibid. 22 Ibid.
The tone of these instruments is unlike that of the true tubas. Its tone was different from the true horns but was somewhat kin to them. These instruments are now known as tenor-tubas.

Wagner introduced one true bass tuba into his orchestra. It was a large instrument which he called kontrabass-tuba. It had four valves and a large cup mouthpiece. The instrument was built in C.23

The range of the bass tubas commonly used today varies somewhat. The ranges of the E flat, F, C, and BB-flat tubas are shown in figure 20.

Fig. 20.—Range of E flat, F, C, and BB-flat tubas.

23Ibid., p. 152.
CHAPTER IV
THE USE OF THE BASS TUBA IN THE SYMPHONY ORCHESTRA

The type of bass tuba used in the symphony orchestra depends generally, upon two factors: the composition being played and the individual tuba player. The compass of the tuba part in the composition must be taken into consideration as well as the individual player's technique and his ability on the different instruments. Generally, the bass tuba in F is considered as being the best all-around instrument for use in the symphony orchestra. At the present time, most orchestral tuba players use this instrument, but the CC bass tuba is becoming popular in this country because of its tonal qualities. Often orchestral tuba players own two or more instruments. Usually one of these instruments is a bass tuba in F while the others will probably be either in E-flat, BB-flat or CC. With more than one instrument to select from, the player can choose the one best suited to the composition to be played. He knows that compositions having high bass tuba parts are more easily played on the F or E-flat instrument, while those having extremely low parts are more easily played on the BB-flat or CC instruments.

Today, very few composers make a distinction between the contrabass tuba and the bass tuba when they are scoring a part.
for the tuba. Usually the part is merely noted "Bass Tuba." They seem to leave the matter of choosing the proper instrument to the player or to the conductor. When the bass tuba was first brought into use in the orchestra, some composers, such as Wagner, specified either "Bass Tuba" or "Contrabass Tuba."

Two of the earliest appearances of the bass tuba in orchestral work are an overture by Otto Bach (1858) and Wallace's opera, Loves Triumph (1862). It is interesting to note that while Berlioz originally scored a part for the ophicleide in his Symphonie Fantastique (1829), in 1850, as he was preparing a copy for a German edition, he added a footnote that authorized the use of the bass tuba in place of the ophicleide. It may be noted also, that Meyerbeer (1791-1864), who died only five years before Berlioz (1803-1869), never used the bass tuba but included a part for the ophicleide in many of his works.

Probably the two greatest early exponents of the bass tuba were Wagner and Berlioz. Wagner used the ophicleide for the last time in Rienzi (1842). From that time on, he used the bass tuba or the contrabass tuba. This bass tuba that Wagner used must not be confused with the so called Wagner-tubas which were instruments of his own design and were in reality not true tubas.

2Ibid.
It is interesting to note the different ways various composers have employed the bass tuba in some of their compositions. Franz Liszt (1811-1886), who was a contemporary of Berlioz and Wagner, did not use the bass tuba as freely as did those two composers. In his symphonic poem Les Preludes, he uses the tuba almost entirely to double the third trombone part either in unison or in octaves. In only five measures of the composition where the bass tuba is scored for, does it have an independent part. Figure 21 shows a section of the score in which the bass tuba plays in unison and octaves with the third trombone.

![Musical notation](image)

Fig. 21--Liszt, Les Preludes, measures 35-39

Shown in Figure 22 is the only section of the composition in which the tuba does not play the same part as the third trombone.
Mussorgsky (1839-1881), in his fantasy, Night on the Bare Mountain, arranged by Rimsky-Korsakov, uses the bass tuba much in the same way as did Liszt in Les Preludes. In only fourteen measures of Night on the Bare Mountain, in which the third trombone and the bass tuba are playing at the same time, do the parts vary. Figure 23 shows a section of the score in which the third trombone and bass tuba play in unison or octaves.

Fig. 22.—Liszt, Les Preludes, measures 131-136

Fig. 23.—Mussorgsky, Night on the Bare Mountain, measures 210-218.
These two composers use of the bass tuba in conjunction with the third trombone was effective for the results each wished. The result was the reinforcement of the other brass and occasionally the contrabass and bassoon.

