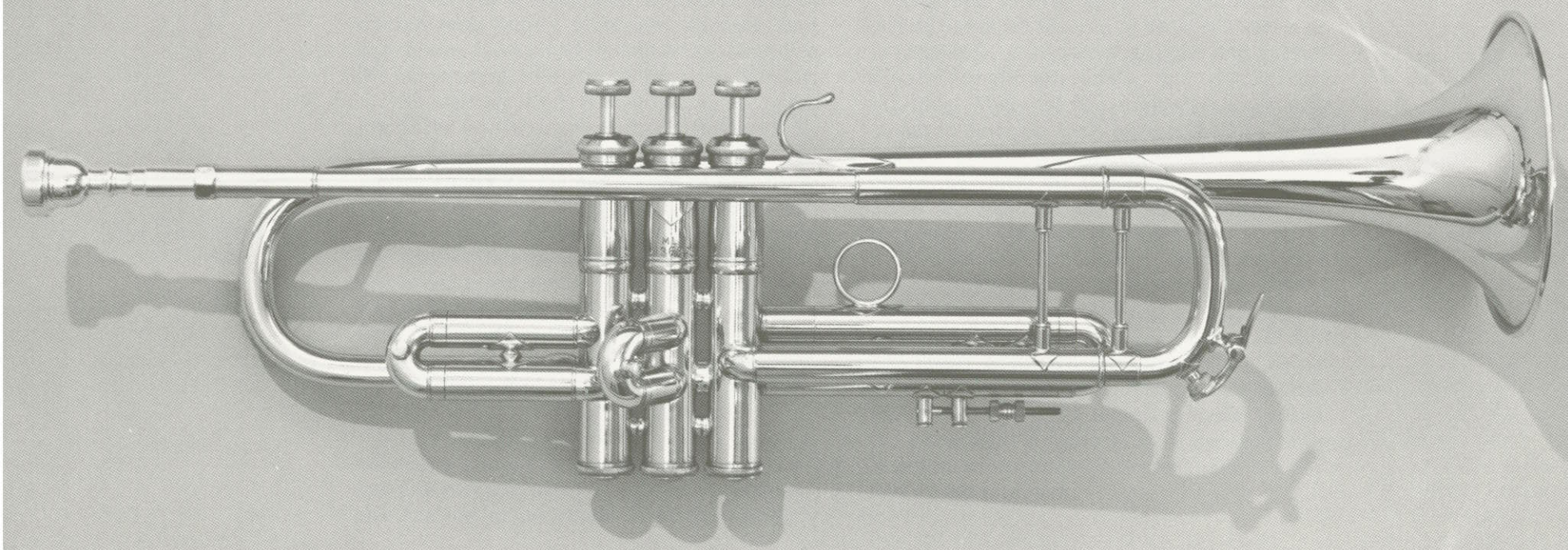
The Art of Trumpet Playing

by Vincent Bach



INTRODUCTION

This booklet became a standard reference source, so widely used that he revised and reprinted the original booklet at intervals, and was at work on another edition when he sold his manufacturing business to Selmer. His first assignment as a consultant to Selmer was to design new Bundy trumpets, cornets, and trombones. His second project was to complete his revision of *The Art of Trumpet Playing.*

Although Mr. Bach is best known today for his brass instruments and mouthpieces, he speaks with the additional authority of a symphony trumpeter. He has served as first trumpet of The Boston Symphony Orchestra, The Diaghilev Ballet Orchestra, and The Metropolitan Opera. This dual background made him, before his retirement, one of the most popular American clinicians. At nearly every clinic his audiences were especially interested in those aspects of instrument design that affected playing technique, and in the significant details to look for in brass instrument designs.

The notes he prepared for these lectures contained a great deal of information that no one else had published, if only because no one else had the unique combination of virtuosity, professional playing experience, and theoretical knowledge of instrument making that Mr. Bach had. Some of this same information is incorporated in this new edition of *The Art of Trumpet Playing.*

Although Vincent Bach first published *The Art of Trumpet Playing in 1916,* his views on instruments, instrument design, and performance remain interesting, and occasionally startling. Many of his suggestions are now common, because they have proved to be effective. Others are still unorthodox. For example, he views the trombone as an anachronism, already obsolete when it entered the orchestra in the time of Beethoven.

On a number of recent occasions, Mr. Bach has remarked that a certain familiar theory in brass instrument making or playing was wrong. When reminded that he himself had previously advanced the same theory, he replies simply that he has since changed his mind. And there the argument ends. Indeed, for nearly half a century, most arguments on brass instruments have ended with a statement from Mr. Bach.

THE ART OF TRUMPET PLAYING

The Genealogy of the Trumpet

The trumpet derived its name from the Latin word *triumphare*. Similar instruments were known and used in the most ancient times, but they were horns in actuality, made from the horns of animals and not from metal. The small end of the horn was opened and rounded in a cup-like manner, thus enabling our forefathers to produce uncertain sounds used for signals.

Many centuries before the Christian era, metal horns were in use. In classical Rome the most common of these was the *lituus*, the J-shaped cavalry bugle of the Roman legions. Numerous relics have been recovered. A trumpet built in snail form was much in use in the Roman armies and in the amphitheatres. Roman literature frequently mentions instruments called tubas, describing them as long straight tubes ending in conical bells and made from wood or metal.

Little information is available on the subject of trumpet development during the Middle Ages but Italian paintings of the 15th Century show angels using trumpets of a zigzag form, and therefore we judge that such instruments were in use previous to 1400.

After the 14th Century more frequent mention of instruments begins to appear in contemporaneous writings. In that century it seems that circular trumpets similar to our French horn were well known in Italy and France. During the 16th Century many forward steps were taken in trumpet development in Germany and among other instruments we find mentioned the *feldtrummet, clareta* and *thuermer horn*. The *feldtrummet,* (natural trumpet) used in military circles, was a low pitched instrument, while the *clareta,* predecessor of the more familiar *clarino,* was built in high pitch. The *thuermer horn* was a brilliant-toned instrument used by night watchmen on battle towers and fortified walls surrounding the cities, for signaling the approach of enemies or reporting fires. The *trummet* or *trommet* was one of the first wind instruments used for musical performances. It was built in low C, field music pitch (high pitch), but if used in concert music (for which the *kammertone* or *orgeltone,* a full tone lower, was used) that same instrument was called a *trummet* in D.

Another horn, identified as the *jaeger trummet,* was proportioned similarly to the *thuermer horn* and used by huntsmen. Smaller models of the *jaeger trummet* were called post horns and drivers of stage coaches were equipped with them to signal their approach and departure by merry blasts. The post horn is enjoying a revival among trumpet soloists, particularly in our service bands.

The trumpet is one of the oldest instruments used as an accompaniment or lead for singing. As early as 1607 overtures were written for five trumpets. Each of the five had a different pitch, the highest being the *clarino,* then the *quinto, alto, basso,* and the *vulgano basso,* the lowest voice. Of these the *clarino* achieved considerable prominence. It was a high pitched instrument used frequently in churches and for concert music.

During the 18th Century composers wrote many unusually effective parts for the trumpet. Many of the compositions of Johann Sebastian Bach are so difficult that we can hardly comprehend how trumpeters were able to perform them on the instruments of their time. Some of these instruments are still in existence and attempts to duplicate their feats only increase our wonder at the extraordinary strength and energy required to play such parts as the *Second Brandenburg Concerto.*

The greatest trumpet virtuoso of this most brilliant period was Gottfried Raiche (1667-1734), who performed J. S. Bach's music with astonishing skill. These compositions are a source of concern among present-day artists, even with the advantage of modern sopranino and piccolo trumpets and superior mouthpieces. In Raiche's time chamber pitch was a half tone lower than today, and he did not have to practice finger technique or transposition, but concentrated entirely on developing an embouchure. Still, he died at the age of 67 after overstraining himself during a performance of a Bach cantata: *"Preise Dein Glueck, Gesegnetes Sachsen."*

The difference between the *feldtrummet* and the *clarino* was solely in the pitch, as the register of the instruments was the same. The notes played on the *feldtrummet* were as follows:

Of these notes, the B♭ and F were too flat and the A was too sharp. The natural trumpets

were usually built in D (concert pitch) but musical development made it necessary that the instruments be adaptable for any kind of musical performance and during the 16th Century alternate crooks enabled the player to change the pitch of his instrument to C, B, B♭, A, G, F, E, and E♭. The performer had the several crooks hanging on his music stand and attached them to his instrument as the music necessitated.

