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Basic Problems in Playing the Cornet

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BASIC PROBLEMS IN PLAYING THE CORNET

by

Loyal J. West

A thesis submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF SCIENCE

in

Music Education

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1965
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Loyal J. West
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CHAPTER I
INTRODUCTION

The Nature of the Problem

After having spent a number of years in the teaching profession, the writer has become aware of the need for a study dealing with the specific and technical problems in playing the cornet.

The problems of performance on the cornet may readily be divided into three groups: (1) those having to do with the instrument, (2) those having to do with the player, and (3) those having to do with the interpretation of music. The problems of playing the cornet will be dealt with in this paper only as they apply directly to the problems of learning the instrument itself. These principal areas of study are: (1) tone production, (2) intonation, and (3) development of technic.
The cornet is a brass-wind treble instrument with a cupped mouthpiece and has a main tube almost five feet long. It is somewhat like the trumpet but lacks the trumpet’s power and brilliance. The tube has three pistons, or valves, and the tone is produced by the vibration of the player’s lips. The instrument has a range of about two and one-half octaves. While the cornet is a modern instrument, trumpets and horns of various kinds have been in use for thousands of years. Horns of many shapes and sizes were used as far back as 2000 B.C. by the Chinese, almost as far back as authentic history dates. The early instruments were made of wood, bone, bronze, horn, shells, elephant tusks or hollowed-out of pieces of wood; but brass came to be the most satisfactory material because it is easily worked.

Today, these primitive instruments would be considered little more than toys, as they were capable of producing only a few tones in the harmonic series, usually the fundamental tone, its octave and sometimes its twelfth. It is interesting to note the various ways in which these instruments were used throughout history. In the early Greek and Roman civilizations these instruments were used for the purpose of frightening enemies in battle. Armies were often accompanied by groups of trumpeters whose function was to blow as loudly as they could to strike fear into the enemy, just as dive bombers in World War II carried shrill noise makers to produce fear. In

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medieval times trumpets were used only by kings and nobles, for signals, fanfares and flourishes. In religious ceremonies, trumpets were used to drive away evil spirits. It seems throughout history there has always been an eagerness for trumpeters to play loudly, and this persistent characteristic is evident today, for in many amateur musical groups there will always be found some who want to continue this tradition.

Of course the horns and trumpets spoken of here did not have valves and have undergone many changes in size and key, shape and mechanical improvement. They have been built in almost every key. They have been as small as the eight-to-twelve-inch animal horn, and as large as the gigantic horn made from the elephant tusk; from the log about a foot long, to the metal tube several feet long.²

The first piston valve was invented by a Silesian oboe player by the name of Blumel, in 1813, and he sold his invention to Stolzel, a horn player of Breslau, who had it patented in Germany. A variation on the piston in the form of a rotary valve was introduced in Europe about the year 1820. A Bohemian by the name of Cerveney claims credit for this invention, but his claim was successfully contested by Antoine Joseph Sax³, who might justly be called the father of band instruments today.

American instrument makers have advanced far beyond anything envisioned by European makers in the time of Sax. The valves of instruments today are light, airtight and noiseless. Musicians are fortunate to have such instruments. With a little humoring of certain tones it is possible to play

²Ibid.
³Ibid.
reasonably well in tune and the possibilities in technic on modern instruments go far beyond what was considered the limits of possibility a generation ago.
CHAPTER III

TONE PRODUCTION

A primary requisite for any cornet player is the ability to produce a pleasant sound from the instrument. In the opinion of the writer, nothing is more unpleasant than to hear a pinched, shrill, forced, or otherwise undesirable tone coming from a cornet. From an instrument whose natural sound is very beautiful, some very strange and unpleasant sounds are sometimes played by cornetists. This does not happen when the player has the right conception of the tonal quality which the cornet possesses. Every note, whether in a loud passage or a lyrical melody, should be pleasing to the listener.

The player must first establish an aural image of the tone quality he wants to achieve. It is this mental picture that should serve as his guide. By listening to established artists the student can get an idea of what constitutes good tone and musicianship. There are many opportunities to do this through the medium of concerts, radio, television, records, band camps and clinics. Responsibility for this concept of tone quality within himself rests upon the player and the teacher; no amount of reading or discussion will serve as a substitute.

A good tone possesses many overtones; this is to say that on a fundamental pitch, many more overtones have been detected coming from a tone of good quality than from one of poor quality. This is why we often hear a

desirable tone being described as one possessing substance, resonance, or richness of sound.

The quality of tone of the cornet is affected by several factors. They include the following: (1) the uniformity and smoothness of the vibration of the lips; (2) the embouchure, or position of the lips; (3) the intensity of the breath; (4) the mouthpiece; and (5) the proportions of the instrument. 5

If the lips vibrate efficiently and this vibration is highly developed, the tone will be pure. It should be of uniform pitch, not varying above or below a given frequency because of changes in the lip muscles while the tone is being played.

Facio-Dental Adaptation

When one selects an instrument for a child, the child's dental formation should be carefully noted and the proper instrument on which to begin should then be recommended. The number of students playing the cornet who would have been much more of a success on some other instrument is quite large. Certain physical characteristics of the mouth, teeth, lips, and jaw make performance on a cup-shaped mouthpiece rather difficult.

The lips are the vibrating surfaces by which the tone is produced on cup-mouthpiece instruments, thus the lips are to the cornet player what the reed is to the woodwind performer. If a reed does not produce a tone, it is discarded; the cornet player does not have such a choice.

If the lips are not able to produce a good vibration because of malocclusion, shape or size of lips, or irregular teeth, the player is not

5Leslie Sweeney, Teaching Techniques for the Brasses, New York, New York: Belwin, Inc. 1953, p. 27.
physically adapted to the instrument. These simple considerations are too often overlooked.

Any unevenness in the structure of the teeth or in the bite of the upper and lower teeth may make the placing of the mouthpiece difficult. The teeth should meet evenly all the way across the mouth.

If the player has a receding jaw there is a tendency to place too much of the mouthpiece on the upper lip. If the upper teeth protrude, in order to be comfortable the player will sometimes attempt to place nearly all of the mouthpiece on the lower lip. If the upper teeth are not even, the mouthpiece will be placed toward the side of the mouth rather than nearer the center. This placement throws again a burden on the muscles of one side so that the player does not have good control of the muscles he must depend on for the highest development.  

Students playing the cornet should have even teeth that meet together all the way across the mouth when the upper and lower teeth come in contact with each other. The teacher must inspect the teeth of the student if he is to expect to be successful on the cornet. If a student does not meet these qualifications he is quite likely to become a mediocre player, whereas, he might have the talent to become an outstanding musician on another instrument. Protruding of the upper teeth, overlapping front teeth which force the lip against the sharp edge of a tooth, uneven teeth, a pronounced receding lower jaw: all of these conditions may be so serious as to make it inadvisable to try to play a cup-mouthpiece instrument.

If one has a harelip, injured lip, or one with a deep scar, it would be difficult to play adequately. The lips would vibrate unevenly or perhaps

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not at all, and a poor tone would result. A student should be encouraged
to play the instrument with which he will have the greatest chance for
success.

Embouchure

The term, "embouchure," is used with reference to the muscle setting,
or position, of the lips and facial muscles used when playing. The place-
ment of the mouthpiece on the lips is often included under this terminology.
"Embouchure" means different things to various individuals; however, it is
the writer’s belief that a highly trained performer is one who must have an
embouchure with which all tones within one’s range could be produced flaw-
lessly. The lips must respond to the softest breath, must not lose tonal
quality in playing loudly, and must produce a sureness of attack in legato
or staccato playing.

Good tone production, range and endurance all hinge upon the develop-
ment of a proper embouchure. The idea of what constitutes a good embouchure
has changed in the past few years. Cornet players of the "old school" were
taught the idea that the lips must be stretched in forming the embouchure,
and the higher notes were obtained by more stretching. This "smile" system,
as it has been sometimes called, proved to have more than a few difficul-
ties for most performers. One can only stretch the lips or the corners of
the mouth so much, and then the lips come completely together stopping the
vibration and the tone altogether. This embouchure did make it possible
to produce high pitches, but it also put the lips in a position in which
they were unprepared to stand the brutal pressure of being squeezed between
a metal mouthpiece and the front teeth. It punished the performer through
loss of range, lack of endurance, thin tone, and lack of flexibility.
Today the embouchure advocated by most artist performers is that which is quite the opposite of the stretched lips system just described. This is sometimes referred to as "the pucker system," or the shortening of the lip segments which are vibrating. The lips are pursed forward in the position in which one would pronounce the word "pure" or "pooh" or "beauty." One will notice that this action is controlled by the muscles surrounding the mouth with muscles converging and tightening around the aperture through which the air passes between the lips.\(^7\)

With this embouchure one must be careful not to bunch within the mouthpiece too much; the middle portion of the lips is flattened, the chin pointed, and the corners of the mouth must always be held firmly to reinforce the muscles in the center of the mouth and also to prevent air from escaping around the outside of the mouthpiece causing air pockets under the lips.

The lower jaw must be slightly forward to put the lower and upper teeth in relatively the same plane, but not to the degree that tension arises in the throat or jaw. The teeth should be kept apart to allow a full stream of air to pass through.

The mouthpiece is usually placed where it feels the most comfortable and should be close to the center of the lips. Teeth formation will determine where this spot is and may prevent some players from playing in the exact center of their lips.

In placing the mouthpiece, Forrest Stoll\(^8\) recommends that the inner rim of the mouthpiece be above the red part of the lip. The lower lip should


also be placed so that the upper and lower ends of the mouthpiece rest away from the red part of the lips.

The success of this embouchure depends upon the freedom of the lips to move. It is the muscles and not the mouthpiece which should form the embouchure, and much practice using lip slurs is required for the fullest development of this embouchure.

Development of strength and endurance, as well as range, now follows the same pattern as that which an athlete follows in getting himself into shape. The muscles must be exercised deliberately and gradually made to take on greater loads that will lead to extended range and endurance. Hurrying this process can lead to injury to the lips.

Incorrect embouchure is usually the cause of poor tone quality. When the "smile" embouchure is used, the lips are stretched, the opening between the lips becomes a thin horizontal slit and results in an unpleasant sound that is thin, hard, and shrill. On the other hand when the lips are pursed toward the center too much, the lips are wrinkled and the resulting tone is soft, hollow, muddy and lacking in brilliance.9

When the upper and lower lips are pinched together too tightly rather than bringing tension in from the corners of the mouth toward the center, a choked tone lacking in resonance is produced. This clamping of the lips together is a common fault. More pursing of the lips changes not only the shape of the aperture but also the thickness of the lips and produces a darker tone. When the lips are kept too far apart, the tone becomes airy and a flatness of pitch is characteristic.

In order to produce good tone quality, it is necessary that the lips be vibrating in the same plane. If the lower lip slides under the upper lip in forming the embouchure, the texture of the vibrating surfaces is not the same and the tone cannot be clear. The tone quality will suffer, as will also range and flexibility.

The acquiring of brass instrument playing technic is a long and difficult process. The beginning period of instruction should be devoted almost exclusively to the practice of sustained tones and simple lip slurs, all within a very limited range. An entirely new function of the player's lips must be developed, and this cannot be hurried or forced. Alternate periods of practice and rest will gradually build a strong lip capable of meeting the strenuous demands made upon it in the course of normal playing. Many cornet players are retarded in the first months of their training by an unwise forcing of their development, and once the damage has been done it is difficult, if not impossible, to effect a remedy.