Jean Sibelius (1865- ), in his composition Finlandia, Opus 26, No. 7, scores for the bass tuba more than he does the trombones. In Finlandia, which is 214 measures long, he uses the first and second trombones in eighty-one measures, the third trombone in seventy-nine measures, and the bass tuba in 137 measures. In some passages in this work, the bass tuba is the only brass instrument, with the exception of the horns, playing. Figure 24 is an example of the bass tuba and the woodwinds in combination.

![Musical score](image)

**Fig. 24.**—Sibelius, Finlandia, measures 57-61
Guiseppe Verdi (1813-1901), the Italian opera composer, used both the bass tuba and the ophicleide. Although he and Wagner (1813-1883), were contemporary composers, Verdi used the ophicleide long after Wagner had changed completely to the tuba. Verdi in his overture to *La Forza del Destino* (1862) includes a part for *cimbasso* or bass tuba, but twelve years later in his *Messa da Requiem* (1874), he includes a part for the ophicleide but not for the bass tuba. Figure 25 is a passage in which the bass tuba has the same part as the bassoon and contrabass.

![Fig. 25.--Verdi, La Forza del Destino, measures 80-83.](image)

Today the bass tuba almost always plays the ophicleide part. Figure 26 is a part written originally for the ophicleide but which is now played by the bass tuba.
Berlioz, in the "Hungarian March" from Damnation of Faust, scores for both bass tuba and ophicleide. With the exception of four measures, the two instruments play in unison, and in the measures they are not playing in unison, they are playing in octaves. Figure 27 is a unison passage from this work.

Fig. 26.--Verdi, Messa da Requiem, "Dies Irae," measures 21-39.

Fig. 27.--Berlioz, "Hungarian March" from Damnation of Faust, measures 96-102.
Figure 28 is an example of the only time the bass tuba and ophicleide do not play in unison, with the exception of the final chord.

Bedrich Smetana (1824-1884), in his symphonic poem Vltava, uses the bass tuba very effectively in the section known as "St. John's Rapids." In the brass section a rhythmic figure begins with the bass tuba and the third trombone in octaves. It is then taken up by the second trombone and then the first trombone as shown in Figure 29.
In Wagner's *Das Rheingold* there are several examples showing the contrabass tuba used with the contrabass trombone and the four Wagner-tubas. Figure 30 shows this combination in use.

![Musical notation](image)

Figure 30.--Wagner, *Das Rheingold*, scene two, measures 1-4.

Figure 31 is an example of Wagner's use of the bass tuba in the overture to *The Flying Dutchman*. In this example the tuba and the contrabass play the same tones.
Since Wagner and Berlioz, Richard Strauss (1864-1949) has probably used the bass tuba as effectively as any other composer. Strauss was undoubtedly one of the greatest masters of orchestration of all time. He used almost all of the instruments, especially the brass, in many effective ways. Often these ways had never been tried before. Some of Strauss's parts for the bass tuba are among the most difficult ever written for the instrument. The rhythmic patterns in some instances are as difficult for the bass tuba as for any other instrument. Figure 32 is an example of a rhythmic pattern in Strauss's *Don Quixote*, opus 35.

**Fig. 31.**—Wagner, *The Flying Dutchman* overture, measures 121-132.

**Fig. 32.**—Strauss, *Don Quixote*, measures 33-38
Often the bass tuba is used as a solo instrument or in conjunction with other instruments to form a solo passage. Figure 33 is an example of a bass tuba part taken from Strauss' symphonic poem, *Death and Transfiguration*, opus 24.

![Musical notation image]

*Fig. 33.*--Strauss, *Death and Transfiguration*, measures 96-109.

Figure 34 is taken from Strauss' *Don Juan*, opus 20. In this example, the bass tuba plays in unison and octaves with the contra-bassoon, second trombone, violoncello, and contra-bass.

![Musical notation image]

*Fig. 34.*--Strauss, *Don Juan*, measures 354-361
Although a suitable mute has not been developed for the bass tuba, several composers, including Strauss, have written parts for muted bass tuba. Figure 35 shows a part written for muted bass tuba.