Modern composers continue to follow the old custom of writing trumpet parts in varying keys and the trumpeter encounters parts written in C, D and other keys. In symphonic work especially, this forces him to have a perfect knowledge of transposition. It is true that modern trumpeters use the B♭ trumpet generally and the C trumpet considerably in symphony orchestras, but often they are required to use a soprano D trumpet, a contralto F trumpet or a high E♭ soprano or F or G sopranino in order to obtain the quality of tone characteristic of those instruments. Many composers seem to consult their own convenience in writing, taking it for granted that the symphony musician is well routined in transposition.

Before the invention of valves in the early 19th Century, it was only possible to play the open tones on trumpets. As the trumpets were built in low D concert, an octave lower than today's D trumpet, it was possible to play the entire diatonic scale above the middle C (now designated high C). It was not possible, however, to play the chromatic scale. At that time there were three divisions of trumpets in general use. In the first division were three high-pitched trumpets playing in A, G and G♭; four medium pitched instruments in F, E, E♭, and D; and five low pitched trumpets built in D♭, C, B, B♭ and A. The latter two groups were pitched one octave lower than the corresponding valve trumpets of later times. But they were used in the upper range, and so sounded much like the more modern instruments.

In 1753 a horn player, A. J. Hampel of the Royal Orchestra in Dresden, conceived the idea of inserting alternate crooks in the middle of the instrument. By this addition the pitch of the instrument could be affected. This instrument was called *das inventionshorn* and a trumpet with similar possibilities was called *die inventionstrompete*. Mr. Hampel also discovered that he could lower the entire register of the instrument a half tone by putting his hand in the bell. This greatly increased the possibilities of the instrument, but had the decided disadvantage that it changed the timbre along with the pitch.

During the 17th Century a trumpet called *tromba di tirarsi* (trumpet to pull out) was invented. This instrument, somewhat similar to our present-day trombone, was frequently used in the compositions of Johann Sebastian Bach.

In 1760 Koelbel, a Bohemian musician of the Imperial Russian Orchestra, attached to his trumpet a key somewhat similar to a clarinet key, by use of which he could raise the entire register of his instrument one-half tone.

In 1801, Weidinger, trumpeter in the Imperial Court Orchestra in Vienna, improved this invention by putting five keys on his instrument. These enabled him to play the entire chromatic scale. The tone quality of his trumpets was far from perfect.

The rotary valve, which enabled trumpeters to produce a satisfactory chromatic scale for the first time, was conceived by Friedrich Bluehmel of Pless, Upper Silesia, in 1813. In 1839 Perinet of Paris invented the so-called piston valve. Since that time numerous valve systems have been invented and tested, but rotary and piston valves are the only two which have survived and are in general use today.

Rotary valves are used in Germany, Austria, Russia and Italy while the Perinet valves are used in most English speaking countries and in France, and appear to be gaining favor over rotary valves in the other countries as well.

Each style of valve has its advantages. Piston valves allow a clearer technical performance, but they do require great agility of the fingers and must be pressed down correctly. Any side pressure will cause friction between the piston and the cylinder and delay the valve action. The piston valve is not as positive as the rotary valve, so long as the latter is in perfect condition.

Instrument Design—Science and Art

The term "technology" represents the theoretical knowledge of manufacturers—the application of both science and art. Brass instrument making must be considered primarily an art and, to a lesser degree, a science. Most research has been confined to instruments with cylindrical tubes, such as organ fluepipes, flutes, and similar instruments, because the source of their sound may be duplicated by mechanical means. The source of sound of brass instruments—the human embouchure—depends on the lip texture, the cavity of the mouth, teeth formation, the physical condition and the correct training of the performer. These cannot be reliably replaced by mechanical or electronic devices. Devices for sounding brass instruments can not become a reliable basis for defining the actual amount of effort a player uses to play in tune, to compen-

sate for deficiencies of intonation, and to produce a certain volume of tone.

Moreover, no two players will obtain from an instrument exactly the same timbre, the same intonation or pitch (I differentiate between intonation and pitch). The question therefore arises: What *does* control the intonation? Does the instrument control the frequency of the vibrations of the lip — in other words the intonation of each tone — or do the lips of the player control the intonation of the instrument? The answer is: the control is mutual.

Acoustics of Brass Instruments

The control of intonation by the instrument depends upon the length of the tubing attached to the mouthpiece, and on the mouthpiece itself.

The theoretical length of a brass instrument is approximately the wave length of a single vibration of the fundamental tone — the pedal C on a trumpet (Pedal B♭ concert on a trombone, baritone, tuba). To determine the wave length, divide the velocity of sound by its frequency. Example: A B♭ trumpet tuned to A-440 double vibrations will have a tempered middle C (B♭ concert) of 466.2 double vibrations or 932.4 single vibrations. The pedal C, being two octaves lower, will have one fourth as many — 116.55 double vibrations or 233.1 single vibrations. For our purpose, the velocity of sound is the rate at which the sound travels through air at 70° Fahrenheit. This is approximately 340 meters per second. If the speed is divided by the number of single vibrations of fundamental C (B♭ concert): 340:233.1 = 1.4586 meters wave length. One meter = 39.379 inches. Thus the theoretical straight length of the instrument is 57.425082 inches.

The actual length of a trumpet is a bit less than the above theoretical length. There are several reasons for this. Because of the bell taper the maximum vibration is slightly outside of the bell opening. Thus an instrument with a larger bell bore, such as a flugelhorn, built in exactly the same straight length as a trumpet, will be flatter in pitch. A deep mouthpiece cup or a large cup diameter will both tend to lower the pitch. A player's embouchure may also tend to pull down the tone. To compensate for these factors, the instrument will have to be shorter than the theoretical half wave length of the fundamental tone.

But how much shorter? Since it is not possible to design an instrument strictly by calculations, the touch of practical experience has to be added.

The Physics and Aesthetics of Musical Tone

A musical tone is a composite, consisting of the prime or fundamental tone, which determines the pitch of the sound as a whole; overtones with frequencies of exact multiples of the vibration of the fundamental tone, called harmonics; non-multiples, or inharmonic overtones; and non-periodic vibrations classified as noise. This combination of the fundamental tone and the various partials does not remain static for the duration of the tone: not only does the loudness change continually, but also the pitch.

To obtain a clear tone and a good response from a brass instrument, it is important to have the fundamental tone predominate and to include certain harmonics which determine the timbre and brilliance of tone. We have to reduce the inharmonics, which have the tendency to distract from the response of the fundamental tone. If these inharmonics are too strong the response becomes insecure and the tone nasal. The worst of these are called wolf tones; they do not respond at all, causing the player to crack them. Both the inharmonic partials and the non-periodic vibrations cause the tone to be nasal or foggy. The harmonics support the vibrations of the fundamental component, thereby improving the resonance of tone.

Apart from these basic requirements, what constitutes a good tone? There is quite a difference between what the Germans, French, English, and Americans call a good trumpet or trombone tone.

German symphony musicians prefer a large, martial, heroic trumpet tone in which the fundamental component predominates — rather dark in color but of tremendous volume. That kind of tone is generally called "Teutonic" by symphony conductors. The German trumpeter uses a smaller bore cornet just for solo playing or coloratura work, but does not really like its tone very well.

The French, however, prefer a very brilliant C trumpet tone and believe that the cornet tone should be more mellow. In their symphony orchestras trombones, and even bass trombones, sound very bright to our American trained ears. This tone contains more intense high harmonics.

The trumpets used in England were in former years even smaller than the French trumpets. Today English B♭ trumpets are of slightly larger bell bore than the French but not as large as our American instruments. English symphony orchestras use trombones and bass trombones not much larger than the French, the latter generally pitched in G.

We in America have trumpets of a bell bore not quite as large as the old German trumpets,

but considerably larger than the French and English instruments. American trumpets give a rich tone which our leading symphony conductors accept as Teutonic. American symphony trombones are approximately the size of the German trombones but differently proportioned, so with the same bell diameter we can produce much more volume of tone. In the past, we had in our symphony orchestras a conglomeration of the finest instrumentalists of Germany, France, Austria, Italy, and Russia. Their taste has merged into what we can justly call the American tone quality for brass instruments.