Playing without pressure of the mouthpiece on the lips is an ideal for which all cornet players strive, and it is a goal which is impossible to achieve, completely, but for which it is necessary to keep trying. The nearer one is to the goal, the nearer he is to mastery over the effortless playing of the cornet.

Peterson\textsuperscript{10} writes in his book that no great cornet players use the lip stretching, or pressure, method of playing. This tight pressing of the lips against the mouthpiece constricts the muscles and shuts off the circulation of the blood. The lips tire easily, so that one can play but a

short time, and out-of-tune playing is likely to result. No muscle in the human body can be made rigid by stretching; rigidity is achieved by contraction.

In the "no-pressure" system, the cornetist should try to push the lips out away from the teeth a little. This will produce the effect as described earlier in the "pucker" way of blowing the cornet. It is not actually possible to push the lips clear of the teeth, but the effort to do so produces the right position of the lips in playing. Also, the effort to keep the lips away from the teeth helps to keep one from pressing against them. The lips should come together naturally, and the breath, therefore, will make its own opening when coming through.

It is necessary to realize that in the no-pressure system there are times when some pressure must be used; however, as one develops strength and flexibility in his embouchure and learns how to control his breath and place the tones, the amount of pressure will decrease. When playing higher tones, or when playing loud, more force of air is necessary, and firmer contact is required. The more fully the muscles of the embouchure are trained the less pressure will be necessary.

The lips should be rested whenever possible. The player should form the habit of releasing the tension of the mouthpiece from the lips each time a breath is taken. This habit should be cultivated for it rests and refreshes the lips and helps to avoid pressure. The student should learn to breathe and relax the lips at the same time. It is not necessary for him to remove the mouthpiece from the lips completely; the contact should be relaxed so the blood may circulate and refresh the muscles.
Buzzing

Since all tone produced upon a cornet arises from the vibration of the player’s lips, one of the very best practice habits is that of "lip buzzing." Buzzing the lips is a good imitation of ordinary playing procedure, in that it involves both correct breathing habits and embouchure adjustment. The richer the buzzing sound which the player can sustain steadily and the extent of the pitch range will largely determine his capacity to control the actual tone and pitch on the instrument. Experimentation and practice in lip-buzzing, with and without the mouthpiece, will aid greatly in the development of flexibility and control. One must be careful to make sure that the buzzing sound is made by the vibration of the red part of the upper and lower lips upon each other, and as near to the center of the lips as possible. Sometimes a student will attempt to buzz the red part of the upper lip against the white of the lower lip. This is incorrect procedure.

The aperture of the lips should be open about the size of a soda straw, and a rich buzzing sound should be made when the breath develops power as a result of diaphragm pressure.

Choosing a Mouthpiece

Mouthpieces have been made of almost every kind of material; brass, copper, ivory, hard rubber, bakelite, plastic, glass, and wood. The rims vary from less than an eighth of an inch to a half-inch or more in width.


12 Sweeney, op. cit., p. 6.
The three important factors in a mouthpiece are the rim, the cup, and the hole at the bottom of the cup. The wide rim mouthpiece is used because it has a broader cushion for the lips and is desirable for a person who has very full or thick lips. On the other hand, a narrow rim mouthpiece provides more flexibility in execution, because the muscles of the lips are not restricted in their function by the width of the rim. The cup is the most important element of the mouthpiece because its proportion affects the tone and intonation more than the other parts.

The mouthpiece should fit the instrument in which it is used. Sometimes the bore of the cornet is larger or smaller than the mouthpiece so that a tight fit is not obtained, permitting a slight leakage around the mouthpipe and also altering the length of tubing, causing out-of-tuneness.13

The first determinant of tone quality on a cornet is the mouthpiece. The shape and dimensions of the mouthpiece play a very large part in the resulting tone quality, probably even more so than the instrument itself.14 Differences in the characteristics of the mouthpiece will affect the tone. A deep cup produces a large, mellow, dark tone; a shallow cup produces a thinner, hard, shrill, small, more brilliant tone. Extremes in either direction will produce intonation difficulties. An excessively deep cup makes possible easy response in the low register but for the average embouchure tends to flat the pitch in the high register. On the other hand, the shallow cup favors the upper register. Response is made easier here but sharpness of pitch is created in this same register and the lower register is made stuffy and difficult to control. Extremes are to be avoided, and the

13 Ibid.

majority of brass players might achieve much better tonal results if they used deeper-cupped mouthpieces. Most mouthpieces in use today are too shallow. Consequently tone quality and good intonation are sacrificed.

A person can get used to almost any kind of mouthpiece if he uses it long enough, but the writer's recommendation is for the young player to acquire a good one in the first place. A young student may find that he can get higher notes a little easier at first with a small mouthpiece or a shallow one and may be misled into the habit of using the wrong kind. The fact is that if approved methods of playing are used, the high tones come easier and more freely with a large mouthpiece than with a small one. 15

One should avoid experimentation when selecting a mouthpiece. A mouthpiece should be chosen with no "freak" characteristics such as oval shaped rims, double cups, adjustable cups and so forth. One with a moderate rim, medium cup, and medium aperture should be selected. The necessary adjustment to the mouthpiece is to be made through practice. A mouthpiece is not a substitute for practice in training a good embouchure and breath control. It has been the experience of the writer that the majority of fine teacher-performers of the cornet have recommended the Bach 7, 7C, or 10½C.

Dirt accumulations in a mouthpiece will throw the instrument out of tune and impair the quality of tone by reducing the diameter of the pipe. The throat of the mouthpiece becomes clogged with dirt in a short time and makes the cornet hard to blow. The mouthpiece should be cleaned at least once a week with a mouthpiece brush.

15 Peterson, op. cit., p. 29.
Starting the Tone

The vibrating media of the cornet are the lips of the player, and because of this, the player is not so dependent upon his instrument as he is dependent upon himself, his lips and teeth. The tone simply does not exist until the lips of the player have been conditioned to respond with flexibility, and so it must be the teacher's first responsibility to establish proper procedures in starting the tone.

Starting the tone, or good attack, depends upon three factors: (1) embouchure set; (2) the action of the tongue; and (3) the action of the breath.

Embouchure set is the setting of the lips for the pitch before the attack and maintaining this position throughout the duration of the tone. The tone may be marred when the lips are set while the attack is being executed. This results in a "scooped" sound in which the pitch changes. A firm setting of the lip muscles can also prevent any movement sometimes caused by the air passing through the lips.

One way of describing the action of the tongue is to compare the tonguing action to that of a valve in which the primary function is to regulate the release of the breath. The tip of the tongue is the only part involved, with the remainder of the tongue being relatively relaxed. The tongue should drop low in the mouth, the exact spot depending upon the register of the pitch involved.

The syllables "too" or "tah" have been used to achieve good tongue placement. In pronouncing the syllable, Forrest Stoll\(^\text{16}\) writes, the player

should make the "t" sound very distinct with the tip of the tongue pointed as much as possible. An attack made with a "th" sound is not good and should be corrected immediately.

In starting the tone, the tip of the tongue goes down behind the lower teeth, and care should be taken that the tongue is not placed between the lips or teeth as this placement disturbs the embouchure set and produces a violent distortion of the attack with an explosive sound and usually results in a change of pitch. The primary use of the tongue is to seal off the air before the attack and to control the release of air; therefore, the tongue should "get out of the way" as quickly as possible.

The action of the breath, the other important factor in starting the tone, is very important. The attack should be prepared by building up air pressure behind the tongue. As the tip of the tongue moves down, the air pressure is released to pass through the lips. This air pressure must remain constant throughout the duration of the tone unless a dynamic change is to take place. Too often the attack is produced without sufficient breath support. Every attack should be well supported with air pressure regardless of how fast the notes occur or regardless of the dynamic level. This support is necessary for the immediate response of a tone.

A tone is produced on cup-mouthpiece instruments by placing the lips to the mouthpiece and causing them to vibrate by blowing through them, exciting the column of air in the tubing into pulsations or "buzzing" as was described previously in this paper. These vibrations are amplified by the tubing and become tone or sound. The tension of the vibrating portion of the lips is increased for the high tones and loosened or relaxed for the low tones. The lips have to vibrate with the same frequency as
the pitch of the column of air, so if this pitch is high, the lips must be
tensed to vibrate with greater frequency, and if low, they must be relaxed. 17

To prevent the student from "puffing out" his cheeks or forming air
pockets under his lips, the muscles of the embouchure must be tensed with
the corners of the mouth slightly drawn in. When blowing it is necessary
to hold this formation until one can blow through the mouthpiece without
letting any of the air escape between the lips into the cheeks or under the
lips.

The student should use the mouthpiece alone, for a short time, to
practice "buzzing" his lips. This will help him to gain embouchure control,
to eliminate air-pockets, and to develop proper tension of the lips for
higher and lower vibrations. Then when the mouthpiece is placed in the in-
strument the student will find the tone easier to produce.

The first tones one should attempt should be in the middle or low
register, second line G or low C being the easiest open tones to produce
according to Sweeney. 18 Less effort is required here since the lips do
not have to be tensed too much and it is not necessary to increase the air
pressure as in producing the higher tones. The student should realize that
if a tone does not come easily, harder blowing or more tension of the lips
will not help. When the proper formation of the lips is obtained, the tone
will come easily. The tone is produced by the vibration of the lips, and
the quality is dependent on the evenness and smoothness of the vibration.
The playing of soft, sustained tones in an easy range, giving the lips
practice in vibrating smoothly, will do much to develop quality of tone.

17 Practical Problems Building Wind Instruments, Elkhart, Indiana: C.
G. Conn Ltd., 1942.

18 Sweeney, op. cit.
The playing of ballads and songs is beneficial for developing the tone. One's musical improvement will come more easily if he thinks more of tonal quality during the first year or two than if he concentrates too much on the development of technic.

The tone is the most important element in musical performance. To develop good tone as early as possible, especially when to do so strengthens the lips, helps the student avoid possible damage due to excessive pressure and lays the foundation for better technical development later on. It is undoubtedly true that unless a cornet player has a good tonal quality, he cannot have endurance, flexibility nor high range.

The proper body position is one of alertness, a state of being ready to do the most efficient job at the right instant. The cornetist must stand or sit straight, away from the back of the chair, but relaxed; he must sit "tall," keep his head and chin up, and stomach in.

Sweeney\(^{19}\) writes of a few general rules that should be observed in the proper holding of the instrument. The left hand should grasp the instrument with the fingers around the third valve casing, with the thumb on the casing of the first valve and the wrist straight. The weight of the instrument should be carried from the shoulder rather than at the wrist. If the wrist is bent forward the muscles of the wrist will soon tire. The cornet should be held so that the valves are in a perpendicular position.

The right hand should be placed so the fingertips are on the valve buttons, with a curve in the fingers in the first two joints in about the position they would be if they were to hold a small ball. When the valves are depressed, the fingertips should push them straight down, instead of

\(^{19}\)Ibid., p. 7.
pulling them with the fleshy part of the fingers. This latter procedure may cause the valve to go nearly all the way down, but not quite all the way, resulting in a distorted tone especially in faster passages. Many times when students complain of sticking valves, it is because of this pulling them down with the side of the finger rather than pressing straight down with the fingertips.

