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Modifications in C trumpets as they effect performance practice among professional musicians

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MODIFICATIONS IN C TRUMPETS AS THEY EFFECT PERFORMANCE PRACTICE AMONG PROFESSIONAL MUSICIANS

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by
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Chapter I

Introduction

The modern C trumpet is a configuration of cylindrical and conical brass tubing that is folded twice into a rectangular shape much like that of the B-flat trumpet. The C trumpet is 4 feet in length and sounds at concert pitch, one step higher than the B-flat trumpet (the B-flat trumpet is about 4 and a half feet long) (Grove's 213).

Over the course of the last thirty to forty years, the C trumpet has enjoyed an immense growth in popularity in the United States (Sherman 45). Prior to that, the B-flat trumpet was the choice of most American trumpeters. All serious trumpeters (those who strive to be proficient in all styles of music) find occasion to use the C trumpet, and many players use the C trumpet for as much as 90% of their work.

There are several reasons for choosing the C trumpet. It possesses a more compact (concentrated) sound than the B-flat trumpet, and its brilliance helps the instrument to project more efficiently. The response of the C trumpet is "lighter and quicker" than that of the B-flat trumpet, and many times fingering patterns will be less intricate by using the C as compared to the

B-flat trumpet (Sherman 45-46).

Along with the benefits of using the C trumpet are some disadvantages. The intonation problems that are found on the B-flat trumpet are slightly magnified on the C trumpet (to the point of the need for alternate fingerings on some instruments). The added resistance that is found, due to the shorter distance between bends on the C trumpet, is also a negative point (Sherman 46). These disadvantages have led most trumpeters to look for modifications that will help overcome the obstructions of added resistance and poor intonation.

For many years trumpet players have been limited to the C trumpets that are mass produced by a few large instrument companies such as the Selmer Company, which makes [Vincent] Bach trumpets; the Schilke Company; and the United Musical Instrument Company, which makes Benge trumpets. This makes it difficult for the trumpeter to find an instrument that meets the demands that will be encountered. In the past few years custom designers have also emerged on the scene (much as Vincent Bach and Renold Schilke did in the first half of this century) who offer the trumpet player an instrument tailored to the needs of each individual performer. There are also a large number of craftsmen building replacement parts to improve the existing instruments.

Most of the literature that deals with trumpet modifications is manufacturers' advertising and is of

little help to most trumpeters. Other books that deal with instrument building usually deal with the historical aspects of the trumpet, such as the invention of the valve, and rarely mention companies or builders. The purpose of this study is to give the trumpet student, new to the C trumpet, a knowledge of how each part of the trumpet functions, to give possible solutions to problems that may occur, and to provide the trumpeter with a directory of manufacturers and builders that make and sell custom parts and instruments. This study is intended to help trumpet players who are frustrated with their C trumpets to find the improvements that they are looking for.

It should be noted that the discussion of the various parts of the trumpet can, for the most part, be applied to trumpets in all keys, not just the C trumpet. This paper does not address the effects of the mouthpiece or the theories of mouthpiece gap adjustments, but only addresses problems and modifications of the instrument in C itself.

Appendix I shows the results of a survey of twenty-six professional trumpet players and college level trumpet instructors (other players were contacted but declined to participate in this project). Each of the trumpet players who participated in the survey was contacted either personally or by telephone. The following questions were asked of each musician:

1. What make and model of C trumpet do you use most?
2. What leadpipe is on your C trumpet?
3. What bell is on your C trumpet?
4. Have you had the valves aligned? If so, who performed the work?
5. Have you had any brace work removed or relocated for acoustical reasons?
6. Do you use a custom tuning slide, and what is it?
7. Does your C trumpet have a tuneable bell?
8. Do you use a "Pitch Finder"?
9. Does your C trumpet have "Amado" waterkeys?
10. Describe any other custom work that you have had done on your C trumpet.

Appendix II is a directory of manufacturers, designers, and distributors of C trumpet modification parts and builders of custom C trumpets, with their addresses, phone numbers, and specialities. Appendix III is a short list of solo, chamber, and orchestral works that are commonly performed on the C trumpet.