Intonation in Brass Instruments

Among the instruments used in orchestra and band, only the string family or the trombone can play in perfect tune — providing the string player avoids using the open strings, or a trombone player avoids using the first position open tones.

Some instruments have relatively fixed intonation — the piano, organ, glockenspiel, etc. The intonation of other instruments can be "humored" only to a limited extent. Every instrumentalist eventually learns this. Highly trained instrumentalists also know that discrepancies in the musical scale multiply the deficiencies of their instruments. For example, in a different key, the "same" tone may have a different number of vibrations. Concert A played in the scale of C may tune to exactly 440 vibrations, while that same tone in the scale of D should have 445 vibrations.

An orchestra tuned to A-440 will, therefore, play in tune only in the scale of C; the open A strings are already out of tune in the key of D. This is why string players avoid the open strings on certain sustained tones, where the discrepancies are obvious. The brass instrumentalist usually knows how to humor those tones which are only a few vibrations off, but his difficulties are amplified because his instrument has only three valves.

Design Problems in Three-Valve Instruments

While it is possible to design the bore of a B♭ trumpet so that the open tones are well in tune, the fifth harmonic (middle E) is always inclined to be a little flat, while the sixth harmonic (upper G) is inclined to be a little sharp. Pressing down the second piston causes the air column to pass through enough additional tubing so that each open tone is lowered half a tone. Pressing down the first piston increases the total length of the instrument so that each open tone will be lowered one full tone. Pressing down the third valve will lower all open tones one and a half tones — a minor third.

Theoretically, this should give equally good intonation on tones played with any one valve pressed down, provided the slides are cut to the right length for the B♭ trumpet. However, if the player presses the second piston down, he would in effect be using an A trumpet, and the first slide should be about an eighth of an inch longer for A trumpet than for B♭ trumpet. The combination of first and second valves thus produces a tone a little too sharp.

The third valve lowers the pitch of the open tones a minor third, playing the harmonics of a G trumpet. If the player presses down this and the first valve (for playing the low D or the low G), that first slide should be more than five-eighths of an inch longer than it is on a B♭ trumpet. Since it *isn't* longer, the low D and G will be considerably sharp. Combining all three valves makes the first slide more than three-quarters of an inch too short; the low C♯ and low F♯ will be badly out of tune.

Of course, a mobile first or third slide may be extended to compensate for these variations in slide length. The manufacturer can further help by making each valve slide a fraction too long. This will give the player a better average scale, leaving the rest of the necessary adjustment to the player's good ear and embouchure.

Theoretically, an instrument with six valves — one for each valve combination — would be expected to avoid these problems altogether. However, the bell of the B♭ trumpet has a bore so proportioned that the open tones in B♭ are well in tune. For an A trumpet, a G trumpet or an F trumpet (first and third pistons combined) that bell would not be well in tune because the lower the pitch, the larger the bell should be, just as the sounding board of a viola must be larger than that of a violin. Lowering the pitch by loosening the strings or pressing the valves isn't enough. So each of the six valves should also have a separate bell. If the second piston is pressed down, the bell should be for A trumpet; if the first piston is pressed down, for A♭ trumpet; if the first and third pistons are pressed down together, or a separate piston substituted, the bell should be an F trumpet bell.

It is obvious that an instrument with so many valves and so many bells would be impractical. And worse yet, an instrument with so many bells of different bores would have a very uneven timbre. So we come back to the most practical compromise — the modern trumpet with three valve slides and one bell, on which the performer is expected to adjust intonation by making use of the mobile third or first slide and his embouchure.

The mouthpiece, if properly designed, will

help one to play a good instrument well in tune. A poor mouthpiece can cause serious intonation difficulties by contracting the octaves — making a given tone too low in comparison with the tone one octave lower. This is particularly noticeable in the middle and high B-naturals and it will aggravate the sharpness of the low C♯ and D, the low F♯ and G.

The French horn player not only shares many of the difficulties mentioned in connection with B♭ trumpets (as well as baritones, basses and other valve instruments) but if he has a double horn, he also is trying to use one bell for two instruments a fourth apart — one in F, the other in B♭! While he can help himself adjust the intonation by manipulating the bell opening with his right hand, he cannot easily overcome the deficiencies of certain tones, commonly called "wolf tones." He must try to improve these with different fingerings or use the instrument in a different pitch (changing from F to B♭ or vice versa).

While trombone players can at least get by with their regular B♭ trombones and the French horn players with their double horns, a trumpet player, by the time he joins a modern symphony orchestra, should have at his disposal a B♭ trumpet, a C trumpet, a D trumpet and perhaps an E♭ or F trumpet for J. S. Bach. Only with such an array of instruments at hand is he prepared for any musical score.

The Changing Pitch of Instruments

The brass player faces problems in pitch as well as intonation. American band instrument manufacturers build their instruments to the pitch of A-440 double vibrations. This is called the American Philharmonic pitch, and it is the official pitch of the American Federation of Musicians. Official but not necessarily actual!

Players will do well to tune individually to a tuning bar or electronic tuner, and to judge by the beats how many vibrations they are off from this standard pitch.

Most symphony orchestras today are playing at A-442 or 443. Players are always inclined to tune a little sharper than the oboe to which they are listening. Since an oboe is a brilliant instrument with strong overtones in the upper register, that instrument will always give the sensation of a sharpness in pitch, and the rest of the orchestra or band will be tempted to tune sharp to match.

Symphony orchestras don't mind playing from one to three vibrations sharper than the American Philharmonic pitch, because they like brilliancy.

This preference is a particular disadvantage to singers. Since the pitch in the time of Haydn, Mozart or Bach was more than a half-tone lower than today (about A-423), singers strain to sing in our modern philharmonic pitch of A-440. If the orchestra is tuned sharper than 440, singing becomes still more difficult, if not at times impossible.

During the year 1859, a convention of French musicians and physicists recommended the so-called normal pitch (diapason normal of A-435 vibrations at 59° Fahrenheit. At 68° Fahrenheit this same standard became A-439 vibrations. This rise in pitch is characteristic of flue organ pipes, which at that time were used as standards; the rise is smaller in wind instruments. At 72° Fahrenheit that pitch would be A-440, the American Philharmonic pitch.

In 1896 English scientists also adopted this French normal pitch of A-435 vibrations at 59°. Today, of course, we do not tune to wood organ pipes, which are so susceptible to changes of pitch if exposed to changes in temperature. We use either a tuning bar or electronic instruments and we say the American Philharmonic pitch is A-440 vibrations, usually without bothering to mention temperature. In today's circumstances, this is the only practical pitch.

Characteristics of Trumpets and Cornets

There are no arbitrary laws regarding the construction of cornets and trumpets, and various manufacturers use different proportions for these two instruments.

The trumpet's main tubing is curled but once and offers little frictional resistance to the air passage. This gives the instrument an open, clear, penetrating tone of the heroic quality needed in symphony, opera and other kinds of orchestral performances. The correct inside bore of a modern B♭ trumpet consists of about half straight and half conical tubing. This allows a good sized column of air to produce a tone of great volume and carrying power.

The *cornet a piston* differs from the trumpet in that its bore is conical over a greater part of its length. The cornet tubing starts with a smaller mouthpiece receiver than the trumpet, and its conical bore through the mouthpipe has less taper. The cornet is usually bent in two curls and consequently is shorter than the trumpet. This double curl, combined with the smaller conical mouthpipe, offers more resistance and a larger bell causes the tone to be more mellow and flexible.

Trumpet vs. Cornet

The trumpet tone is not so flexible as that of a cornet and it is more difficult to slur from one note to another — which is of good advan-

tage when playing a fortissimo attack. The cornet, with the more conical bore and two windings, produces greater resistance. This allows a better diction, causes the tone to be more flexible, and makes it possible for the player to slur from one note to the other more easily. It is, therefore, better suited to coloratura work. By the same token, however, one can more easily slip off a note, and the cornet is not well suited to fanfare or staccato playing.