The right thumb should be placed between the first and second valves. This position will put the thumb where it cannot grasp the instrument and will result in pressing the instrument onto the lips, causing pressure and poor tone with rapid tiring of the lips.

The little finger should not be permitted to rest in the finger ring or hook. It should be free to respond in sympathetic movement with the third finger of the right hand. If the little finger is restricted in its movement, it has a tendency to slow the action of the third finger and since this one is the weakest anyway, it should not be further restricted in its action. The finger ring, or hook, is on the instrument for the purpose of supporting the cornet while the player is marching, turning pages, inserting mutes or otherwise performing when the instrument is held only with one hand.

As all good cornetists already know, a correct or proper use of air is vital to the success of performance. Only through correct blowing can tone, range, accuracy, and endurance be attained. When the breath support is utilized to the maximum, the work load of the embouchure becomes reduced.

Breath control involves the correct usage of the entire respiratory apparatus, the muscles of the abdomen, the muscles surrounding the chest, the diaphragm, and the nerves which are connected with them, from the brain
to the nerves which operate the most minute muscles. Breath control, therefore, is not one but a combination of all of these.

One must develop as much economy in the use of the breath as possible. Herbert L. Clarke said, "The most important thing in playing the cornet is breath control, and this involves the whole body and the whole mind."\(^{20}\)

In playing the cornet one should use the breath to make the lips vibrate, and if there were any other way to produce this vibration one would need absolutely no breath at all. The tone does not require breath for its production, in fact the tone would be purer without it. After the breath has gone through the lips its work is done, as far as the tone is concerned. Its passage and exit through the horn are of no importance.

One does not "fill" a horn when blowing into it. It is already full of air. If the player depended upon breath to put the tone through the horn, it would take two or three seconds to travel that distance. The sound is out and gone long before the breath comes out. The vibrating air-column remains stationary in the horn while the sound waves pass on at the rate of about 1100 feet per second. Studies made by the Conn Corporation\(^{21}\) have shown that the breath moves along at a leisurely rate of about 18 inches per second. One should remember that the breath only serves to vibrate the lips. Its escape through the instrument is a mere incident.

When one breathes correctly he fills the lower lungs first, then the upper. He expands to breathe; he does not breathe to expand. He forces the air from the lungs by pressure from the diaphragm, a powerful muscle

\(^{20}\)Sweeney, op. cit.  
\(^{21}\)The Effect of Temperature on the Tuning Standards of Wind Instruments, Elkhart, Indiana: C. G. Conn Ltd., 1959.
lying under the lungs just underneath the breastbone. The action of this muscle is like a bellows; when pressed it forces air out under pressure. This muscle is important for it controls the breath which sets vibrations of the lips into activity. It controls the volume, the dynamics, shading, pitch and character of the tone. When the diaphragm is properly used, the playing of all music becomes easier.

When making crescendos, the diaphragm exerts a gradual pressure against the chest cavity, and in diminuendos, the pressure is gradually relaxed. One must discipline himself to produce an even tone, free from jerkiness and uneven pitch so the tones will become smooth and even. The tone will become softer or louder as the diaphragm forces the breath, and as strength in the diaphragm is developed, extremes of dynamics will be obtained more easily.

The player should not rely entirely on the muscles of the lips in playing intervals of notes, from a lower note to a higher pitched one, or vice versa. The diaphragm should be used in conjunction with the action of the lip muscles. As the intervals become larger, a firmer and quicker contraction of the diaphragm is necessary. The sudden pressure of the diaphragm on the lungs forces the air out in a sudden gust, and with the firmer embouchure the higher tones will come more easily.

One can tell whether the diaphragm is being used properly by placing the finger tips just below the breastbone where this action can be felt. The student should repeat a hissing sound several times, and then blow a "foo" as if he were blowing out a candle. The tensing and relaxing of the muscles will be found to correspond with those which should be used in blowing the cornet.
During the first year of study the teacher should teach the exaggerated use of the diaphragm, and as the student gradually develops this correct way of blowing, the blowing will become firm and dependable and its use automatic.

The playing of sustained tones and of applying crescendos and diminuendos is excellent for developing the diaphragm. One can tell by the lack of evenness in the swell in volume whether the diaphragm is reacting as it should. Any variation in pitch or quiver in the tone will indicate that the functioning of the diaphragm needs improvement.

The band director who has had some training in voice and choral technics under a competent teacher is fortunate, for the basic principles of choral and instrumental tone production are much the same. It is very important that the breathing always be free and relaxed and that what singers call "support," which may be roughly described as the feeling that the diaphragm is gently pushing the breath up and out of the lungs as it is needed, be present. Many cornet players today almost completely neglect this breathing process, resulting in shallow breathing, inadequate supply of breath, and insufficient control of the flow of the breath stream.

Sometimes there is a difficulty of having too much breath. Because of a small aperture in the lips and the small amount of breath used to sustain vibration of the lips, the player has no means of changing the air in the lungs, except to let out periodic "gasps" of air. This student will have a small, thin, pinched tone and should be encouraged to widen the opening of his lips to let more air pass so that the lips will vibrate more freely to give a larger, more "open" sound.
CHAPTER IV
INTONATION

A musician may habitually play either sharp or flat and not be aware that he is doing so; he may play only a few notes out of tune and also be unconscious of this. Playing in tune is basically a problem of educating one to show a degree of proficiency in this skill whenever he plays his instrument. If one's training consists of hearing the very best music and of listening only to music played in tune, this player will learn to accept only accurate intonation.

There are other factors which may enter into the achievement of accurate intonation. Sweeney\textsuperscript{22} writes that the beginner will often blow his tones flat. He has not spent time enough to condition the muscles of his embouchure to provide adequate tension for maintaining the correct pitch. Advanced players are inclined to play sharp. They generally tune up while the lips are not properly warmed up, and then when they do warm up, his pitch will rise and his playing will be sharp. Playing after the lip muscles have become over-tired will result in playing flat.

Judging from the way many bands sound, this writer believes that only a few musicians would place the skill of keeping in tune near the top of the list of basic requirements; yet this is by far the most important single consideration whenever two or more instrumentalists play together. This skill is based upon the necessity of changing a tone from its natural pitch

\textsuperscript{22}Sweeney, \textit{op. cit.}
to the same pitch of another instrument or voice. This upward or downward change of the pitch requires a change in the pitch of one instrument to bring it into perfect unison with another.

To develop the ability to play in tune, one must play often with other instruments, either with a piano or with other instruments in ensemble. When playing in ensembles it becomes the responsibility of all other players to adjust to the pitch, one with another, and especially to tune the intervals carefully to the pitch set by the melody and bass instruments.

**Accoustical Considerations**

The tempered scale (this was a division of the octave into twelve equal semi-tones, in defiance of the law of nature, which demands a different proportion), in use since Bach devised it, is of such a complex nature that absolutely accurate intonation is impossible. Sweeney says, "No two makes of instrument are identical in their scales, nor are any absolutely in tune with the scale of the piano."

One's hearing has not grown to accept absolutely accurate pitch, simply because one never hears it.

The construction of all valve instruments is such that it is theoretically impossible to produce an accurately tuned scale. In the manufacture of the cornet these compromises are necessary; however, the degree of compromise is different in different makes of instruments, so the scales of different makes will be found to be slightly different.

So far as the cornet is concerned, its out-of-tuneness is explained by the fact that the valve slides cannot be made to provide the correct added tune length in all possible valve combinations. The result is a

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23Ibid.
mixture of compromise and pure accident if some notes happen to be exactly in tune. Acoustical engineers are constantly improving both the intonation and the tone quality of cornets and are the first to admit that perfect tuning in instruments is not possible. It is a well known fact that the best possible instrument can be played out of tune and that an instrument which is not too badly off pitch can be made to sound in tune by the player. The conclusion is simply that each player must be impressed with the importance of making constant pitch adjustments through careful listening.

A brief explanation of the principles of construction of cornet valves will be undertaken here for the purpose of laying a basic foundation of this discussion.

The instrument proper consists of a length of brass tubing that is partly cylindrical and partly flaring ending in a spreading bell. The small end is played with a cup shaped mouthpiece against which the performer forms his embouchure in order to incite the movement of the air within the pipe that results in sound. By controlling the length and tension of the vibrating surface of his lips, and controlling the pressure of the air stream, the performer can produce the various notes in the harmonic series. These are sometimes called bugle tones. It would require six such bugles to achieve a chromatic series one half step apart. This series of half steps has been accomplished by the use of pistons which redirect the air through auxiliary tubes, thereby lengthening the main pipe. After much experimentation by early instrument manufacturers a three valve system was finally adopted as being the most practical. These three valves lower the main pipe by one whole step or semitone, one-half step, and a minor third through attached tubing. 

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The three valve system greatly enriches the repertory of tones available. By combining the valves with each other, or by adding two or three lengths of tubing together, the number of possibilities of different pitches is increased.

The tones obtainable in the open position are:

\[ \text{\includegraphics{open-position.png}} \]

The pressing of the second valve produces a series of tones one half step lower than in the open position:

\[ \text{\includegraphics{second-valve.png}} \]

The first valve lowers the tone one whole step below the tone in the open position:

\[ \text{\includegraphics{first-valve.png}} \]

The first and second valves in combination lower the tone one and one half steps below those of the open position:
The second and third valves lower the tone two whole steps below the open position:

The first and third valves lower the tones two and one-half steps below those in the open position:

All three valves together lower the tones three full steps:

As was shown in the preceding charts, the pressing of the second valve produces a series of tones a semi-tone one-half step lower than in the first or open position. The first valve extends the tubing to lower the tone one hole step, one step below the corresponding tones in the open position. The combination of the first and second valves produces a series of tones one and one-half steps (1-1/2) below those of the open position. The third valve alone will serve as a substitute for the first and second valves but produces a tone a bit flatter, due to the shortened length of tubing than the length used when the first and second valves are used together. The second and third valves give a series of tones two whole steps below the open position. The first and third valves produce a series of tones two
and one-half steps below those in the open position. All three valves together lower the tones three full steps.\textsuperscript{25}

It is here that the fault of construction makes itself known. The coupling of tubing results in inadequate lengths of pipe which produce sharpness in pitch when the valves are used in combinations. In some modern instrument manufacture, a more or less happy medium is arrived at by building all three valves slightly flat so that the couplings will not be too sharp.

According to Stauffer there seems to be a general preference for building the first and second valves quite well in tune and letting the "all three" combination suffer. This procedure can be justified when it is noted that these two valves are used very frequently and because of this more notes are played closer in tune with less difficulty in humming.

Present day band instrument companies vary in the degree to which they flatten the valve slides. A cornet of one maker often differs quite markedly from a similar instrument of another maker. Consequently two such instruments would always be at odds in any ensemble, no matter how carefully any one note was tuned from one instrument to the other. A good argument is presented here for having instruments made by the same manufacturer throughout a band.