Most trumpet players have had more custom work done on their C trumpets than on the other keyed trumpets. Mel Broiles of the New York Metropolitan Opera Orchestra cites this reason: "No one has ever come up with the right leadpipe and bell combination to make a C trumpet

work. I've given up on it (the C trumpet) and only play the C when I have to." (Broiles Telephone Interview)

The following chapters are a discussion on how each part of the trumpet functions, the general problems that may be caused or partially caused by that part or section, and some alternatives that can be employed to resolve these problems.

Chapter II

The Leadpipe

The conical tubing between the mouthpiece and the tuning slide, known as the leadpipe, is the most important part of any trumpet. This tapered piece of brass tubing sets up the intonation pattern for the entire instrument. The leadpipe also helps to establish the quality of the sound that the trumpet will have as well as the amount of resistance that the player will experience.

Two factors are involved in the intonation pattern to be set by the leadpipe: (1) the shape of the taper and (2) the length of the tapered portion of pipe (Blackburn Interview). The length of the taper makes a big difference in the way the trumpet responds and sounds. The longer the taper, the more easily poor intonation may be corrected; but the longer the taper, the more the instrument will feel and sound like a B-flat trumpet (Blackburn Interview). A third factor that, according to Dave Monette, is overlooked by other designers, is the thickness of the walls of the leadpipe. It is of great importance that the thickness of the brass remains consistent from the small end of the leadpipe to

the big end. Some builders are not careful when shaping the leadpipe, and the brass stretches and develops thin spots (Monette Interview).

The design of the taper is at best a compromise. This is due to the fact that any change in the taper will affect any note which has a vibration pattern that hits the changed spot. This will alter the entire vibration pattern (more properly called the nodal pattern) from that point on. An alteration in the shape of the pipe must be done at a point in which only one nodal pattern makes contact with the walls of the tubing (Schilke 2-4).

The late Dr. Renold Schilke spent a great deal of his life working on the physics of brass instruments. Schilke started working on the shape of his leadpipes by first drawing the nodal pattern for each note (the shape of the vibration as it progresses through the trumpet). Then by drawing the shapes of the nodal patterns on onionskin paper and placing one on top of another, he was able to find where the multiples (the points shared by two or more notes) appeared in the leadpipe. These are called "pressure points". Dr. Schilke then concluded that single nodes could be altered without adversely affecting other notes (Physics of Inner Brass 2, 3).

More recently brass instrument designers such as Clifford Blackburn, have been aided by the use of a computer to fine tune the leadpipe design. The computer is used to take a holistic look at the intonation

problems and make the best compromises. Blackburn says the leadpipe must be fitted to the bell; that the taper of the leadpipe and bell must complement each other so the air column flows evenly throughout the entire playing range of the instrument (Interview).

Custom Leadpipes

There are more custom leadpipes on the market today than any other trumpet modification accessories. They vary in length, venturi bore (the small opening), materials, taper, thickness of the metal and many other factors. Some of the custom trumpet designers of today, such as Dave Monette and Clifford Blackburn, got their start in the business by designing new leadpipes.

Bach Leadpipes

The most commonly-used custom leadpipes are the variations on the Bach 25 pipe. The 25 is basically the same leadpipe that Bach uses on their standard B-flat trumpets, but the taper is cut shorter for the C trumpets. Over years of experimentation with the limited number of leadpipes on the market, trumpeters found that cutting the 25 B-flat pipe in various lengths could be an improvement over the stock 25C. The result of this experimentation was the development of the Bach line of custom C trumpet leadpipes. In order of shortest to longest, they are: 25H, 25C, 25A, 25S, and 25R. The 25R uses the over/under style tuning slide discussed in Chapter III. In addition to the number 25 series leadpipes, the Bach 7 and 43 leadpipes can be used on the Bach C trumpet (Bach catalog 7).

Blackburn Leadpipes

Clifford Blackburn makes a full line of leadpipes for Bach C trumpets as well as his own custom trumpets. There are one or two numbers used to distinguish the different models on the Blackburn pipes. The first number is a mandrel number (the mandrel is the tool used

to give the pipe its shape), and tells the performer the relative development of a particular pipe in relation to other pipes. For example, the 12-350 is the 12th tapered mandrel in Blackburn's development. If the letter M follows the first number, it stands for modified and means there are two pipes from that mandrel with some changes in the M version. For example, the 12M-350 is a modified version of the 12-350. The second number (if there is a second number) stands for the bore measurement at the opening (venturi) of the leadpipe. For example, the 12M-350 has a .350" (measured in thousandths of an inch) bore size at the point where the mouthpiece meets the leadpipe.