"Is the cornet easier to play than the trumpet?" "Which of the two instruments has the larger volume of tone? — which is more brilliant than the other?" These questions can only be answered alternatively. A small bore will produce a more brilliant tone than a large bore. If you compare a small bore cornet with a large bore trumpet, the trumpet will have a more mellow tone, and vice versa. Instruments made by different manufacturers have different bell tapers, and so you cannot draw general conclusions by comparing a cornet of one make with a trumpet of another make. When talking about easy playing, you also have to answer the question: What is easy — the staccato, or the legato, or the dynamics? And remember that neither instrument will produce anything that you don't blow into it!

Since the accepted standard of a cornet calls for a mellow, dark timbre, a large bore instrument with a large bell should be given preference. The rich, singing voice combined with easy response and flexibility places the cornet in the first rank as a solo instrument, especially for coloratura work. This is why it is often used in concert band in preference to trumpet.

I receive occasional inquiries about short model cornets that are supposed to produce a mellow tone like the old-fashioned European instruments.

Whether the instrument is long or short does not in any way alter the timbre. Such European cornets sound more mellow because their players used deep mouthpieces with "V" shaped cups. Unfortunately most young players are more eager to produce brilliant high tones than a beautiful tone throughout, and for that reason they select the shallow mouthpieces.

The B♭ flugelhorn, well represented in European bands, has been sadly neglected in America. It is an important instrument, needed to complete the mellow brass choir (B♭ flugelhorn, E♭ alto horn, B♭ euphonium and large bore tuba) of a well-instrumented concert band. Some symphony scores specify the B♭ flugelhorn.

Aspects of Trumpet Design

A good trumpet should be fairly heavy, not only for the purpose of making it durable, but also to respond properly and produce a sufficient volume of tone (which depends a great deal on the thickness and quality of the metal).

A light instrument that responds easily when playing piano or mezzo-forte, may rattle and vibrate excessively when playing *fff* in a large symphony orchestra. The instrument will not take all you can put into it and your volume will be more limited than when using a heavier instrument. It warms up quickly, and tends to go sharper in pitch. A medium-heavy instrument will have a more compact tone, which — in musician's language — will not spread so much.

Trumpets are built in various bores. The usual descriptive terms, small, medium, and large, are misleading if the corresponding micrometer measurements are not furnished with them. A trumpet with an inside bore between .453″ and .462″ is usually best for general professional use. When such an instrument is properly proportioned its volume of tone is great enough for any large orchestra work. Trumpets with smaller bores may not fill all the requirements of the professional artist. However, they respond more easily and of course take less effort. This is why somewhat smaller instruments are commonly built for students or small dance orchestras.

A B♭ trumpet requires a bell taper of certain proportions to have the open tones in tune and to encourage optimum response. If you pull the tuning slide of the instrument to A, it will be playable, but only an instrument with a correctly proportioned A trumpet bell will produce the best playing results. While a half tone change of pitch will not affect playing qualities drastically, a full tone will. Playing a C trumpet in the pitch of B♭ or a D trumpet in the pitch of C is unsatisfactory. Tone quality, response and volume will all suffer. The conscientious artist must therefore possess instruments in various keys if he expects to fulfill his duties in a modern symphony orchestra.

Does gold or silver plating harm an instrument? When the sun shines on a clean window pane a part of the light is reflected, the rest entering the room through the glass. It is similar with sound; when a brass instrument is played, it transmits its vibrations to the atmosphere not only through the opening of the bell but also through the walls and outer surface of the tubing and the bell. Sound waves are partly transmitted and partly reflected by this bell. The plating alters the amount of reflection and increases the thickness of the metal.

The velocity of sound is not the same through every medium. For instance, through air the sound travels 340 meters (about 1100

feet) per second, through copper or brass 3558 meters (about ten times as fast as through the air), through silver 3285 meters, and through gold 1744 meters. Since there is not a great deal of difference between the velocity of sound through brass and through silver, silver-plating does not affect the vibrations as much as gold plating.

A trumpet in plain brass will always give a more brilliant, freer tone of somewhat metallic timbre, while a plated instrument will sound more mellow and slightly heavier according to the thickness of the plating. The gold or silver with which instruments are plated is not sufficiently thick to discourage the player from using a plated instrument. Meanwhile, plating greatly increases the durability of the instrument. For my own use, I always preferred a burnished silver-plated instrument.

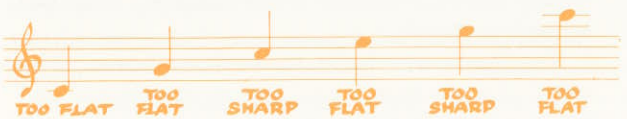
The Legend of Changing Intonation

A brass instrument cannot be forced out of tune. The tuning of the open tones depends entirely on the proportions of the bore. If a player discovers that his instrument "becomes" badly out of tune, he either didn't know that the instrument was always out of tune or it is clogged up inside. The latter condition will considerably affect the tuning. A thorough cleansing will restore the instrument to its original playing qualities. The idea, not uncommon among musicians, that "the instrument was blown out of tune" is ridiculous. Nor is it possible to blow *into* tune an instrument which was poorly constructed. Some players have claimed that they did correct faulty tuning by persistently forcing the correct tones into the instrument; however, they only acquired the habit of forcing certain notes up or down with their embouchure, until it became natural to play that particular instrument in tune.

The unfortunate result of such forcing is that the player, accustomed to humoring certain tones excessively, will invariably force the same tones *out* of tune on a well designed instrument. Of course, these habits can be broken with practice; but meanwhile, it is impossible to judge a new instrument. The schooled player with a normal embouchure should be able to pass a reliable judgment after a trial of approximately five or ten days.

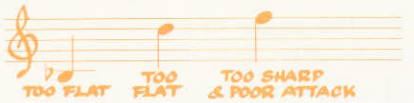
How to Test A New Trumpet

Be sure to examine every slide to see if it fits tightly, as a leaking slide will greatly interfere with response and intonation. Also be sure that the valves are airtight. This can be tested in the following manner: pull a valve slide part way out, push it back in, then press the corresponding piston down and listen for a "blip" sound. If you hear a "blip" sound, then you have good compression. If you fail to get a "blip," you have poor compression, or none at all. After examining the various slides and pistons, pull out all three valve slides. When each piston is pressed down the portholes of the pistons must be perfectly lined up with the holes in the casings (they are not supposed to line up when the pistons are up). Replace the slides and try the open tones. The following notes are frequently out of tune on trumpets and cornets:



If you are convinced that these tones are well in tune, then 90% of the battle is won.

Next, try the first valve tones. The most common defects on the first valve tones are as follows:

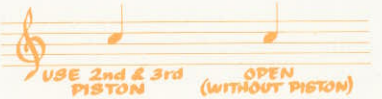


Try the second piston

On most instruments this is too flat.

The third piston is seldom used by itself except to facilitate rapid technical passages, because the notes produced are invariably flat and of poor quality. For testing purposes it is of minor importance unless used in combination with the first or second valve.

Try the middle C



Compare the tuning of this note on the open horn will the same note using the second and third valves.

Next try the E

Compare its tuning as played open, and with the first and second valves.

Then try the G, both with the first and third valves, and open

If the open tones and the tones made by the above valve combinations can be played in tune, then the entire scale of the instrument is as well tempered and as nearly perfect as human hands and brains can build it.

The octaves do not fully correspond, as this is practically an impossibility. To illustrate this to yourself, pull out the third slide about 1/2″; the octaves will be in tune, but other notes will be out of tune.

Some players complain that the middle C♯ and D of a B♭ or C trumpet are too flat, compared with the corresponding lower octave, even on better grade instruments. There are three reasons for that.

1. The human ear does not hear octaves perfectly in tune, the higher tone usually sounds slightly flat. For this reason some of our great pianists of the past, like Paderewski, Hofmann, and others, always wanted the octaves on their pianos "stretched" — the upper tone one or more beats sharp. To have a mathematically perfect octave you have to check your tuning with an electronic stroboscope or Magna-Tuner.
2. Since the higher octaves may also sound slightly flat — on account of insufficient strength of the player's lip muscles — the player may use alternate fingering for these two high tones.

   Middle C♯ should be fingered with the first and second pistons down, the high C♯ with the second. Middle D should be fingered with the first piston down. The high D should be played open.
3. If the octaves in the entire register are contracted, then the mouthpiece is clogged or improperly made.