Faulty pitch in the extreme high and low register, according to Stauffer, is due to the fact that the bore of the mouthpiece cannot possibly be well suited to playing in both extremes but is made so that the playing will be best suited for playing tones in the middle register. The bore

\textsuperscript{25}Sweeney, \textit{op. cit.}, p. 22.
must not be too small to make low notes difficult nor so large as to make high tones unplayable.\textsuperscript{26}

**Valve Limitations**

Each tone of a wind instrument has a "center" in which a clear, open sound of maximum quality may be obtained. Some cornet players who overwork the embouchure by playing too loud, by "blasting" in dance or military bands or by playing long rehearsals, parades, concerts, etc., are apt to strain the lip muscles to such an extent that they no longer play with a relaxed, light-pressure embouchure. This attempt to play a loud volume of tone by pinching their lips too tightly together, pressing the mouthpiece too heavily against their lips restricts the blood circulation, paralyzes the lip nerves and prevents the lip muscles from functioning properly.

Since it is not possible to produce any kind of musical instrument with perfect intonation, there are certain deficiencies even on the open tones and more noticeable ones on the tones produced through the valve mechanisms. Based upon many experiments, manufacturers have learned to rectify the open tones so that they are quite well in tune. Vincent Bach\textsuperscript{27} writes that the fourth line D, and the E and E\textsubscript{b} following will always be inclined to be slightly too flat

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure1}
\caption{Note: Only the D note is shown.}
\end{figure}

while the upper G, F\# and F will have the tendency to be too sharp.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure2}
\caption{Note: Only the G, F\# and F notes are shown.}
\end{figure}

\textsuperscript{26}Stauffer, op. cit.

These deficiencies, however, can be corrected so that a player with a good embouchure and good ear can humor these notes adjusting them slightly up or down in pitch as required to put them in tune.

The C. G. Conn Company has noted the following intonation problems in the cornet:

These notes are sharp, regardless of mouthpiece and player.

The low register tends to be flat regardless of the player.

From E through C, and again on high Ab, the intonation appears to have irregularities in cornets due to factors other than slide lengths. A part of the extreme variation between players is very probably due to unevenness of response from note to note.

The intonation pattern shows practically all second valve tones as being too flat, indicating a 2nd valve tubing that is too long.

This note is flat.

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A pattern which characterizes extreme flatness in the low register and sharpness in the high register. Some cornets are notorious for a sharp high register.

Sharp in the high register.

As a result of many detailed analyses by the Conn Instrument Company\textsuperscript{29}, it was determined that to correct faults of cornets in general the goal for cornet development should be:

1. An intonation pattern which would tend to be stable regardless of player and mouthpiece variations.

2. A low register which would not be as flat as is common on all cornets.

3. \textsuperscript{29} Ibid. This area to be easily "lippable" by most players and under the worst conditions of mouthpiece and player without resorting to valve slides which are too long when used individually.

4. This area should be brought into line so that the C\#, D, E\flat{} and E could be played up to pitch without the F, F\# and G being objectionably sharp.

5. The high register should be easy to play up to pitch, but not objectionably sharp.
All of the facilities of the Conn Research Department were employed in attacking the problem of understanding the valve deficiencies and limitations in cornets. For instance, since the study just described began, accoustical engineers from Conn have filled several notebooks with electrical measurements of sound waves inside cornets of different shapes. These studies were not made simply by having players play the instruments and then using their judgments or opinions in arriving at the results.

The following figure portrays the chromatic scale of a random selection of cornets showing general tendencies of bad intonation by means of long and short arrows. This data was reported by Donald W. Stauffer after interviewing twenty skilled professional cornet players, coupled with his own symphony orchestra and band experience. 30

It should be recognized that the preceding study of factors involved in faulty pitch is based upon the best judgment of Mr. Stauffer and his colleagues making the study. Represented in the chart are the usual tendencies, considering cornets as a group. The complete listing of out-of-tune tendencies is not apt to be found in a single instrument. Individual cases

30Stauffer, op. cit., p. 53.
may no doubt be found that will represent contradiction to these findings.

In studying further into the area of valve limitations of the cornet, it will be observed that it is possible to play several different notes by the use of more than one valve position. When does one use an alternate fingering for a given note instead of a regularly used fingering? The answer is that each alternate fingering producing the same named note will produce a slightly different pitch either higher or lower than that of the regularly used fingering. Usually, however, it is a safe policy to use the fewer number of valves whenever speed is necessary. But when one is sustaining tones, the use of a greater number of valves sometimes results in easier tuning.

Whenever one uses a combination of more than one valve, the cornet player will observe that the resulting tone will be sharper in pitch than if the same tone is produced by one valve or in the open position. According to Sweeney\(^1\) when one is playing in flat keys, a smaller number of valves should be chosen for any given tone, and when playing in sharp keys, a larger number of valves should be used. One cannot always follow this rule too closely because the awkwardness in fingering would make the playing of many passages impossible. So if speed is desired, one must use the principle of less effort in using a fewer number of valves.

The perfect functioning of a valve pump is the goal for which every manufacturer of the cornet strives. It is well known that a leaky valve makes an instrument hard to blow, and, unfortunately, a valve does not need to leak much before it loses considerable efficiency. Just as a loose-fitting

\(^1\)Sweeney, *op. cit.*
piston causes an automobile to consume more gasoline, so does a poorly fitting valve piston of the cornet consume more energy in being played.

Traugott Rohner\textsuperscript{32} describes several ways in which one can test for leaks:

1. If the valve can be wiggled sideways, it is too loose.

2. After oiling the valves, stop up the bell with a rubber ball or something else which won’t scratch the finish, and blow smoke through the instrument. If a valve is loose or if the casing and pump are irregular, the smoke test will show up these as air leaks.

3. Neither of these tests will show up leaks around the port holes. These can be found only by careful measurements with a micrometer.

The ideal valve (casing and pump) is one which has the closest possible tolerance throughout the entire pump and casing and acts with a minimum of friction. Expert workmanship is of prime importance in achieving such excellence.

Vincent Bach writes:

I do believe that plating of nickel silver pistons or brass pistons is better than using unplated valves. The problem is not so much the plating but what kind of plating and how it is applied. We have used both chromium and nickel, and we also have used pure nickel pistons. The nickel-plated ones seem to be the best because nickel creates an electrolytical action and eats holes in the pistons.\textsuperscript{33}

L. W. Echols, manager of product development for C. G. Conn stresses the importance of the thickness, the type and the hardness of plating. He adds:

We know that there are certain types of plated finishes that are so smooth that it is practically impossible to keep lubricant


\textsuperscript{33}\textit{Ibid.}
on the piston. Most professionals will have no trouble with this type of piston because they play enough to keep the piston wet. However, a student who plays just a few hours a week may have trouble with it.\textsuperscript{34}

H. & A. Selmer Company concurs with the majority opinion: "Nickel plating eliminates wear and provides smooth action and avoids corrosion.\textsuperscript{35}

The problem of air temperature is a very important factor in determining the pitch level of wind instruments. In any situation, a band might be required to play indoors or outdoors in temperatures ranging from 35 to 90 degrees Fahrenheit or more, a range of more than 50 degrees. Even under more ideal inside conditions the pitch level of the band often changes significantly during a concert, due to the warming action of the breath of the performers, the rising temperature of the room due to the presence of many people, poor ventilation, or very warm overhead stage lights.

A common misconception exists as to the manner in which temperature influences the pitch of wind instruments. Many believe it to be due to the expanding of the material of which the instrument is constructed, thereby causing a change of pitch due to lengthening of the tube. According to Stauffer\textsuperscript{36}, however, this is a negligible factor. He further writes that the change in tuning the instrument is in direct ratio with temperature rise and opposed to the expansion factor, and is due entirely to the lighter density of the air within the tube and the increase of the velocity of the sound waves therein. This increase in velocity raises the pitch.

The warming effect of the performer's breath through the cornet means that there can be a rise or falling of pitch during and after the period

\textsuperscript{34} Ibid.
\textsuperscript{35} Ibid.
\textsuperscript{36} Stauffer, \textit{op. cit.}, p. 26.
of warming-up and playing. It has been the experience of the writer that the pitch of the electrotuner will increase by one vibration per second above A 440 for each 10 degrees rise in temperature above 70°.

"Humoring"

What is meant by saying that an instrument is out of tune? In the previous chapters, the observation was made that no wind instrument can be made so that every note is perfectly tuned and that it is the responsibility of the player to adjust his embouchure or mechanics of fingering the instrument to adjust the pitch and correctly tune every note.

It might be assumed all musicians have a keen sense of pitch and are able by hearing various sounds coming from the band to make necessary corrections or adjustments in pitch. This proficiency, however, is not very often the case, and the importance of listening and humoring the pitches must be considered vital to the problem. Only the ear can be the final judge as to whether a pitch is accurate or not.

All wind instruments have what have been termed "grooves" into which the tones must fit for maximum "speaking" quality. Grooves are fairly constant and always in the same relationship with each other, unless some of the factors change, such as pulling the tuning slide, using a mouthpiece with an odd-sized bore, etc. It is the improper positioning of the grooves that accounts for unevenness of the scale in the cornet.37

It is precisely because of these misplaced grooves that humoring is necessary on a wind instrument. Humoring might be described as the changing of lip tension, air pressure, and aural cavity by the player in an attempt

37Stauffer, op. cit.
to bring the pitch in line with the musical standards of pitch as dictated by the ear.

Before the cornetist can effectively play his instrument in tune, he must first understand the most fundamental requirement which is the ability of the individual to distinguish differences in pitch. This to some people is an inherited ability or gift; and while this is too vast a subject to discuss here, most musicians will agree that there seems to be a certain inherent capacity or innate ability to detect pitch differences and that some individuals hear pitches more discriminatively than do others.

A disadvantage to the cornet player is that the sound wave is directed away from him which makes judgments more difficult in determining the exact placement of the pitch. It is difficult to judge the effect of one's playing against the ensemble which seems to the ear of the player to be louder than his own tone. This condition sometimes fosters overblowing to compensate for the seeming unbalance.

One reason for this need of hearing discrimination on the part of the cornet player is the lack of stressing the intonation factor in playing during the early learning years. From the first the violinist is taught how and why to direct his hearing faculties toward the problem of playing in tune. Cornet players, on the other hand become complacent and non-critical after the initial process of learning what valves to push and a rough ability to play the tone is achieved. It seems perfectly right for the young player to play the tones right in the heart of the "grooves" at all times. It seems that really critical listening is delayed until the player runs into difficulties in a professional ensemble, and by this time the ego is usually so well developed in the way of musical overconfidence that faulty pitches are credited to the other fellow.
Although it has been stated that cornet players do not as a rule use the ear to proper advantage, this assumption does not in any way excuse them for this oversight. It is even more necessary that they hear and play the notes correctly because of the necessity of fighting the pitch imperfections of their instruments at all times. Talented players may acquire a "perfect pitch" concept for the out-of-tune notes on their instrument and firmly establish an incorrect "embouchure set" which will be difficult to rectify in later years.\textsuperscript{38} Much of the blame for allowing this condition to exist must be placed on the private teacher and school band leader who should both constantly stress the matter of overcoming the misplaced grooves of the instrument.

The physical condition of the cornetist has much to do with faulty judgment of pitch. A tone which seems in tune today may seem flat tomorrow, because of lack of sleep, fatigued lips, general body fatigue, boredom and other conditions.

According to Vincent Bach\textsuperscript{39} intonation is not a question of whether an instrument is in tune but whether it can be played in tune. And this depends on the proportions of the conical bore and on the proper length of the valve slides, which must also be tempered to compensate for the deficiencies caused by using two or three valves at the same time. A player possessing a well trained embouchure should be able to control fully the intonation of a good cornet by compensating for slight mechanical deficiencies.