Malone Leadpipes

Several trumpet players in the western part of the United States are playing on leadpipes built by Bob Malone. Mr. Malone has designed leadpipes, tuning slides, and a third valve extension ring (see Chapter 4).

The Malone pipes are a longer taper than the Bach 25A, but not as long as that of the 25S. Mr. Malone was featured in the U.S.A. Profile section of the Brass Bulletin. Author Tom Stevens had the following to say regarding Mr. Malone's work:

> Bob Malone, in Los Angeles, California, has been experiencing a great deal of success as a modifier of the trumpets of various manufacturers. He has designed leadpipe conversions for many established artists. Hakan Hardenberger's debut album featured a Malone conversion "C" trumpet on its cover. (103)

Pilczuk Leadpipes

The Pilczuk leadpipe is the most unconventional design on the market (see Figure 1). It is the only leadpipe that is not tapered. Instead of the normal tapered tubing, Gene Pilczuk uses small cylindrical tubes that gradually progress in size from smallest to largest. The development of the Pilczuk leadpipe is outlined in the following paragraph by the Pilczuk company:

> Mr. Pilczuk made a mouthpipe in a few crude but controllable cylindrical steps. It worked very well but it wasn't exactly right. He then made each cylinder a dimensional and mathematical equivalent of each note in the chromatic scale and spaced all of the cylinders, or notes, out on one solid pipe. Thus he had one integral

pipe hydraulically formed into thirteen precise, chromatically stepped chambers. One for each note in the chromatic scale. The entire scale was simply formed into the mouthpipe. (Pilczuk pamphlet 1, 2)

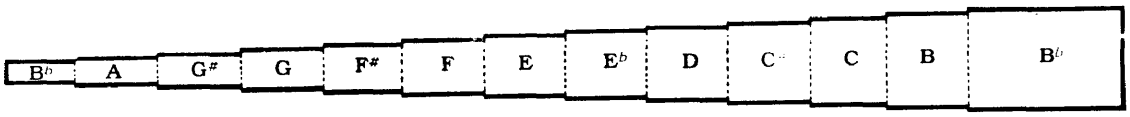


Fig. 1. The Pilczuk Chromatic Chambered Leadpipe (Pilczuk pamphlet 1)

Mr. Pilczuk claims that his Chromatic Chambered Leadpipe will give the performer the following results:

- Precise, crystal-clear intonation.
- No triggering is necessary.
- Absolute centering and control.
- Total overall efficiency.
- Projection with the least effort (Pilczuk pamphlet).

Pilczuk also makes a standard tapered leadpipe, but does not recommend it over the chambered leadpipe.

Other Leadpipes

There are a number of other leadpipes available. The Osmun Company makes a set of leadpipes called the Shires series in addition to their copies of Bach leadpipes. The Shires series pipes are designed to be used with their custom C trumpets, but can be fit to any instrument.

Jerome Callet also makes a custom leadpipe which is the same as the leadpipe used on the Callet "Super Large Bore" C trumpet. The Callet leadpipe features a longer taper than the standard Bach 25C pipe.

The Monette leadpipe, which is available only on a Monette custom trumpet, is made by a process that Dave Monette says will insure consistent thickness in the brass from one end of the leadpipe to the other. The technique involves a great deal of time in which the taper of the pipe is divided into twelve chambers. Each chamber of the leadpipe is shaped one at a time; then when all twelve chambers have been formed, the leadpipe can be drawn over the mandrel. The chamber process gives the pipe its general shape so the mandrel does not stretch and pull the brass as it is drawn (Monette Interview).

The leadpipe is a very personal part of the trumpet. It is the single most important factor in determining the way the instrument responds and focuses, and how stable it will feel. Because of this, a change in leadpipe will be the most significant modification to most instruments. The player must consider the type of playing the trumpet will be used for, as well as the playing characteristics of the individual player, before changing to any modified leadpipe.