Make sure that the inside bore of the mouthpiece and mouthpipe are perfectly clean; any accumulation in the bore would seriously disturb the intonation.

Volume and carrying power can only be tested adequately in band or orchestra over a period of a few days.

The Mouthpiece

Not all musicians realize the value of a properly constructed mouthpiece. An instrument is often condemned for faults that lie solely in the mouthpiece being used. Even on a high grade instrument satisfactory results cannot possibly be obtained with an inferior mouthpiece, while on the other hand a perfect mouthpiece will permit surprisingly good results even on a second grade instrument.

A mouthpiece consists of the rim, cup, throat and backbore (which is surrounded by the shank). All of these affect performance.

The best width for a trumpet mouthpiece is 3/16″; the face of the rim should be a flat curve, declining toward the outside; the edge on the inside must be sharp but somewhat lower to prevent cutting of the lip; the outer edge should not be too rounded. A pronounced outer edge will offer a firm grip. Musicians with heavy, soft lips should use broader rims to prevent digging into the flesh. Performers with small, muscular lips should use a medium rim (3/16″ for trumpet, 9/64″ for horn, 13/64″ for alto, 1/4″ for trombone or baritone and 9/32″ for tuba).

A mouthpiece with too narrow a rim cuts off the blood circulation in the lip and paralyzes it. On the other hand, a rim too broad may feel comfortable but will prevent free movement of the lip muscles, handicapping flexibility and hastening fatigue. It is advisable not to go to extremes in either direction but to use a medium rim.

The size of a mouthpiece is always measured by the cup diameter at the inner edge. A large mouthpiece produces a large tone of great volume and carrying power and unless too large, gives more endurance, better lip control and greater flexibility than a small one. Therefore a player should always select the largest mouthpiece he can comfortably play upon, with a cup diameter of at least 21/32″ for trumpet, 11/16″ for horn, 49/64″ for alto, 1″ for trombone and baritone and 1-9/32″ for tuba.

A very deep cup produces a mellow, round tone, less brilliant and without the necessary penetrating qualities to cut through the rest of the brass section in an orchestra. It will also tire the user more quickly and may make the high register more difficult to play. A deep cup slightly flattens the high register of a brass instrument. A cup too shallow produces a brilliant tone of a rather shrill quality far from

beautiful. It may temporarily facilitate playing in the high register, but after a short period of playing will cause the lips to swell, the muscles to relax, and the lips to protrude more or less into the mouthpiece cup; the lips do not have sufficient room to vibrate in such shallow cups and tire quickly. It is true that for a C trumpet it is nceessary to use a shallower cup than for a B♭ instrument. For a D trumpet a yet more shallow cup is used. In other words, the higher the pitch of a brass instrument, the more shallow the cup of the mouthpiece. A shallow cup sharpens the high register and is one of the tuning problems to be solved by the individual performer when he finds it necessary to use instruments of a different pitch.

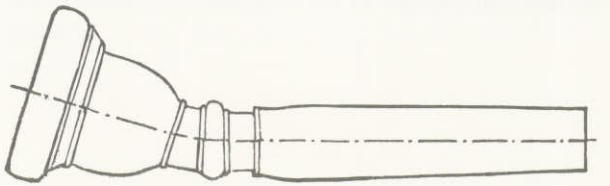
A mouthpiece throat too large will reduce air resistance, tend to draw the lips into the cup and so induce quick fatigue. It will make the pianissimo more difficult, but will help produce a larger volume of tone. A throat too small chokes the tone and causes the instrument to play out of tune. Therefore a medium bore throat of no less than .140″ diameter for trumpet, .180″ for horn and alto, .232″ for trombone and baritone, .328″ for tuba (i.e., approximately 1/5 of the cup diameter in all instances), is recommended for all-round work.

The back bore must be proportioned correctly to the cup and the throat. A too large back bore does not give a better tone, for while it makes the tone more mellow it also sacrifices the center of tone, and hardly improves intonation. The proper shape of the back bore must be left to the judgment of the manufacturer.

In changing to a new mouthpiece, the player is bound to feel a certain reaction in his lips. A new mouthpiece usually plays fine for the first day and if it is shaped differently from the old mouthpiece affects other lip muscles than those ordinarily used. The strain on the unaccustomed muscles will not be noticeable during the first few hours of playing but the effect will be felt the next day. The aching muscles will not respond properly and consequently the new mouthpiece will not respond quite as well on the day following as on the first trial; however, if the player persists and avoids the old mouthpiece, he will overcome the reaction and after one or two weeks will feel perfectly comfortable with the new mouthpiece.

Changing mouthpieces frequently will irritate the lip muscles to such an extent that no mouthpiece will be satisfactory. Try several medium large mouthpieces which feel comfortable on your lip, choose the largest you can manage, and keep on using it. The lips will gradually become accustomed to it and will shape themselves according to the rim. The writer does not approve of using mouthpieces with irregular shaped rims. It is impossible to place such a mouthpiece in exactly the same position on the lips each time and the result is approximately the same as a constant change of mouthpieces.

There is no reason for seeking an irregular mouthpiece because of the formation of the teeth. The performer does not play with his teeth but with his lips, and to have the mouthpiece lie well on the lips depends principally on how the lower jaw is held. If a player has *overbite* (the upper teeth projecting over the lower teeth), he must move his lower jaw forward so the upper and lower front teeth are in line. If the teeth are irregular so that the inner edge of the mouthpiece rim will rest against the edge of a tooth, change to a different size mouthpiece so that the edge will press against the flat face of the teeth. If the teeth are protruding or so shaped that the instrument cannot be held horizontal even with the lower jaw held forward, then get a mouthpiece bent as shown in the sketch below — though I do not encourage that.



A mouthpiece should not fit tightly around the lip; but it should press slightly in the center, leaving the sides loose and thus enabling the muscles to move freely. It is impossible for the lips to perform their function properly in producing tones if the mouthpiece clamps the muscles down tightly.

Methods of Instruction

The most popular method for cornet and trumpet (and for most other valve instruments) is that by Joseph J. B. L. Arban. This method is comprehensive and is used in the world's foremost conservatories. Another well known method is by Alexandre Petit (published in French only). It is yet more exhaustive. The method of Gatti (in Italian) is also popular.

The writer personally prefers Arban. If its wealth of exercises and etudes is thoroughly mastered they will develop the talented musician into an artist. Arban is most effective if material is selected from it, to meet the student's changing needs. It should not necessarily be reviewed strictly in order, like a book.

Each performer has individual talents. Some have magnificent tonguing, others an excellent high register, while some are especially proficient in tone qualities, phrasing or technic. Al-

most everyone has some kind of weakness and has to struggle and practice to overcome it. He may have a stiff, clumsy tongue which only keeps moving if he practices systematically. Such a player will want special studies (etudes) to develop his modicum of ability to the highest degree.

Excellent studies include:

Herbert Clarke. *Technical Studies.* Published by Carl Fischer Music Co., 56 Cooper Square, New York, New York.

Bartold: *Orchestral Excerpts.* Published by International Music Co., New York, New York.

Clyde E. Noble: *The Psychology of Cornet and Trumpet Playing.* Published by Mountain Press, Missoula, Montana.

G. Pietzsch: *Die Trompete* (Orchestral Studies). Published by University Music Press, Ann Arbor, Michigan.

Max Schlossberg: *Daily Drills and Technical Studies.* Published by M. Baron Company, P.O. Box 149, Oyster Bay, L. I., New York.

Upon request, publishers will send you a list of their instructive literature.

How to Play Correctly

A. Position of Instrument

Correct posture is essential not only to the instrumentalist, but to his instrument and to his tone. A trumpet or cornet should be held in a horizontal position, in order that the weight of the pistons will rest entirely on the springs. If the valves are held in a sloping position (in either axis) the pistons will rub against the side of the casing and will not only wear quickly on one side, but will cause the action to become sluggish. Use the tips of the fingers to press down the keys. This assures a straight up and down motion.