A newly made instrument with a hand-hammered bell responds rather stiffly. There are changes in the response to intonation after a while which

\textsuperscript{38}Ibid.

are caused by atmospheric conditions, temperature variations, oxidation and other chemical effects produced by acid in the saliva.

The acid of the saliva causes the brass to corrode and form verdigris; and after a number of years the metal becomes thinner, which causes the instrument to respond more easily and the intonation to become easier to control. After using an instrument for a long time, the player usually adjusts his embouchure to the response and the setting of each individual tone so that he has little difficulty playing in tune.

It does happen, however, that an instrument can become out of tune after a comparatively short period of time. The reason is that the inside of the tubing, particularly in the mouthpipe and tuning slide, becomes incrusted with foreign matter.

As verdigris forms inside of the tubing, this accumulation becomes heavier and heavier and causes a serious change in the bore of the instrument which changes the intonation. Sometimes a player has a mouthpiece which at times is so full of foreign matter that one cannot look through it. To avoid this condition a player should use a mouthpiece brush and clean the mouthpiece frequently.

For cleaning the mouthpipe and the rest of the tubing of a cornet, a player should use a flexible cleaning brush. By taking the instrument apart, he can brush the mouthpipe, tuning slide, and all valve slides and remove all loose accumulations. Some players have the kind of saliva which actually hardens the inside of the mouthpiece and the instrument tubing.40 This type of individual should go to a reliable instrument repairman and have him clean the cornet thoroughly.

40 Ibid.
Intonation Awareness

According to bulletins written by Wesley Pearce of the Pearce Music Company in Salt Lake City, development of good intonation will come quickest if the following four requirements listed below are "demanded" of all members of an organization.\(^1\)

1. The ability to sustain a tone of steady pitch.
2. The ability to raise or lower the pitch at will.
3. The ability to hear beats and control their speed.
4. Practice in simplified situations, with only two sources of tone present.

Does the school musician listen attentively enough? One can easily cultivate critical listening habits by playing every day just to listen to his own playing and by playing at least one tune by ear. With closed eyes one can concentrate on hearing, directing the attention to the pitch, as well as the tone quality, phrasing, dynamics, etc. This process focuses more attention directly to the problems of the embouchure. It is known that the embouchure on the cornet should be firm, yet flexible, to allow for those minute adjustments from the mental ear. It will help to produce a correct scale, and inasmuch as no cornet or trumpet is perfectly in tune, the correct scale is the cornetist's responsibility through humming.

Another way to increase intonation awareness is to alternately play and sing a scale. It will be noticed that one does not sing every step of the scale with equal ease. The difficult ones are the same ones that many cornetists habitually play out of tune. Singing focuses the attention and this is an important step toward improvement.

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\(^1\)Wesley Pearce, *That Good Sound*, Bulletin, Salt Lake City, Utah: Pearce Music Co.
Because some people instinctively want to distinguish themselves from their environment, they sometimes assert their identity through actions of which they are not conscious at all. Playing unison in a group, some find it difficult to hear themselves and experience a feeling of being lost. Since this feeling tends to weaken the awareness of the individual's identity, he tries to assert self-confidence by playing, subconsciously, just a little off tune. Now he stands out against the other players and his identity-awareness is assured. This cornetist will almost always tend to raise the pitch, and because we subconsciously choose the higher pitch the other players are induced to assume a similar action and a regular "pitch inflation" results.

**Tuning Mechanisms**

Not so many years ago none of the various brands of cornets had tuning gadgets built onto them, except for a movable third slide, and when the writer took trumpet lessons his teacher would remind him that the low C# and D were deficient and must be "lipped down." Even today one will find many, if not most, professional trumpet players in leading symphony orchestras and dance bands who do not use any tuning mechanisms, but who are players that are accustomed to using the lip and the ear to play acceptably in tune.

The writer believes, however, that it is advisable to have instruments equipped with slide and trigger mechanisms to help tune the notes played by the first and third valves. No such device is any better than the player's ear and his ability to tune quickly and at the right time. There are times, however, when the cornet players are sitting in a symphony orchestra or concert band directly in front of trombones, or else in front of the
percussion section, and at times cannot hear a sound from the other side of
the ensemble because of the interference of sound from these other sections.
If the trombonists take their pitch a little too sharp or too flat, then
the trumpet player adjusts the pitch of his instrument to match the trombones
and in such cases may not tune correctly against the woodwind section sitting
on the other side of the band.

As has been stated earlier, when valves are used in combination there
arise problems in intonation, and with the slide mechanisms on both first
and third valve slides, the compromises become easier to cope with to com-
pensate for sharpness in valve combinations. In fast moving passages the
use of these mechanisms is at times impractical.

Trigger Mechanisms

What can be accomplished with a first valve trigger? The cornetist
can control the intonation of any note which requires use of the first valve
slide and this includes all notes using valves in combination with the first,
and in most cases where the first valve is used singly.

The third slide attachment is limited to use on low C♯ and low F♯ in
which cases all three valves are used together. The low D, using first
and third valves, is a troublesome note, as is the top line F, A above the
staff, and B♭ above. The first valve trigger should be used on all of
these notes.

Since the invention of valves in 1813, cornetists and instrument makers
have recognized that academically perfect intonation could not be an inherent
characteristic of the cornet and trumpet. J. B. Arban, in his Complete
Conservatory Method (originally published in 1864) said that a well constructed
cornet ought to be so mounted that the thumb of the left hand should be able to enter the ring of the tuning slide, and open and shut it at pleasure, without the help of the right hand. It is then possible to regulate the pitch of the instrument while playing. The slide is also used for the purpose of equalizing all those notes, which, in the course of natural production, are rendered too high. Each valve is tuned for separate use, and the natural consequence is that when several are employed simultaneously the slides get too short and the precision of tone is inevitably affected.  

If the instrument is constructed by the manufacturer with the first valve's slide a trifle short (to bring the fourth line D and the third space Cº in tune), we are apt to find that certain tones requiring the first and second valves in combination are too sharp for comfort in some situations. Therefore, when we play sustained tones on the following notes we must often count on using the extension device, or else use the third valve alone.

To use the third valve alone is often not the easiest thing to do. Sometimes it is very awkward to use, and sometimes solving one problem creates another, i.e., using the third valve alone to lower the pitch of a sharp note may sometimes make the new pitch too flat and also more difficult to center in "groove" because of position in the harmonic series.

42 Clifford Lillya, Improving Intonation with Movable Slides, Elkhart, Indiana: Martin Band Instrument Co.
There are four general areas of tuning problems involving the manipulation of the first valve trigger.\footnote{Ibid.} The first includes those situations which can be handled with either the first or the third valve slide ($\frac{1}{3}$ and $\frac{1}{3}$). In most of these cases, using the first valve slide is easier than altering the third.

A second category comes from the tendency of the first and second valve combination to be sharp. The trigger here is particularly useful when there are numerous A's and C#'s and E's while playing in the key signatures using sharps.

The use of the first valve trigger is especially effective when playing music using the rapid alternation of two tones, in which one of them is $\frac{1}{2}$ fingering. Trills are more secure and distinct if the longer tubing is on the lower note, the fingering more smooth, and the note better in tune.

The trigger is extremely important in ensemble playing. In band or orchestra participation, the cornetist needs to make use of all the mentioned kinds of intonation adjustments. Here the emphasis is on pitch relation to the tonal center of a group, and here one becomes more conscious of more times to use the adjustment device than when playing solo literature. Often, after a number of measures of rest, the music calls for a sustained tone which must fit into a chord structure. In passages of this kind the mechanism on the first valve can become very valuable.

There does not seem to be any exact formula regarding the use of the first valve slide trigger, and learning to use it must be a gradual thing according to the needs of the student, rather than on a request for use.
on a specific note by the teacher. Since pitch adjustments on the part of the player require mature judgment, and the use of the trigger requires some skill, it would not be a good idea to force the student to use it before he is ready for it. The trigger is something to be used after the student has already acquired fundamental techniques of the cornet.

These movable slides, then, are not to be looked upon as a solution to all of the cornetist's tuning problems, but only as something to add to the natural flexibility of the instrument. At least an elementary understanding of the slide lengths is necessary to intelligent adjustment. The cornetist should learn to use these slides but not to expect the instrument to do what the player is not able to do for himself.

**The Effect of Dynamic Changes**

One of the peculiar problems for the teacher in ensemble playing is that in the production of a crescendo the pitch of the woodwinds tends to go down. The cornets, on the other hand, are affected in exactly the opposite way—they tend to go sharp. The resulting effect is quite a serious problem when executing crescendos unless all of the cornet players make a conscious effort to compensate for the normal pitch variation. This is done by gradually changing the embouchure to lower the pitch in order to keep the given pitch in tune to compensate for the natural tendency of the pitch to rise.

**The Role of the Performer**

In view of all that has been written, much would be implied that almost everything in regard to intonation in playing the cornet is of a
negative nature; however, there are many artists who do play with remarkable intonation and purity of tone by what one might consider to be a natural feeling to play all of the notes in tune instinctively.

There are several human factors that cause the intonation to be uncertain upon a given instrument. The three major physical factors directly controlled by the player are: (1) lip formation and tension, (2) pressure of the air stream, and (3) volume of the aural cavity.

Much attention has been given by teachers to the embouchure. Brass players are always discussing their lip and how it isn't as good as it used to be for some reason or another. This vibrator then, in the cornet, is not a constant factor but varies from day to day.

Many factors enter into the day to day fluctuation of efficiency of the lip vibrator on the cornet. Chapped lips, canker sores, skin irritations, body fatigue, fatigue of the embouchure muscles, nervousness in rehearsal or performance.

The question of thick or thin lips or the general formation of teeth is frequently discussed in regard to tone production and intonation of the player. There have been so many glaring exceptions to this reasoning that it probably would not be considered a factor in itself; however, it can be seen how a sharp protruding corner of a front tooth could seriously interfere with the vibration of the delicate muscle fibers of the lip, causing lack of endurance and lip fatigue.

A great help for the performer in gaining considerable insight into the problems of playing in tune is the use of the Stroboconn. This is

44Stauffer, op. cit.
an electronic device which brings intonation problems "out into the light" and clarifies for the student many of the problems he might have in playing his cornet in tune.

The Stroboconn measures musical tones to an accuracy of 1/100th of a semitone. A tone presented to its microphone appears as a visual pattern which shows immediately whether the tone is sharp, flat or in tune with the tempered scale based on A 440. All the factors that influence pitch—vibrato, embouchure, blowing, slide positions, etc., can be analyzed from this pattern.

Playing before the Stroboconn, a student is able to see his pitch errors. He hears only the tones of his own cornet and soon learns how each should sound when played in tune. What he learns by visual and muscular coordination becomes firmly implanted in his memory. Adjustments made in embouchure, breath control, etc., to produce a stationary Stroboconn pattern become habitual with the player because he can see the effect of these changes on his tone. Chords, unisons or difficult passages for ensemble work can be checked and practiced since the Stroboconn will measure two or more tones simultaneously.

The Stroboconn must not become a crutch; rather it should be a means to help locate, treat and overcome faulty intonation habits. The players should face away from the Stroboconn and not train the eye but should learn to use the ear.