Chapter III

The Tuning Slide

The tuning slide, often called the tuning bow or crook, is a short piece of cylindrical tubing that connects the leadpipe to the valve section. There are basically two types of tuning slide setups. The most common (called a standard tuning slide) is configured so that the top and bottom tubes of the slide fit inside the sleeves of the leadpipe and the valve section. The second (referred to as the over/under style) is designed so that the top tube of the slide fits over the leadpipe and the bottom tube fits into the sleeve of the valve section.

The tuning slide has two functions in a standard design instrument (as opposed to a tuning bell design; see Chapter V):

1. Overall pitch adjustment of the instrument.
2. The most efficient location for the water key.

Tuning slides have been designed with several different shapes from a very square bend to as round or as gradual a curve as possible. The Bach standard C trumpet tuning slide has a sharper bend (almost square in shape) than the Bach B-flat tuning slide. The standard C trumpet tuning slide tends to give the player more resistance than is often desirable, so many players use a

B-flat slide cut down to fit the C trumpet. This is done by cutting the sleeves shorter so that they fit into the slide receivers of the C trumpet.

The over/under tuning slide setup has been used for several years. Many trumpet players have sent their Bach C trumpets to the Schilke factory and had them make a tuning slide and leadpipe in the over/under fashion. This serves three purposes:

1. It makes it possible for the length of the leadpipe taper to be considerably longer.
2. Full length B-flat leadpipes can be utilized.
3. The instrument should have less resistance.

The biggest problem caused by the tuning slide occurs when the slide is pulled out to bring the instrument to the correct pitch. When the slide is pulled, the bore of the instrument is altered considerably in the two areas at the ends of the slide. Players who have to pull tuning slides more than normal will sometimes use tuning bits to take up some of the gap. Tuning bits are short pieces of cylindrical brass tubing inserted into the tubes that receive the tuning slide. Osmun Brass Instruments of Belmont, Massachusetts will make a set of tuning bits (see Appendix II) as will Giardinelli in New York City, or The Schilke Company in Chicago. Any brass repair facility can make up a set if the right size tubing is available. The only real problem that may be caused by these tuning bits occurs if

one needs to remove them quickly. They may become corroded or fit too tightly to be removed in the event that the pitch is higher than normal.

Custom Tuning Slides

Osmun stocks the B-flat tuning slide cut to fit the Bach C trumpet. Giardinelli will also make the same slide, or a performer can order the parts and have any repairman put them together.

The setup designed by Bob Malone of Los Angeles gives the trumpeter a choice of a C or B-flat slide, and Mr. Malone rebuilds it to work with his leadpipe. His setup is longer than the Bach 25C and leaves the player with less adjustment on the tuning slide. His system, however, is not nearly as short as the Bach 25S configuration (Malone Interview).

Clifford Blackburn makes four basic tuning slides with the choice of two different bow bends and sleeve arrangements. The first slide is shaped much like the standard Bach slide with its very sharp corners. The second has the same bow as the first, but with the over/under setup. The third and fourth are made with each of the above-mentioned slide configurations and have

a round bow for the least amount of resistance (Blackburn Interview).

A repairman in the Pittsburgh area, Ted Woehr, has designed a tuning slide that works very well, even though acoustically (due to the sudden change in bore size) it should not work. He uses a Mirafone French horn tuning slide made of nickel silver, .470" bore size (a large bore Bach is .462"), and rebends the bow to fit the Bach C trumpet. The bend is not as sharp as a normal Bach slide, and Mr. Woehr does not use a brace between the top and bottom of the bow. He also uses a water key stopper with a nipple to eliminate any disruption in the tubing (McKie Interview).

Pitch Finders

A "Pitch Finder" is a device that enables the player to make pitch adjustments mechanically rather than physically with the embouchure. Designed by Jack Holland of St. Louis, the "Pitch Finder" attaches to the main tuning slide and can move the slide to three settings. With a spring-loaded mechanism, the main tuning slide always returns to the central location when the "Pitch Finder" is not in use. Jack Holland's "Pitch Finder" is available in several different models, some with thumb

trigger, swivel mounted finger rings, and different mounting brackets (see Figure 2).

Fig. 2-A.