B. Embouchure

I advise putting the trumpet or cornet mouthpiece 1/3 on the upper lip and 2/3 on the lower lip in the exact center of the mouth if possible, as recommended in the Arban Method. This will enable the diligent student to play the high register easily. Others advise placing the mouthpiece 1/2 on the upper lip and 1/2 on the lower lip and still others recommend that 2/3 of the mouthpiece be on the upper lip and 1/3 on the lower. The choice is in part a matter of teeth and lip formation. By using more of the upper lip it is possible to produce a larger volume in the lower register, but the high tones are sometimes sacrificed and so also is the endurance. In the end it becomes a matter of hard, diligent work to develop whatever embouchure suits you best. Use more pressure on the upper lip, thus leaving the lower lip loose.

I have always advised my younger pupils to change their embouchure if they were not using my preferred position, and all of them without exception were successful in improving their playing and their ability to produce the high register. Young pupils naturally adapt themselves quickly to such a change of embouchure. Professional players above 35 or 40 years of age who are required to play daily should not attempt to change, as they risk serious lip trouble. Playing in one position for a great length of time develops certain muscles and a change of position not only develops new muscles but the muscles previously developed seem to counteract the change.

Pressure against the mouthpiece rim depends on how loud one has to play. But the pressure should always be as little as the volume requires. I also tell students that the lip should be flat, not projecting into the mouthpiece. It is easy enough to pull apart a man's fists when they are stretched far in front of him together, but it is extremely difficult to pull them apart if the fists are held to the chest. So it is with the lips. If they are allowed to protrude into the mouthpiece cup the muscles won't have sufficient strength to contract and retract them to overcome the increased strain necessary to produce the high notes. If, however, the aperture between the lips is kept open and the lips are drawn tightly against the teeth so that they will vibrate, so far as possible, on the outer edge (of the red tissue) tremendous power and endurance will be gained, the faintest pianissimo played, and the high register will be produced with the utmost ease.

Just as a piano string will not sound when it is touched by the finger, the lips will not produce a clear vibration if tightly squeezed together—they cannot vibrate if they touch each other. A space of at least 1/32″ must be left between the lips in the center of the mouth if the musician is to play freely and easily. The lips are to be held parallel and the upper lip must not overlap the lower while playing.

Keeping the lips tightly closed is one of the chief causes of a fuzzy tone and will prevent a pupil from advancing beyond a certain degree of skill. To discover such a faulty habit, stand in front of a mirror without an instrument or mouthpiece and try to produce a tone with the lips in position for playing into an instrument. If it is possible to produce a tone while the lips are slightly open without letting them blow away from the teeth or letting one lip slip above the other, the embouchure is correct. Next stand in front of a mirror and while play-

ing, slowly pull the mouthpiece away from the lips without stopping their vibration and without interrupting the tone or changing the lip position.

In this manner the student learns exactly how the lips are being held behind the mouthpiece. If the student is unable to continue holding the tone while pulling the mouthpiece away, the embouchure is not correct and either the lips are jammed into the mouthpiece to produce a tone or they are so tightly squeezed together that it is necessary to use heavy mouthpiece pressure to keep them apart. In either case the sound stops because the support is lost by removing the mouthpiece. It is necessary to learn to use the lip muscles by contracting them, not by squeezing them together continually or by pressing the mouthpiece hard against them.

C. Tonguing

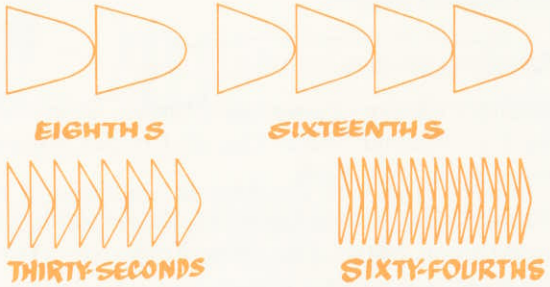
The tongue should never come out beyond the lips but remain behind the teeth. A staccato attack is started by pressing the tongue against the edge of the upper teeth, the air pressure resting against the tongue. At the moment of attack the tongue is withdrawn quickly, thus allowing the full air pressure to pass through the lips into the mouthpiece. This heavy volume of air will cause the lips to vibrate instantly and produce a full volume of tone. There should not be any break or waver in the beginning of the tone. Nor should the tone sound pinched, an unmusical effect caused either by the lips being squeezed too tightly together or by the tongue being pushed between them to restrict their vibraion.

The staccato may be compared with the strokes of a bell in that the tone starts with the biggest volume and immediately begins to decrease in volume. However, the word "staccato" does not mean "short;" it means "separate." A graphic analogy of the tone looks like this:

It should not look like this:

The preliminary studies of staccato should be practiced with long tones attacked as illustrated above, and then diminishing in volume immediately. Of course, the longer the tone is held the more gradual is the diminuendo. The illustration below shows the attack and playing of a number of long tones:

Note that the first tone diminishes gradually, and just at the moment when the sound has entirely stopped the following tone is struck. In other words, one tone must not overlap the next. If quarter notes are to be attacked consecutively, it naturally follows that they diminish with more rapidity than half notes, but the method of attack and playing is exactly the same. Consecutive eighth, sixteenth, thirty-second and sixty-fourth notes are performed in exactly the same manner, as graphically shown by the following:



If this manner of tonguing is practiced diligently, it will give a melodious ringing tone throughout the entire value of the note and yet it will sound short and snappy, for listeners will not hear the pianissimo part of the tones just before the following ones are struck.

The wrong way of performing a staccato:

or

Attacking a tone and after an instant of straight sound cutting it off abruptly will give

a harsh, unmelodious sound similar to the cackle of a chicken.

When attacking high tones, place the tongue against the middle of the upper teeth (near the gum) as when starting the syllable Tee. For low tones place the tongue on the lower edge of the upper teeth. So-called "soft-tonguing," principally used when playing songs, is performed by pressing the tongue slightly against the upper gum and pronouncing the soft syllable Dee.

In staccato playing it is not necessary to move the entire tongue, and in fact the slighter the movement of the tip of the tongue the better the results will be and the greater the speed. Inasmuch as perfect single tonguing is difficult to perform, is used in every musical composition, and is of the utmost importance for the player's musical advancement, the student should endeavor to gain exact control over it from the very beginning of his studies. Brass instrumentalists are judged principally by their quality of tone and their ability to single tongue.

Do not study triple or double tonguing until you have completely mastered the single tongue. Triple and double tonguing will interfere with single tonguing if persisted in before the latter articulation is perfected. In rapid staccato passages give preference to single tonguing wherever possible and triple or double tonguing only when the passages are so extremely fast that it is impossible to play them otherwise.

For double tonguing the principle is the same as in single tonguing with the exception of using the syllables Ti Ki in the attack. Attack the Ti with the tongue on the middle of the upper front teeth as in single tonguing, and the Ki as far forward on the palate as possible — like saying Kitty, Kitty. Do not articulate the K at the back of the mouth as though pronouncing Talker, Talker, for this necessitates moving the entire tongue, retards the speed, and makes the double tonguing sound awkward.

Triple tonguing is similar to double tonguing with an additional syllable Ti, as Ti Ti Ki. Care must be used to give each of the three syllables exactly the same length of time while accentuating the Ki. In order to play consecutive triplets evenly, avoid making a slight pause after the Ki.

It should sound

Inasmuch as the Arban Method goes into this subject thoroughly it will not be necessary to further describe how to execute triple or double tonguing.

To perform a clear staccato it is absolutely necessary that the instrument have perfect valve action and fairly stiff valve springs. A "clean" tone cannot be produced with the pistons half way down. They must be either all the way up or all the way down, and springs that are too light give the pistons a tendency to bounce. This can be proved by pushing down the piston and sliding the finger off sideways so that it will jump back. If the piston bounces up and down for a moment it will be absolutely impossible to produce a clean, fast scale or a clear single or triple staccato, for if the valve piston is $^1/_8$" down at the exact instant of attack, the tone will crack, whereas if the valve is in the correct position the tone will speak clear and true and without particular effort. Always use medium stiff springs just heavy enough so that the pistons will not bounce.

D. Tone Production

The most important result toward which a musician should strive is the production of a clear, pure tone. Tone is the player's greatest asset. All the technical skill and routine knowledge is of no value if the tone is weak or of poor quality. A good tone depends on the mouthpiece, instrument, embouchure, method of attack and correct breathing.