Additional factors upon which one should depend for good cornet intonation are the following: (1) practice hearing the tone mentally before producing it, (2) sing the part before playing it, (3) use the stroboscope and check tones carefully, (4) discover the tones which are out of tune.
on the cornet and make necessary adjustments as automatic as possible,
(5) play the instrument that is best obtainable, (6) use a mouthpiece of
proper dimensions, (7) know the cornet, its limitations, its alternate fin-
gerings and when they should be used, (8) keep in the best condition of
health and training, (9) always warm up before playing, (10) do not strain
the muscles of the embouchure, (11) listen to good music. To hear the best
is to want to play the best.
CHAPTER V
DEVELOPMENT OF TECHNIC

One of the most important points in the development of technic by a cornetist is regularity of practice. By that is meant, practice every day. One cannot miss many days of practice and build up a strong embouchure. It was once stated that if the cornetist loses an hour of practice, he notices it; if he loses two days of practice, other musicians will notice it; and if he misses more than that, everybody will notice it.

When practicing, one should not forget to rest at frequent intervals. The rests are as important as the playing. One should rest about one minute for every two minutes practiced, particularly until the embouchure is set. One should never reach for tones he is not able to get.

The beginner should start with the playing of long tones, and, until they develop well, this habit should be kept up. Great artists invariably practice long tones for a few minutes every day.

The advanced player should always remember never to sacrifice tone for technic. Musical tone is the foundation of music, and long tones in the form of scales, songs, or slow melodies are very good practice. Long tones develop the embouchure, whereas slurring, without the aid of finger-gingering, is good for the making of a strong and flexible lip.

The term "technic" when used in playing an instrument is usually understood to refer to the purely physical or mechanical operations involved in the playing of the instrument. This would also include other factors
in a musical performance such as manipulating fingers, valves, tone production, dynamic control, and interpretation.

In helping a student to build adequate technical facility on the cornet, the teacher must know problems of the instrument and their early symptoms. He then recommends a remedy of study exercises or drills which he believes will cure the symptoms.

**Articulation**

One of the earmarks of a well-schooled cornet player is clear, clean tonguing. Untrained players seldom have the control and flexibility of the tongue necessary to perform distinctly the rhythms found in all serious music. Good articulation is acquired through careful training and practice. Here are some suggestions.45 In tonguing a given passage or exercise of similar note values with a constant dynamic level, the last note on the line must still equal the first in volume, quality, intonation. Although the notes may come faster and faster and get shorter and shorter, they must not get weaker or thinner. Insist on evenness as this can be accomplished by steady air pressure, steady lips and a relaxed and open throat, the same as is required to produce a good tone. Sustaining a tone and tonguing should feel almost identical. The only difference is that in the latter the tip of the tongue makes interruptions to create the desired rhythmic pattern.

One may use a mirror to see that there is no movement of any sort when playing. The cheeks, lips, jaws and throat must show no movement.

Tonguing through the lips is cumbersome and awkward, speed is impaired and staccato effects are difficult. Clear and rapid staccato effects require a minimum amount of movement of the tongue and more emphasis on breath control. The function of the tongue is to release the force of air which causes the lips to vibrate. The tongue must not stop the vibration, and the player should stop the breath by diaphragmatic control and not by means of the throat muscles. He should never stop the tone with the tongue by saying "tut" or "toot" but should substitute the "too" or "tu." The sharpness of the attack will depend on three factors: the placement of the tongue before starting the breath, the force and suddenness with which it is withdrawn, and the amount of breath pressure released at the instant of attack.

When the student stumbles in his playing, it is generally because he has tried to go too fast. He has not spent enough time or exercised enough care in developing correct practice habits. The student must not hurry. Slow, careful practice, with each exercise done correctly many times, is necessary. This repetition is particularly essential in gaining complete control over the tongue.

Cornet players often lack the flexibility players of other instruments possess because of their inability to vary their attack. Many players use the same rigid type of technic regardless of the character of the music. Many teachers have a problem in getting a really fine pianissimo attack. The usual attack is a prepared staccato and it seems that only a small number of cornetists possess the ability to imitate the floating attack like that produced on the stringed instruments. It is well to eliminate the tongue action almost entirely for the very soft attack, literally starting the tone on the breath. This sort of attack demands a most
Sensitive adjustment and control of the lips in order that the vibration may be started without a dependence upon heavy breath pressure. 

Style

The basis of all good execution, and the first matter which calls for special attention, is the production of a good tone. Without this, a musician will never become a great artist. Next, the striking, or commencing, of the sound ought to be mentioned. This articulation should be clear, with no thickness or disagreeable qualities to it.

After acquiring the proper tone production, the player must strive to attain a good style. To sound natural, to execute music as it is written, to phrase according to the sentiment of the music, and the strict observance of the value of each note is the responsibility of each cornetist.

Particular attention should be given to the playing of music which is produced by movements of the lips alone without the aid of a valve. Exercises of this type are comparable to those practiced by singers when they study the movement of the glottis to master the trill.

The easiest interval to perform in this way is the minor second. The major second, somewhat more difficult, uses a certain movement of the lip in order to obtain it. The interval of the third is the most difficult of all. This type of exercise develops a suppleness of the lips and is an essential aid in acquiring flexibility in cornet playing. The object of the slur is to slightly inflate the lower note, and when it has reached the extremity of its power it must be slurred up to the higher note by

46 A. Richter, op. cit.
a slight pressure of the mouthpiece on the lips. The notes should be produced with perfect equality; they must be connected with each other with absolute evenness.

**Scale Studies**

The study of the scales seems to greatly be neglected in much of the teaching today. Most method books generally give a few examples and then leave the pupil to supply for himself whatever may be wanting in the method. The result is that few students are capable of executing a scale correctly. It is the writer's belief that it is of great importance that the scales be practiced diligently, and in every variety of key. This drill trains the player to read more fluently the many key changes and accidentals written into the music and also to become a better reader of note patterns in music, inasmuch as all music is nothing more than scales or parts of scales.

The chromatic scale is one of the most essential and should be practiced at considerable length. This type of study develops ease in fingering. Care must be taken to press the valves down firmly in order that all notes may come out very clearly. At first the student must practice slowly and observe good breath support in ascending and descending. It is recommended to use the metronome in order to reach that degree of evenness and precision which brings about beauty of execution.

**Grace Notes**

A grace note is a note that in no way constitutes a part of the harmony, but which receives a part of the value of the note before which it
is placed. It deducts its value from the note which it accompanies and is generally used in somewhat animated movement.

The trill is the most difficult of all embellishments. The one most used is that in half tones. Whole-tone trills may be produced, but care must be taken to press the valves down so that each note comes out perfectly distinct.

**Intervals and Chords**

Exercises using intervals should be practiced carefully and care must be taken not to change the position of the mouthpiece when passing from a low to a high note, or from a high to a low. All notes must be played with equality, and the student should practice slowly at first and then develop speed as the fingers acquire evenness of motion. Too rapid execution does not always result in the brilliancy expected unless the performer is careful to control the breath well, press the valves down very, very firmly, have a clear tone through a good valve action on the cornet, i.e., the valves do not "bounce" when they return after having been depressed.

Major and minor chords should be practiced in every key. Some of the fingerings will at first be difficult, but this is no reason to skip over them. Practice should be slow at first and that which at first seemed impossible will soon prove that it was only impossible in appearance.

Because the dominant seventh chord appears so very regularly in compositions, one must practice this pattern of notes diligently in order to play with good melodic intonation, especially in playing from the flatted seventh to the next note following.

The diminished seventh chord plays a conspicuous part in musical composition, and due to its elastic nature is frequently used; for consisting
solely of minor thirds, it may be interpreted in different ways, and there are innumerable instances when musicians may use it.

The Cadenza

The cadenza should be practiced to accustom the pupil to be effective in solo playing. Care must be taken to breathe and phrase correctly so as to reach the end of the phrase with full power and good intonation.

Triple Tonguing

Triple tonguing consists in detaching a succession of notes with evenness, without allowing the tonguing to be either too short or too long. In order to achieve perfection, this technic should be practiced slowly.

The student should first practice to pronounce with perfect equality the syllables tu, tu, ku.

\[ \text{tu, tu, ku} \]

In order to tongue more evenly, it is important when beginning to prolong each syllable a little. After precision has been obtained, the note should be more briefly tongued to obtain a true staccato.

In pronouncing the syllables, tu, tu, ku, the tongue places itself against the teeth of the upper jaw, and in releasing pronounces the first two sounds. The tongue then re-ascends to the roof of the mouth, the
throat opens up by the effect of the pronunciation of the syllable ku, which allows a column of air to penetrate the mouthpiece.

In order to develop this rather awkward motion with perfect regularity, it is necessary to practice slowly, so that the tongue will act like a valve in allowing the same quantity of air to escape at each syllable. If this articulation is mastered, no passage will be found difficult; the tone production on the cornet will be as easy as that on the flute\textsuperscript{47}; but to reach this end the pronunciation must be perfectly pure. Experience has shown that it is necessary to pronounce groups of four notes, tu, tu, ku, tu, in order to get a very even effect, and to also be careful not to get a legato effect which is very indistinct when the syllables, du, du, gu, du, are used. These will come faster at first, but the notes are lacking in detail and a sound results which is quite the opposite of the clear and distinct staccato the player is seeking.

\textbf{Double Tonguing}

This kind of style is of great importance in the playing of scales or arpeggios in duple rhythm. To execute these with precision, the player must practice the notes slowly, regarding the same technics used for triple tonguing.

First of all the student should pronounce these syllables:

\begin{center}
\begin{tabular}{c}
\text{\textbullet} \text{\textbullet} \text{\textbullet} \text{\textbullet} \\
\text{\textbullet} \text{\textbullet} \text{\textbullet} \text{\textbullet}
\end{tabular}
\end{center}

\begin{center}
TKTK TKTK - \text{etc.}
\end{center}

The tongue here also performs an awkward movement which is very difficult to achieve until a great deal of practice is rendered; but once this skill has been perfected, the most difficult passages may be performed with all desirable speed and power. In fact, a good deal of music would not be playable up to tempo today without the technical facility of the cornets to double tongue.

The writer, having observed many cornet players in bands and other groups who have not succeeded in correctly performing the true staccato in double and triple tonguing, believes that this fault is an obstacle to other articulations also. Students should not be recommended to practice double and triple tonguing until they have thoroughly mastered a good staccato in single tonguing.

**Phrasing**

Many teachers devote so large a proportion of their time to the mastery of the mechanical phases of reading music, i.e., correct fingering and correct counting, that they neglect to study the problems related to the teaching of interpretation and expression and the feeling that must be put into music. Some teachers teach first the source of the difficulty—the reasoning that physical skills should be taught first, then the interpretative skills. This division of emphasis can be fatal in music education. All skills must be taught at the same time in order that one may support the other and give purpose and direction to the entire process of music enjoyment.

If the teacher himself is not sensitive to the interpretive qualities of the music, it is not surprising that the players themselves should regard
interpretation as of secondary importance. The teacher must strive to bring out the emotional, spiritual, descriptive, or dramatic elements hidden far under the surface of mere note sequences and rhythmic patterns.

Phrasing and interpretation are elements which are taken too much for granted. One high school player described interpretation as "what the players do to the music to make it interesting."