Fig. 35.—Strauss, Don Quixote, measures 92-97

In several of his major works, Strauss scored parts for two bass tubas. Two of these works are Also sprach Zarathustra, opus 30 and Eine Alpensinfonie, opus 64. Figure 36 is an example from Also sprach Zarathustra.

Fig. 36.—Strauss, Also sprach Zarathustra, measures 158-163.

The manner in which the parts for two bass tubas is scored varies. In some instances the parts are in unison or in
octaves. Occasionally the parts are completely different as shown in Figure 37.

![Musical notation](image)

Fig. 37.--Strauss, *Also sprach Zarathustra*, measures 311-317.

Anton Bruckner (1824-1896) used the bass or contrabass tuba in many of his works. In his *Symphony No. 7*, he uses the tube extensively. It is interesting to note that in the first and third movements he refers to the instrument as bass tuba, while in the second and fourth movements he refers to what is probably the same instrument as contrabass tuba. In the second and fourth movements, Bruckner includes parts for two tenor *tuben* in B-flat and two bass *tuben* in F (Wagner-tubas). It is evident that in the first and third movements when Bruckner refers to the instrument as bass tuba, he does not mean bass *tuben* in F because the part is written in the concert key and the range of the part is lower than the bass *tuben* in F can play. Figure 38 is an example of the bass tuba part in the first movement.
Fig. 83.—Bruckner, Symphony No. 7, first movement, measures 243-248.

Figure 39 is an example showing Bruckner's use of the contrabass tuba with the two B-flat tenor tuben and the two bass tuben in F.

Fig. 39.—Bruckner, Symphony No. 7, second movement, measures 1-4.

Igor Stravinsky (1882- ) has used the bass tuba in several of his better known compositions including The Firebird, Petrouchke, and The Rite of Spring. His scoring for the bass tube in these works does not seem to be unusual except that in the Rite of Spring, he uses two bass tubas as well as two tenor tubas in B-flat. Figure 40 is an example of the two bass tubas being used together.
Figure 40.—Stravinsky, *The Rite of Spring*, "The Games of the Rival Tribes," measures 1-3.

Figure 41 is an example of Stravinsky's use of the two tenor tubas in B flat and the two bass tubas in combination.

The manner in which the bass tuba is used will vary with the individual composer. In each individual composition the composer must take into consideration the effect he desires when writing a part for the bass tuba. In order to learn
more about the use of the bass tuba in the symphony orchestra, one must study the compositions of many composers.
CHAPTER V

CONCLUSION

In conclusion it must be said that the information in the preceding pages is by no means complete. Likewise, the music discussed comprises only a small part of the bass tuba repertoire. However, most of the works discussed and used in the examples are important ones, and in the limited space allowed, were analyzed for their inclusion of some important factors in the development of the bass tuba and its use in the symphony orchestra.

The discussion has shown that the bass tuba is a relatively new instrument in musical circles, as compared to most of the other instruments. It also shows that, with the exception of Wagner, Richard Strauss and a few other composers, the true capabilities of the instrument have not been exploited. The bass tuba can be a very effective instrument when it is used correctly and it can be a very ineffective instrument when it is used incorrectly. If such masters of orchestration as Wagner and Strauss can use the bass tuba to such good effect, as shown in many of their works, then that instrument does have a definite place in the symphony orchestra. The manner in which these two composers scored for the bass tuba proves that it does not have to be relegated
to the role of a supporting instrument, and being used in tutti passages only.

It is evident also that there should be a standardization of the term bass tuba. When a person speaks of the trumpet or the trombone, no one is confused as to what instrument he is referring to, but when one says bass tuba he may be referring to any one of a number of instruments. He may mean the Wagner-bass tuba, which is in F; he may mean the contrabass tuba; or he may mean the bass tuba. It is especially confusing when a composer refers to the instrument as bass tuba in one section of a work and in another section of the work he refers to what is probably the same instrument as contrabass tuba. It would be a matter of little difficulty to standardize the term so that no confusion would result.
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