The first and most important study to be used by beginners as well as professionals in their daily exercises is the practice of sustained tones:

Starting with the middle C, count slowly from one to eight. Attack the C pianissimo, make a crescendo to a fortissimo at the count of five, then let the tone diminish gradually back to a pianissimo through the count of eight. Be sure that the attack is clean cut; if the tone is fuzzy, stop immediately and remove the mouthpiece from the lips. Then set the mouthpiece on again and try to strike the note clearly. If the tone does not come out clearly it is probable that the mouthpiece is not set right on the lips or the lips are not exactly in the

correct position. The player must learn to strike the tone immediately at the right volume level when the mouthpiece is set against the lips, keep the tone straight and steady without a waver, and increase and decrease the tone volume gradually and regularly without abrupt changes. Take especial care that the tone does not become sharp when it is diminished.

After being able to perform the above study with the note C, try it with D, E, B and A; in other words, play the scale up and down starting from the middle C. This enables the student to learn to play all registers with exactly the same embouchure. Do not play the scale any higher than can be done with perfect ease and without heavy pressure. If the upper G cannot be reached without strain, do not go above the E or F. Through systematic training the lips will be strengthened within a short time until the range can easily be increased without straining the embouchure.

On the trumpet the vibrato is best performed by rolling the right hand fingertips on any valve tips in use.

Other methods in use are the lip vibrato, the jaw vibrato, and the throat vibrato. All have shortcomings. Lip vibrato imposes strain upon the lip muscles. These muscles have enough to do in controlling pitch and maintaining a powerful fortissimo. It is also difficult to control the speed and intensity of the vibrations. The jaw vibrato, a biting motion of the jaw, not only interferes with the embouchure control, but the player cannot change its speed and intensity, and if he is in the habit of using it can hardly stop it when a straight tone is required. The throat vibrato is a misnomer, for it is not a pitch change but tremolo or dynamic change produced by altering the air pressure emitted from the throat.

E. Breath Control

In order to produce a perfect high register, a big volume of tone without over-blowing the instrument, it is essential to gain complete breath control. The importance of proper breath control cannot be over-estimated. Some players breathe from the chest alone and have the muscles of the diaphragm so cramped with belts or tight trousers that they cannot be used effectively for correct breathing. While a performer is playing the air pressure should not rest solely on the muscles of the chest but primarily on those of the diaphragm. The chest should be expanded, although not unnaturally blown up and without raising the shoulders, and the lungs sufficiently filled with air so that the diaphragm muscles can push against it; therefore, the diaphragm must have perfect freedom.

Practice the following breathing exercises without the instrument: stand erect with coat, vest, etc., unbuttoned and belt loose, place the arms on your hips and inhale as much air as your lungs can receive. Retain the air for a few seconds, then press your lips tightly together and exhale very slowly through them. The diaphragm and chest have to contract simultaneously to perform the work of pressing out the air. If you practice this daily you will soon be able to exhale continuously but slowly for a minute and perhaps longer. While playing a brass instrument, breathe both through the nostrils and the sides of the mouth.

It is better to stand erect while practicing, with the chest thrown out. This enables the diaphragm muscles to move freely.

F. Practice Methods

Musical progress does not depend on a certain amount of practice but on how the practice is carried out. The studies should not be played over but studied over. Playing should not be done mechanically or absent mindedly, or the student will unknowingly acquire faults that later in life may become uncorrectable.

The lungs and the lip muscles of wind instrumentalists need more care than is ordinarily given them. Nature does not build them strong enough to stand the unnatural strain that must be put into wind instrument playing. Therefore do not abuse the lip by overstraining it: practice only short periods, but regularly, thoughtfully, and carefully.

A beginner will act wisely by playing no more than one half-hour in the morning and another half-hour in the afternoon. After two months of such training he can probably hold out for one hour at a time, but should not. In fact, it is much better to practice in half-hour sessions with a three-hour interval between them. Frequent intervals of rest should be taken in order to permit the blood to circulate freely in the lips and also, for the same reason, the mouthpiece should be removed from the lips as often as possible.

Tone and tonguing should be studied at the same time. Practice for tone alone may cause the development of an embouchure which, while suitable for a good tone, would not be adaptable for a good staccato, and on the other hand, if staccato practice is indulged in too much the tone quality may be neglected. Therefore practice them interchangeably.

Do not practice too forte, for this will not strengthen the lips but will make them stiff. Begin practice with fifteen minutes of long tones (crescendo and decrescendo), then play technical studies — softly and lightly as a general rule, with occasional fortissimo practice. Long tones sometimes sound poor in practice

because of careless tonguing. Press the pistons down properly even when the exercise is not officially designed to improve finger technic.

If a high tone cannot be played without effort, leave it out entirely, for nothing is more destructive to the lip nerves than to squeeze them into producing a high note.

Few players know how to play a scale correctly. Numerous players do not press the pistons all the way down when playing a fast scale, or they lose so much time moving the pistons up and down that the scale sounds sluggish. To perform a clean-cut scale push the pistons down with a quick movement, pressing them hard, and lift the fingers up just as quickly. To improve finger technic, rest the fingers on the valve tips without pressing them down; then exercise one finger at a time, endeavoring to avoid the slightest movement of the other two fingers. After this, exercise the other two fingers; do this with each piston. Finally press two pistons down and exercise the other finger. Where two fingers are exercised, the action up and down must be simultaneous.

The daily practice should not be confined to the commonly used keys of C, F and G. Practicing the more difficult keys, as A♭, E and F♯, will greatly increase the agility of the fingers.

G. Routine

"Routine" in musical parlance means "experience;" a thoroughly routined musician is one who has had experience in all classes of work. An ambitious brass instrumentalist should seek experience in three directions: solo, orchestra and band.

To be a good soloist the player must first be sure of himself. When the player's technic is thoroughly developed and a solo completely mastered there is no reason for stage fright. The nervousness called stage fright can only be overcome by frequent appearances before audiences, combined with mental discipline. If the mental attitude of the soloist is, "Will I miss that high C?" he is almost certain to miss it. On the other hand, if his thought is, "I will strike that C as they never heard it before," it is practically a certainty that he will do so. Clyde Noble's book, mentioned above, contains an excellent analysis of stage fright.

In many cases the accompaniment is a cause of irritation and uncertainty. If the soloist plays some passages in irregular tempo the accompanist is unable to follow him. Once the performance becomes shaky, both soloist and the accompanist are affected by nervousness and the solo is a failure. Solos should be practiced as often as possible with different pianists. In this manner the soloist will learn to avoid too sudden changes of tempo that are not shown in the piano score. The soloist must dominate the performance while making it easy for the pianist to follow.

One of the greatest causes of nervousness is a defective instrument. Leaky valves or slides will cause the intonation to be uncertain and bring about a feeling of timidity in difficult passages. These defects are often the reasons for tones splitting or cracking. A sluggish valve action makes a clean-cut technical performance impossible. A soloist cannot afford to be without the most perfect instrument obtainable.

Playing in an orchestra is an art in itself. A fine soloist is not necessarily a good orchestral musician. A soloist strives to be heard at all times, while the orchestra is only effective as an organization, and the various instruments must fit into the ensemble as a part of the coloring rather than as individual colors.

The terms *f, ff, p* and *pp* are relative; they do not represent fixed measures of power or volume. In one composition *f* is stronger than in another, depending upon the nature of the music. In solo playing the artist is his own guide; in the orchestra it is the conductor's duty to coordinate the individual players. "Piano" in a band might be "forte" in an orchestra or "fortissimo" in a chamber music ensemble. Most amateur organizations always play too loudly, each player straining to be heard above the clamor. When a fortissimo is called for in order to produce a climax, the power is lacking, the contrast is missed, and the entire performance becomes monotonous. The orchestral player is at most times an accompanist, knowing which instrument is carrying the melody and playing under it. The melody must always be heard by every member of the orchestra, which is impossible if every accompanying voice endeavors to stand out.

An artist is generally recognized by his pianissimo, not by his fortissimo.

Much of the information on orchestra playing applies to playing in bands. As a rule there are different classes of players in the two organizations, the band musician being notably of stronger embouchure and more forcible performance. Band playing requires more technic, more endurance, more flexibility, more ability for solo playing, but never the nerve-racking responsibility of symphony work.