The system of notation leaves much to be desired because of the rigidity of the printed symbols as compared with the flexibility of the actual performance. The printed music becomes a point of departure to more artistic and finer points of expression. The tonal coloring of a note may be controlled, a given passage may be made either ponderous or light by different treatments, but in each case the printed page is the same.

Too often the player is asked to play notes when his natural desire is to make music. This is done when enthusiasm and interest will actually recreate the spirit which was originally set down by the composer.

A common failure of cornetists is that of not sustaining notes to their full value, and a similar weakness in the matter of breath control is the habit of "clipping" the phrase endings and losing the sustained character they should possess. Students are inclined to shorten the close of short melodic phrases, leaving gaps, where ensemble music is concerned.

**Advanced Technical Studies**

Characteristic studies such as one finds in the last section of the Arban method or the St. Jacome method of cornet instruction have been written for the purpose of providing the advanced cornetist with suitable
material with which to test his powers of endurance. In practicing these studies, one will doubtless be fatigued, especially in the beginning by such numbers as require unusual length of breath. Careful practice will triumph over difficulties and in turn will develop a strong player with lasting endurance. On the cornet, as with the voice, clear tones may be obtained by widening the lips, and veiled tones by contracting them. By skillful handling of his resources, the player will reach the end of the longest and most fatiguing exercises with a reserve of strength and power. The building of strength will allow the performer opportunities to rest while still continuing to play.\(^48\)

The cornetist who is ambitious and wants to arrive at the exalted pitch of perfection should above all things endeavor to hear good music well interpreted. The cornetist must seek out the artist performer and practice to develop tastes to be as similar to the ideal as possible.

**Daily Practice Routine**

A daily practice routine is a part of cornet playing that is often neglected. Most teachers ask their students to practice but fail to instigate a definite plan, nor do they follow through in helping the student establish a carefully arranged practice routine.

It has been expressed that many instructors minimize or completely ignore a daily practice routine. Let us compare music with athletes, for example, weight lifters, or ball players who have certain prescribed exercises which must be done each day for maximum improvement. Ambitious

\(^{48}\text{Arban, op. cit.}\)
athletes allow nothing to interfere with their daily routine of exercises. And what is more important, they usually do the same series of exercises, continually increasing gradually the number of repetitions.

Yet how many brass teachers make use of this well-known fact in their own teaching. The cornetist is certainly dealing with muscles, the muscles of the embouchure, the diaphragm, the fingers, and the tongue which will all respond to a daily routine as sure as the biceps.

Most students in bands have inefficient and haphazard practice habits. They practice as the mood strikes them—more than an hour one day, half an hour the next, and probably none the following day or two. Or their mood may have them working on solos one day, band music one day, or perhaps jazz the next day. Or they concentrate a solid hour one day and daydream through half their practice session the next day. Also, many students spend most of their time on the part of their technic on which they are already very good, practicing the easy and skipping over the difficult.

Regularity, perseverance, and variety are the keys in developing cornet endurance and technic. The emphasis must be on a regular daily routine, preferably at the same hour each day. Some may benefit more from two or three practice sessions each day with the most extensive warm-up during the first session.

The student should spend a short period of practice time on each item in the daily routine. Very gradually he should increase the difficulty of this routine as his embouchure strengthens and his technical facility improves. He should remember that practice with excessive pressure upon the mouthpiece or when the lip is tired can do more harm than good.
The strength of the embouchure limits the time available in practicing; therefore, one must make good use of the practice time. The student must learn what to practice, when, and for how long. The content of the material is more important than the length of time; also it is important to know when to quit practicing and how long a period of rest is needed between studies.

Endurance will improve from practice only so far, excessive practice beyond this point will tear down the lip. Each cornetist will have a different limit which he must discover. The cornetist must practice daily and without exception. One day of not practicing may eliminate the beneficial results of several days of practicing. Perseverance is necessary since the progress is slow and difficult to observe over short periods of time. No cornetist can expect miraculous results in a few weeks, and he must expect to devote himself to a sincere, faithful extended period of time.

The following is a suggested routine of daily practice as recommended by James Hoffren:

1. **Warm-up**—must be in the low register, of a slow tempo and piano.
   a. Mouthpiece buzzing—scales and slurs.
   b. Sustained tones—also with crescendo and decrescendo.
   c. Low lip slurs—as pianissimo as possible for better control and less pressure upon the mouthpiece.
   d. Tonguing—not too rapidly in the warm-up.

2. **Major and Minor Scales**—use numerous articulations.

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3. Chromatic Scales

4. Lip Slurs—very important to the development of endurance and flexibility. Try to play more in one breath each week to develop the diaphragm.

5. Internal Exercises (including arpeggios)—slurred and tongued.

6. Single Tonguing—legato and staccato, more ambitious than the warm-up tonguing.

7. Double and Triple Tonguing—repeated notes and scalewise, also in musical context.

8. Songs—for the development of expressive playing and cantabile.

9. Etudes—for work on individual rhythmic problems and so forth.

10. Solos—covering all styles and periods of music.

11. Transposition (optional) this could include chord improvisation for those interested in jazz or dance work.

12. Sight Reading—do not stop for mistakes nor slow down during difficult passages. Use a metronome. Move the eyes ahead of the actual sound.

**Breath Support to Improve Technic**

In Chapter II of this paper, breath control was discussed as to its function in the production of a good tone. Breathing will be treated here as it relates to development of technical playing ability.

A difficult problem in teaching the cornet is that of keeping the stroke of the tongue the same, in hardness or lightness, throughout dynamic or register changes. The tendency is to strike harder with the tongue when playing louder or when playing in the upper register, with a resulting change in the tone quality.
The student will not be able to articulate correctly unless his breath support is constant and sufficient. This will require him to demonstrate easy production and good tone throughout the playing of a passage without use of the tongue. A scale passage should be practiced quite slowly, first piano and then forte.

A student should be taught that breath support is not dependent upon the dynamic level; proper support from the breathing muscles is just as important in soft playing as in loud playing, for piano is not synonymous with weak, nor forte with strong. For the player to achieve proper support, a conscious physical movement has to be experienced; in the case of dynamic change the process is largely mental and the physical adjustments unconscious or involuntary.

In articulating a tone, the student should never forget the fact that the tone is started by the breathing mechanism, not by the tongue. If one applies this knowledge correctly, his tonguing will not become harder when he plays louder, for he will realize that the increase in volume is caused by the emission of more air—not by a harder stroke of the tongue, which will tend only to tense the throat muscles and make the tone harsh or strident. 50

The aim should be to have a clean, consistently light tongue stroke in all registers with a tone quality equal to that of legato passages.

The student should be required to play passages slurred, then tongued, and then he can check for himself if his quality, breath support, and ease of blowing remain equal.

Proper articulation lies in the correlation of proper breath support coupled with correct placement of the tone within the mouth. Poor articulation is often the basic cause of a pinched tone quality or improper use of the tongue. All tones should be placed forward in the mouth, especially in the upper register.

When in ascending a scale, the tone quality becomes thin, the embouchure is usually pinched; and the throat tightens (these three commonly occurring together), the student should be asked to sing the scale and to notice where the tones go as he ascends. He will notice that they go back toward the throat or toward the front of his mouth. If the tones go back, the teacher could demonstrate for him (in singing and playing) how tone production is affected by incorrect, then correct placement. It should be mentioned that it is most useful from a teaching standpoint to be able to demonstrate incorrect procedures as well as correct ones. This feeling of "forwardness" can be acquired, usually, in one of three ways: 51

1. A vocal approach. Singing will demonstrate the absence of straining the voice as he sings up the scale. This sensation should then be applied in playing the instrument.

2. All tones should be blown toward the mouthpiece.

3. Each tone should be projected, in ascending, farther away from the previous tones. For example, aim the lower note at the music stand, and keep projecting the tone farther away as you ascend, so that when the top notes are reached, the cornetist would imagine that he would be blowing out the window and clear across the street.

Once this technic is acquired the pinched embouchure and tight throat will clear up, and the tongue will not have to work harder in tonguing to

51 Ibid.
compensate for poor tone placement. This is the reason for having the student play the scale passage at a piano level at first. The tones will not speak unless they are properly placed, whereas at a forte level forcing can often disguise the fact that the tone is not being produced correctly.

By playing the passage slurred, then tongued, with emphasis on ease of identical production, correct placement, and breath support, the student will be enabled to gain a concept of articulation on a stream of air (much like running the hand back and forth under an open faucet), which will result ultimately in a clean, light articulation in all registers and at all dynamic levels.

**High Note Production**

Many students are unable to play high tones, and no matter how hard they try, their range remains limited. The average cornet students' limit generally is about G above the staff. Any note above that is either impossible, or is thin and indistinct. Students ask what can be done to get high tones more easily or how to increase their range. There does not seem to be a single answer to apply to all cases, but the difficulty is so common that most cases fall into a definite pattern. The cause is often the use of pressure, not enough breath support, too large an opening (or too tight and pinched), or trying to play high notes too quickly before the embouchure is properly trained for them. It seems that pressure and haste often go together.

To increase the upper register, one should set aside a block of time, say one or two months for the project, and not expect results too quickly. One should remember that it is necessary to remove old habits and replace
them with new ones. This discipline may require some time and effort. The more slowly one builds the new habits, the more firm will the foundation be for further progress.

The cornetist should not practice after the lips become tired. He should rest often and try to rest before the lips tire, not after. One should play all exercises with careful regard for the breath marks and practice to form the habit of relaxing the contact of the mouthpiece with the lips each time a breath is taken.

In practicing high tones, one should practice ten minutes at a time and rest at least five minutes before starting again. A practice period of at least one hour each day, and more if the lips do not tire too much is recommended, as well as a careful, definite warm up procedure each day. One should never attempt to start his practice by attempting to do the things he could do only at the end of the previous day's period.

It should be realized that one chief goal in training to play high notes is to develop the lips so they will produce clear tones and become strong so they will produce high tones easily. The lip muscles are tender and delicate. They must be cared for with the same consideration an athlete has for the muscles of his arms or legs. The baseball pitcher, the runner, the football player all warm up to condition the muscles upon which they depend for peak performance. The muscles of the embouchure require even more careful treatment because they are more delicate.

Lip slurs are fine exercises for developing the muscles of the embouchure and diaphragm and for strengthening them for adequate support of high tones. The exercises found in Clarke's "Technical Studies," are
very good for this particular training. Care should be used so that the pitch changes are obtained without the use of pressure and are played very softly, very rapidly and with proper breath control. The soft, rapid playing will help considerably in relieving pressure of the lips upon the mouthpiece. If correct and conscientious practice of high notes is followed, soon the muscles should become strong and the notes should come easier.

One should also remember to extend the high range gradually, to go higher one note at a time. Practically all of the method books on the counters of music stores today contain good training and technic studies in developing all facets of cornet playing, except that of building the high range. It was the experience of this writer, when confronted with the necessity of playing high notes professionally over extended periods of time, to turn to practicing exercises from several clarinet method books, rather than the standard cornet texts. Cornet method books simply do not have high notes, or enough of them for a long enough time, to adequately train the embouchure for the needs of today's professional cornet player.