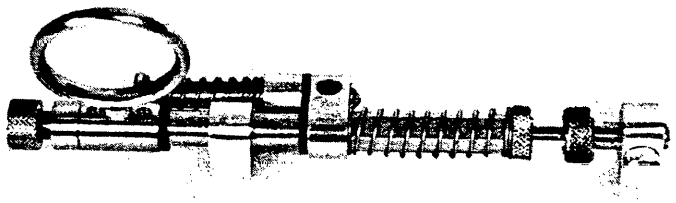


Fig 2-B.

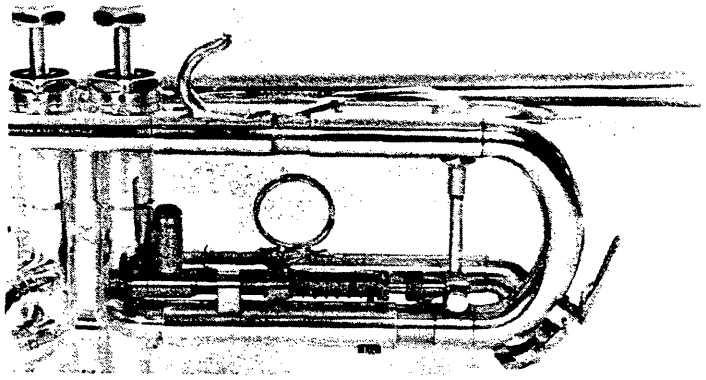


Fig. 2-A. The "Pitch Finder" by Jack Holland. Fig. 2-B. The "Pitch Finder" installed on a C trumpet (Holland pamphlet 1).

The "Pitch Finder" can be a help in conserving a player's endurance. With the "Pitch Finder" a player does not have to manipulate the pitch with the lips as much as he or she would normally, cutting down on the physical strain and enabling him or her to play longer.

The main problem with the "Pitch Finder" is that of tuning slide adjustment. If the player needs to set the main tuning slide quickly (the central position on the "Pitch Finder"), he or she must move the calibrated

indicator by turning the threaded nut. This could be a problem if, for example, the trumpeter is placed in a position in which he or she is tacet for a long period of time and the pitch has changed since the last tuning.

The tuning slide is a good way to fine-tune the leadpipe. Changing the tuning slide will probably not make a big improvement in intonation, but may increase or decrease the amount of resistance that the player will experience. Some tuning slides will help the focus of the sound.

Some trumpet players look at the "Pitch Finder" as an unnecessary gadget and feel that if the intonation of an instrument is so poor that a "Pitch Finder" is needed, perhaps a new trumpet should be purchased. Other players see this modification as a great aid in their intonation adjustments. Nevertheless, the "Pitch Finder" has established itself as a legitimate tuning compensator among many professional trumpeters (see Appendix I).

Chapter IV

The Valve Section

The main body of the trumpet from the tube which receives the tuning slide to the stem of the bell is known as the valve section. This is a cylindrical set of pipes, all of the same bore size, that includes three pistons and three valve slides. The up and down positions of the pistons direct the air column through the various lengths of tubing necessary to produce the desired harmonic series, thus enabling the trumpeter to play a chromatic scale over the entire range of the instrument.

The valve section is often a prime source of problems in intonation, response, and consistency in the way the trumpet performs. The main problem with the valve section occurs when the holes in the pistons do not line up with the ports in the valve casings. The slightest misalignment can make a big difference in the way the instrument plays. Most of the newer instruments can be aligned by a qualified repairman, but many trumpets cannot be put into alignment because the ports were cut in the wrong places (Blackburn Interview).

Most alignment problems in newer trumpets are due to inaccurate assembly at the factory. The valve guides on the Bach instrument, for example, are ground down in the factory to fit loosely into the valve grooves. This allows the pistons to work much more freely when the trumpet is new, during the breaking-in period. However, the loose fit allows the pistons to twist in the valve section and, consequently, the ports frequently do not line up (Blackburn Interview). The first step to improving the alignment on most new Bach trumpets is to replace the valve guides with new ones from any parts supplier. Other problems occur when the assembler does not check the felts or corks to see that they are the precise size needed for a perfect alignment.