The Family of Trumpets

The modern symphony or opera orchestra trumpeter must be prepared to play instruments varying in pitch and bore. This is not for the purpose of avoiding the difficulties of

transposition, but to facilitate the execution of difficult technical passages, to overcome problems of intonation, and to produce the particular tonal quality which best suits a composition or which a composer prescribes.

For instance, the D trumpet prescribed in Bach oratorios was originally a low D trumpet, only a major third higher than our trombone, with a small, rather shallow mouthpiece, used in the upper high register. Symphony men of today are not accustomed to playing this type of instrument and could not afford to upset their embouchure just for the occasional use of these low-pitched instruments. For this reason, most Bach oratorios are today performed on a soprano high D trumpet, and extremely difficult compositions, like the *Christmas Oratorio,* and *B Minor Mass,* are generally played on the sopranino trumpet in high F or high G, or the piccolo trumpet in high B♭.

Composers do not always write their trumpet parts either to facilitate execution or produce the best tone quality. Instead they sometimes follow the road of convenience by writing the trumpet part in the key in which the composition is written. They take it for granted that a trumpet player knows how to transpose and will select the right instrument. Some composers assume that every player uses the B♭ trumpet predominant in Germany and Russia. But composers who lived in France or Austria, where C trumpets are used, have written most of their trumpet parts in C.

Some additional reasons for similar practices among composers are discussed on page 5.

There are so many variations in music and musical instruments that I have prepared this descriptive catalog of the brasses as a guide to choosing the best instrument for a particular purpose.

A. Mezzo-Soprano Trumpet in C

Every symphony trumpeter must have a C trumpet available and should use it a good part of the time — if not altogether. In France, C trumpets are used almost exclusively in symphony and opera orchestras, and to a great extent also in Austria. A good many modern compositions are very strenuous to play when written in the high register. A trumpeter can perform these parts more effectively and with greater ease by using a C trumpet than by forcing the high tones on a B♭ trumpet. Even advanced students are using C trumpets more and more.

The instrument is particularly effective in Wagner's *Parsifal Prelude;* Strauss' *Thus Spake Zarathustra, Symphonia Domestica,* tone poems and other compositions; Brahms' *First, Second,* and *Fourth* symphonies; Mendelssohn's *Italian* and *Reformation* symphonies; Dvorak's *New World;* Debussy's *Festivals;* Stravinsky's *Petrouchka,* Respighi's *Pines of Rome;* and *all* chamber music, because of the light singing tone of the instrument.

B. Mezzo-Soprano Trumpet in B♭

Because of its sure response in attack and its heroic, martial tone, this versatile instrument is especially effective for heavy fanfares, flourishes and other staccato work, but it is also the most practical all-round orchestral instrument. For solo and band work, the cornet should be given preference.

The B♭ trumpet is popular in the United States, England, Germany, Italy, Russia and the German speaking part of Switzerland. In France, Austria and the French section of Switzerland, trumpet players are accustomed to C trumpets.

C. Soprano Trumpet in D

This is another "must" for the symphony trumpeter playing modern works or oratorios by Bach, Handel, etc. This instrument's brilliant tone is effective in the high register in Bach's *B Minor Mass, Christmas Oratorio, Suite in D,* and most other orchestral compositions by Bach; Handel's *Water Music,* and *Messiah;* and Purcell's *Trumpet Voluntary.* Mozart and Haydn symphonies are played advantageously on a D trumpet (which blends well with the strings) as are Beethoven's *Seventh* and *Ninth* symphonies. Respighi's *Pines of Rome* was written for B♭ trumpet, but parts lie better within range of D trumpet. Prokofieff's *Lieutenant Kije* is written in B♭, but the backstage bugle call should be played on D trumpet. Prokofieff's *Scythian Suite,* the second part of Stravinsky's *Sacre du Printemps* are effective on D trumpet. For Ravel's *Bolero* it is a "must."

D. Soprano Trumpet in High E♭

This is a very important instrument for modern symphony work and every symphony trumpeter should own and be ready to play it on quick notice. The instrument is used for compositions such as William Schuman's *American Festival Overture,* Vincent d'Indy's *Symphony,* and Stravinsky's *Sacre du Printemps* (written for D trumpet but the first part is better performed on the E♭ trumpet).

E. Sopranino Trumpet in High F

The high F trumpet, an important instrument for a symphony musician, is used today for most of the difficult oratorio performances. It is the most popular instrument for some of the very high parts in the Bach *B Minor Mass,* and for Bach's *Brandenburg Concerto No. 2.*

F. Sopranino Trumpet in High G

The high G Trumpet has been designed principally as an alternate to the high F Trumpet for the performance of Bach's *Brandenburg Concerto No. 2.* This can be executed with greater facility on the high G trumpet because the high G-A trill can be played one tone lower (F-G trill). The instrument has a very brilliant tone and is suitable for work in the extreme high register. Like all sopranino instruments it should be used with small, shallow mouthpieces to do justice to both instrument and player.

G. Piccolo Trumpet in High B♭

This instrument, though not much used, is well suited for the performance of Bach's *Brandenburg Concerto No. 2, the Christmas Oratorio, B Minor Mass,* and other baroque compositions in the extreme high register.

H. Contralto Trumpets in Low E♭ and F

These instruments, little known in the English-speaking countries, are popular in Austria and other Germanic countries, as well as in Russia. In European orchestrations they share the work of third and fourth cornet parts, and of French horn parts, playing to a great extent the afterbeat in march music. These instruments are also effective in brass quartets or quintets and also in combination with the tenor trumpet in B♭.

I. Tenor (Bass) Trumpet in C

Although it is now confined to Italy, Spain, and Mexico, where most tenor instruments are in C, this instrument was originally designed for the performance of Wagner, Strauss, and other late Romantics.

J. Tenor (Bass) Trumpet in B♭

This instrument is designed principally for replacing the valve trombone. It is suitable for the Wagner operas, and as a solo instrument, and can be used to advantage in jazz. It is ideal for brass quartets (two B♭ trumpets, a low E♭ trumpet, and a tenor trumpet in B♭). It is surprising that this instrument has not been adopted for general orchestra work in place of slide trombones, whose musical advantages diminished with the invention of valves a century and a half ago.

The Proper Care of A Brass Instrument

To keep an instrument in perfect working condition constant care and attention is necessary. New instruments are particularly susceptible to the development of faults if they are not given correct attention. The new instrument should be thoroughly cleansed daily for the first week and at least twice a week thereafter. Run warm water through it, starting at the bell end, to keep the instrument clean and easy to blow. This will prevent the incrustations of oil and dirt which are so detrimental to tuning. Supplement this occasionally by using soapy water, followed by a thorough rinsing with clear water.

Cut a little ball of silk sponge (1/2" in diameter), push it into the mouthpipe, pour in some tepid water and blow it through the entire instrument while holding the three pistons down. Then do the same with the pistons up. Finally let some warm water run through from the bell end, and wipe off the pistons and inside casings with cheesecloth.

High grade instruments have the pistons fitted very close and at the beginning they work stiffly. The player is supposed to work them in according to his own finger pressure. Within a week's time, with a fair amount of practice, they will work perfectly — providing they are cleaned daily with warm water and wiped off with cheesecloth to remove the particles of metal that wear off on the pistons. These metal particles wear off according to the finger pressure of the individual player.

A drop of specially prepared valve oil should be placed on the valves daily. Do not use ordinary light machine oil, which is too heavy for pistons. Light valve oil not only lessens the friction but preserves the pistons against the ill effects of the acid of saliva. It also absorbs all corrosion and small particles of food that may be blown into the instrument. The dirty oil must be wiped off frequently with cheesecloth; then, when warm water is run through the instrument and a fresh drop of oil placed on each piston, the valve action will be reliable.

Never spit on the valves. This is not only unsanitary but the acid in the saliva will eat into the pistons in a short time, causing them to become leaky. This spoils the intonation and causes the instrument to become hard blowing.

The springs should not be too soft; stiff springs always give better results. When inserting new valve springs be sure first that they will stand absolutely straight (vertical) on either end when stood on a plane, level surface. A bent spring, or one with slanting ends, will bend when compressed and scratch against the spring box, causing constant trouble with the valve.

Applications of tuning slide grease or a mixture of half vaseline and half mutton tallow to the threads of valve caps and to all slides will keep them in good working order and prevent rust.