**Endurance**

Occasionally the teacher encounters a student whose endurance is so limited that he can play only five or ten minutes, and then the lips become so tired that he can't continue. The cause is generally the use of pressure; however, there are some cases where the teeth have such a

sharp edge that it causes the lip to tire easily because the sharp edge interferes with the vibration of the lip tissue. Sometimes there are air pockets under the lips or cheeks, which indicate improper use of the muscles of the embouchure.

If the student can be trained to place the mouthpiece away from the sharp edges of the tooth, or if the embouchure can be re-set and developed correctly, in the case of air pockets under the lips, then the student should be able to play much longer than the five or ten minutes spoken of earlier.

It is possible to become a good performer and puff out the cheeks and also to do many other things wrong in playing the cornet, as one will observe by noticing some of the trumpet players on television and in personal appearance of popular dance bands. These poor habits in cornet playing are exceptions, however, and are very few in number. One will always do better if the basic rules of playing are not violated.

If tiredness in playing is caused by improper use of the muscles of the embouchure, they must be trained as if one were just beginning the instrument. Sustained tones should be practiced with the mouthpiece touching the lips as lightly as possible. The player should practice lip slurs, taking care that the change of tone is made with the muscles of the embouchure, assisted by the diaphragm, and that they are strengthened slowly and thoroughly. There will always be a tendency to use force to produce tone changes, and new habits must be accomplished slowly and properly.

53 Sweeney, op. cit.
In attaining the embouchure as described by Fay Hanson\textsuperscript{54} in developing strong facial muscles, the chin must be firm, the cheeks must be held in, and the lips must not be stretched across the teeth; instead a cushioning of the lip muscles should be achieved. One never strengthens a muscle by stretching it. The player should not crush his lip between the hard teeth and mouthpiece but should resist the pressure by cushioning the lip.

Mrs. Hanson further states that wind control is all-important in developing good endurance. "We must teach our brass players to blow."\textsuperscript{55} The cornet player should make the bell on his instrument rattle each day for a few minutes. This does not mean to force the volume, but to accomplish volume with freedom. The idea of blowing fast wind for high tones and slow wind for low tones must be constantly on the minds of our students.

The use of the tongue muscles inside the mouth is important for good range. The tongue must be arched to close the aperture inside the mouth and the lip muscles contracted to close the aperture in the lips for high tones.

The teacher and student must know that even when all correct ways of forming the embouchure and blowing are accomplished, still the only way to develop endurance is by frequent rests. Leaving the mouthpiece on the lips too long at one time is suicide for the cornet player. Too long usually means anything over one minute without taking the mouthpiece away at all.


\textsuperscript{55}\textit{Ibid.}
Musicians often talk about the "non-pressure" method, but most accomplished cornet players will probably agree that there is no such thing as "no pressure." When a player is playing there must be enough pressure on the lips to seal the mouthpiece and lips so that the power of wind forcing into the instrument does not leak out between the mouthpiece and lips. When the cornetist must play high and loud much of the time, pressure is necessary and the muscles of the lips will tire. The blood circulation is cut off at this time and if the player cannot have some chance to take the mouthpiece away for a short time, he will suffer from lip fatigue.

It is pointed out that a player can play for a three or four hour dance job and feel fresh at the end when he cannot play over three or four solos at a concert without getting very tired. This is because a dance band player does not usually play longer than 40 to 50 seconds at a time, then rests while another instrument takes over. One can keep going for a very long time at this pace, but the same player can ruin his endurance for the entire night if called upon to play solo cornet in a band alone and have to play an entire march with no one to relieve him. For this reason, it is well to have three cornetists playing the solo parts and to have one of them resting most of the time by alternating the playing.

**Vibrato**

Vibrato in vocal music or instrumental music is one of the most useful ornaments the performer can use, for it gives life and sparkle to the tone. This is a subject of disagreement among cornet players and among teachers who do not actually play the cornet themselves. Some say it should always
be used, some say it should never be used, and some say that there are occasions for both cases. The problem is that too often the player uses the vibrato with poor taste and this usage has resulted in a prejudice against it. It has too often been used to cover up a poor tone, hide unevenness, poor intonation, or breathiness.

In symphony work the trumpet will almost never have use for the vibrato. A clear, smooth tone which blends with other instruments is desired. When the penetrating, percussive trumpet tone is heard alone it should be without a variation of pitch.

In band playing the vibrato is seldom used; however, in solo passages it has been the experience of the writer to consider it desirable. Some cornet teachers say that a very slight vibrato by all players is desirable all the time, saying that this brightens and enhances the tone of the cornets.

The technics used in producing vibrato are diaphragm, throat, hand, and lip or jaw. The hand vibrato is the most prevalent today due to the fact that the diaphragm, throat, lip or jaw are used for much more important tasks than producing vibrato. The diaphragm should keep a good steady stream of air going and the throat should remain as open and relaxed as possible.

The hand vibrato is the simplest to teach and is very popular now in preference to the methods listed above. The technic is produced on the cornet by the gentle movement of the right hand, by the use of the thumb between the 1st and 2nd valve tubing. The finger tips rest lightly on the valve buttons with the hand lightly moving forward and backward, pressing and releasing pressure on the lip, thereby raising and lowering the
pitch of the tone. The movement should be rapid enough to get the proper frequency and small enough not to wobble the tone.

The character of the music may sometimes call for a faster vibrato at some times than at others. A dramatic phrase may be inclined to speed up the vibrato, while a tender and soothing, or slow and calm, piece will call for a slow vibrato. Which vibrato to use depends upon the feeling and sensitivity of the performer.

One should be able either to use the vibrato or to play without it, and it should never be used if the pitch of the instrument is thrown out of proportion.

Sweeney writes that,

... the finest performers try to get a pure "white" tone. A tone which is absolutely free of variation in pitch. This tone is one of the highest goals for which a cornetist may strive. Then he will have developed complete control over the embouchure, his diaphragm, his breathing, his muscles, and in critical hearing. The harmonics of the tone will be clear and pure. He will need no vibrato to help his musicianship.56

In England, the players of all competing brass bands use vibrato simultaneously.57 According to Brasch, these groups can be compared with a vocal chorus. In symphony orchestras the brass choir performs with straight tones. These groups can be compared with the classical concept of organ playing.

56Sweeney, op. cit.

CHAPTER V
SUMMARY AND CONCLUSIONS

The playing of the cornet today has certain requirements in common with the other wind instruments used in bands and orchestras. These all require certain breathing technic, embouchure, pitch adjustment, and tongue action, with each instrument handling these requirements in a slightly different manner. The principal difference between playing the cornet and playing other instruments is that the vibrating source is the lips of the player rather than a bamboo reed or other device. This difference means that the cornet player is much more dependent upon himself, his lips and teeth than are other instrument players.

The quality of the tone of a cornet is determined before contact is made with the instrument. This tone quality is made by the lips of the player and is determined completely aside from the instrument itself. This is different from woodwind instruments because players of these instruments are much more dependent upon their instruments than are the cornet players.

A young student may often select the cornet to play because he thinks it will be easier to play. It doesn’t look so complicated as do most of the other instruments. The three valves of the cornet look very simple and uncomplicated. Actually the cornet is more difficult to play because of the necessity of training and developing the lips so they will vibrate evenly and not tire; also flexibility must be developed so that the lip
and muscles surrounding can control the differences in pitches played with the same fingerings but different lip and embouchure arrangements.

Learning to play the cornet well with a good tone, technic and endurance is a long process. In training one cannot hurry or force the development of these lip muscles any more than one could quickly or hurriedly make the arm or leg muscles strong. This muscle development comes after long periods of training, much as the athlete works to train his muscles. Many cornet players are ruined when they are just beginners because an uninformed or too ambitious teacher tried to force their development too quickly.

The cornet player can never produce a beautiful tone until he knows in his own mind exactly the quality of tone he wants to come out of his instrument. A student cannot develop this mental tonal concept very easily without studying under an instructor who can produce this tone and can do it well. This, of course, is true of all instruments, but one must consider that in the case of the cornet player, the tone simply does not exist until the lips of the player have developed. In woodwind instruments, strings, piano, and others the tone quality is largely in the instrument itself and the player is much more dependent upon a fine quality instrument to get the desired beauty in the tone. The listener is not usually interested in how fast, how high, or how loud a cornet player plays without first having a tone that is pleasing to listen to.

Brilliance and carrying power may be desirable in the marching band, but in the concert hall the full, mellow blending quality of the cornet is more desirable to the shrill and penetrating tone the trumpet sometimes has when played by amateur musicians.
Because of poor breathing habits, cornetists fall into the habit of cutting the last notes in a phrase short of its full time value. The half, dotted half, and whole notes are released too soon thus leaving gaps between the phrases or resulting in inaccurate counting by starting into the next phrase ahead of time.

In attacking a note, the tip of the tongue should be placed against the upper teeth or against the roof of the mouth back of the teeth. The quick pulling back of the tongue causes the stream of air to cause the lips to vibrate which produces the tone. One should always avoid a spitting effect or starting with the tongue between the teeth or lips resulting in a "Thu" or other "Th" effect.

The cornetist should try to avoid the too prepared or too staccato attack. One must try to get a floating attack similar to that of the violinist. This is difficult to do, but the beautiful liquid attack is something to strive for. One should try more to start the tone on the breath and to use generally less tongue in all phases of cornet playing. Most private teachers instruct the student to use much less tongue, and many, many times more breath.

Practice in lip buzzing is important to the cornet player. When one gets a good, steady, rich and even buzzing of the lips he already has a pretty good embouchure and lip set and is using correct breathing habits. The control and flexibility that the player has is directly in proportion to his ability to buzz properly.

Power and endurance are equally important in general playing. The cornetist must be able to play very loud and with treat intensity at times, and during these loud passages a great physical strain is placed on the
player. His training and preparation must make him fit for the job and in a way that will not cause injury to his lips. The preparation for this must be a gradual and carefully planned process.

Many cornet players (and their instructors) do not know that certain notes on the cornet are either a little too sharp or a little too flat. Out-of-tune tendencies of cornets are inconsistent to a high degree, so that the same note on different cornets is not of the same pitch.

There is a definite need for more rigorous training in listening. Intonation consciousness should be fostered right from the beginning. Cornetists do not play in tune unless trained to do so. They, as a rule, play according to the "grooves," or the place where each note blows more freely and with resonance, and this is either sharper or flatter than the correct pitch on practically all the different fingering combinations of the cornet. Playing only in the grooves of each tone is not because of a lack of hearing, but because of a lack of sufficient stress on listening habits as taught by the teacher.

In conclusion, the writer would like to recommend that the student have the best obtainable instrument. A fine quality instrument can do much to improve his playing and take much of the work out and to put the enjoyment in.

The author would offer the following suggestions to the student cornetist: Use a mouthpiece of proper dimensions, preferably a Bach 10\(\frac{1}{2}\)C or 7C. Know your instrument, what it can do and especially its limitations. A few hours' use of a Stroboconn used intelligently will open the student's eyes and mind to many things that will help to improve his playing. Keep in good health, both physically and mentally. Always warm up before playing.
Do not strain the muscles of the embouchure; rest before getting tired. It is too late after you become very tired because the damage is already done. Remember that even the heart is resting approximately half the time and look at the great amount of work that it is doing and how strong it is. Take every opportunity to listen to good music, both by recordings and in live performances by fine artists. To hear the best is to want to play the best.
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