Valve Alignments

A valve alignment consists of two considerations: (1) The alignment of the valve horizontally and, (2) the alignment of the valve vertically. Bob Reeves is probably the premier specialist in valve alignments. Several of the trumpet players in the survey (see Appendix I) have had Mr. Reeves do valve alignments on their instruments. Mr. Reeves has designed a quick test to find out if the valve section of a trumpet is

misaligned. One should play a two octave arpeggio from low C to high C (no valves down), then proceed through the rest of the valves (2nd valve, 1st valve, 3rd valve). At this point the player is to ask himself two questions: (1) Does each arpeggio blow the same and, (2) does each arpeggio sound the same. If the answer is negative to one or both of the questions, the valves are probably misaligned. Mr. Reeves says, "Even if it (the misalignment) is as little as six thousandths of an inch, that is still the difference between a medium large bore trumpet (0.459) and a medium bore trumpet (0.453)" (Reeves).

There are several other repairmen who do valve alignment work (see Appendix II), but Bob Reeves is the most respected repairman in this field as indicated by the survey of professional trumpeters (see Appendix I).

Other Valve Modifications

There is some evidence that valve casings may play a role in intonation and resistance of the trumpet. Michael Tunnell reported in the International Trumpet Guild Journal that the length of the valve casing may make some difference in the way the trumpet plays:

> Anyone who finds the trumpet's upper register tight or stuffy should try loosening the bottom valve caps, particularly the third valve cap. Better yet, loosen all caps one or more turns and put on a "Grime Gutter" (see Figure 3). If all the bottom caps are loosened until they are held on by only one or two threads (with the Grime Gutter), the main tuning slide must be pulled in as the pitch of the whole instrument is lowered. Experiment to find optimum position of the bottom caps. Anyone who has problems with second valve being sharp should loosen the second cap a little more. (2)

Some players have placed 9/16 inch rubber "O" ring seals (a common plumbing supply found in most hardware stores) between the casings and the valve caps instead of the "Grime Gutter". Both methods add length to the valve casing, but the use of the "O" rings also lets the player make fine adjustments in the way the instrument feels by increasing or decreasing the amount of pressure between the valve cap and casing.

Bob Malone makes a brass ring that fits between the valve casings and the valve caps to serve the same purpose as the "O" rings. Mr. Malone feels it is only necessary to place the spacer on the third valve.

Bob Reeves also does what he calls "Cylinder re-enforcement" in which he modifies the bottom of the

valve cylinder and valve cap. This is mostly for Bach trumpets (Mr. Reeves does not elaborate on what this process involves).

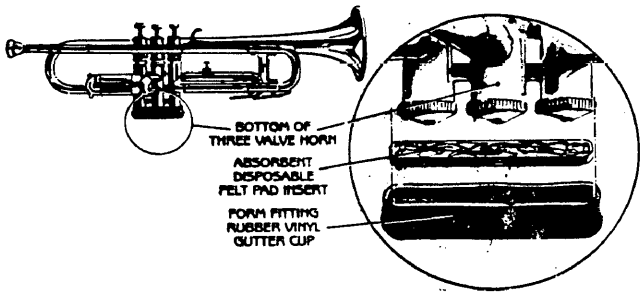


Fig. 3. "Grime Gutter" (International Trumpet Guild Journal 28).

Problems in the valve section are oftentimes overlooked, but there are several fine-tuning adjustments that can be made in this area. Inexpensive modifications such as the addition of "O" rings or valve cap adjustments with the use of a "Grime Gutter" can be performed for under $5.00. Valve alignments are considerably more expensive.

Chapter V

The Bell

The final extension of conical tubing that begins at the valve section and extends outward to the end of the trumpet is called the bell. It is the bell that is mainly responsible for the projection and the refinement of tone quality the trumpet will produce.

The most common method of bell construction is the one-piece bell. The bell is cut from a single sheet of brass, folded and welded down the middle, and shaped over a mandrel. Some companies use a two-piece bell in which the body of the bell and the bell flare are made from two different pieces of brass. The two pieces are then welded together and shaped the same as the one-piece bell.

The most popular C trumpet bells in use today are the Bach 229 and the Bach 239. The 229 has a sound with a big center, powerful projection, and a bright cutting edge at loud volumes. The Bach 239 bell is a brighter-sounding bell, but it is slightly better in tune than the 229. Bach also makes a very dark-sounding bell with the model number 238. This bell is used by a few players who prefer a very dark sound and have the control

to overcome the intonation problems that come with the 238. A combination of gold brass material (also known as ambronze) and a large bell flare give the 238 its almost B-flat trumpet quality.

The intonation problems often encountered with the 229 and 239 bells are flat fourth space E and E-flat, flat fourth line D, and flat C above the staff (not to say that these are the only pitch problems found on this bell or C trumpets as a whole). The high C is an acoustical problem that Clifford Blackburn describes as a "descending harmonic series." The higher that the instrument is played in the harmonic series, the lower the pitch gets (Blackburn Interview). Many players have to counter this problem by playing the high C with the first valve down.

Some of the problems with Bach trumpet bells may be due to a manufacturing technique that is used at the Bach factory. The bell of the trumpet is made in one long, straight piece and then bent into the shape needed to fit the trumpet. In order to bend the bell, it must first be filled with something solid to keep its shape. The substance that the Bach company uses is a mixture of water and detergent which is then frozen before bending. Using a substance that is frozen is the easiest method, because there is no problem in removing the solution after the bending process is completed. The workman just lets the bell warm to above freezing, and the solution

runs out. Another method is to use a substance called "pitch", which is a lead-like material but with a much lower melting point. When the bell is bent, the filling does not always bend true; thus the shape of the bore may tend to be oval throughout the bell bow. Robert Osmun, of Osmun Brass Instruments, has a theory that this alteration in the bore shape is a problem spot in the instrument. Osmun does a modification to the bell bow that rounds the bow back to the original bore shape (Osmun pamphlet 1).

Several custom builders have designed bells that have the same sound characteristics as the Bach 229, but with slight alterations to compromise the problems in the traditional 229 bell (see Appendix II). The trend at this time seems to be toward very heavy bells. Clifford Blackburn attributes this to several things: (1) concert halls are getting bigger, (2) orchestras have to play at very loud volume levels, (3) the heavier bells project further and the sound does not break up as easily, and (4) the bell responds with a much warmer and more lyrical tone at soft volumes (Blackburn interview). The Monette trumpets (Chicago) and the Osmun Shires Custom trumpets also have very heavy bells on their instruments (see Appendix II).

Some designers believe that more projection may be achieved by changing the material used in the bell ring (a wire-like piece at the end of the bell flare with the

end of the bell rolled back over and sealed with solder). One of the secrets of the Monette trumpet is the material in the bell ring (Monette Interview).

Tuning Bells

A bell-tuned trumpet does away with the braces between the bell and the trumpet, and the brace work is replaced with a sliding guide rail. The guide rail is mounted on the valve section where the middle brace would normally be. A piece of tubing extends out of the valve section for the small end of the bell to fit over or into. These two points are the only areas of contact between the bell and the trumpet (a standard trumpet has four or five areas of contact between the bell and the body of the instrument).

The bell-tuned trumpet is adjusted by sliding the bell back and forth to the desired position. The tuning slide is then pushed all the way in. Most tuning bells have one or two set screws (one on the guide rail and another may be placed at the small end of the bell).

The advantage of the bell-tuned trumpet is that the gaps at the end of the leadpipe and tuning slide are gone. This should improve the response of the trumpet, and there should also be less resistance. According to a

study done in 1978 by Colin Bloch for the Schilke Company, the bell-tuned trumpet has a much better intonation pattern than that of a standard slide-tuned instrument (see Figure 4).

There are several problems with the bell-tuned trumpet. When the brace work is removed to make the bell mobile, the instrument is much more fragile. The instrument also may not have as much projection as a standard design trumpet. This is because much of the vibration is lost from the bell since it rattles away from the body of the trumpet (Blackburn Interview). Another problem may occur when a fast tuning adjustment must be done. The screws must be loosened before the bell can be moved.

In this as well as in any case, the trumpeter must decide whether the advantages of the bell-tuned trumpet outweigh the disadvantages. A removable bell does make it easier for the trumpet player to try different bells on the body of the trumpet.

The most important consideration in choosing a bell is that it is compatible with the leadpipe. Consultation with the designer may be very beneficial in the search for a matching bell-leadpipe combination.

Fig. 4-A and 4-B. A comparison of tuning patterns between bell-tuned and slide-tuned trumpets (Bloch 5, 6).

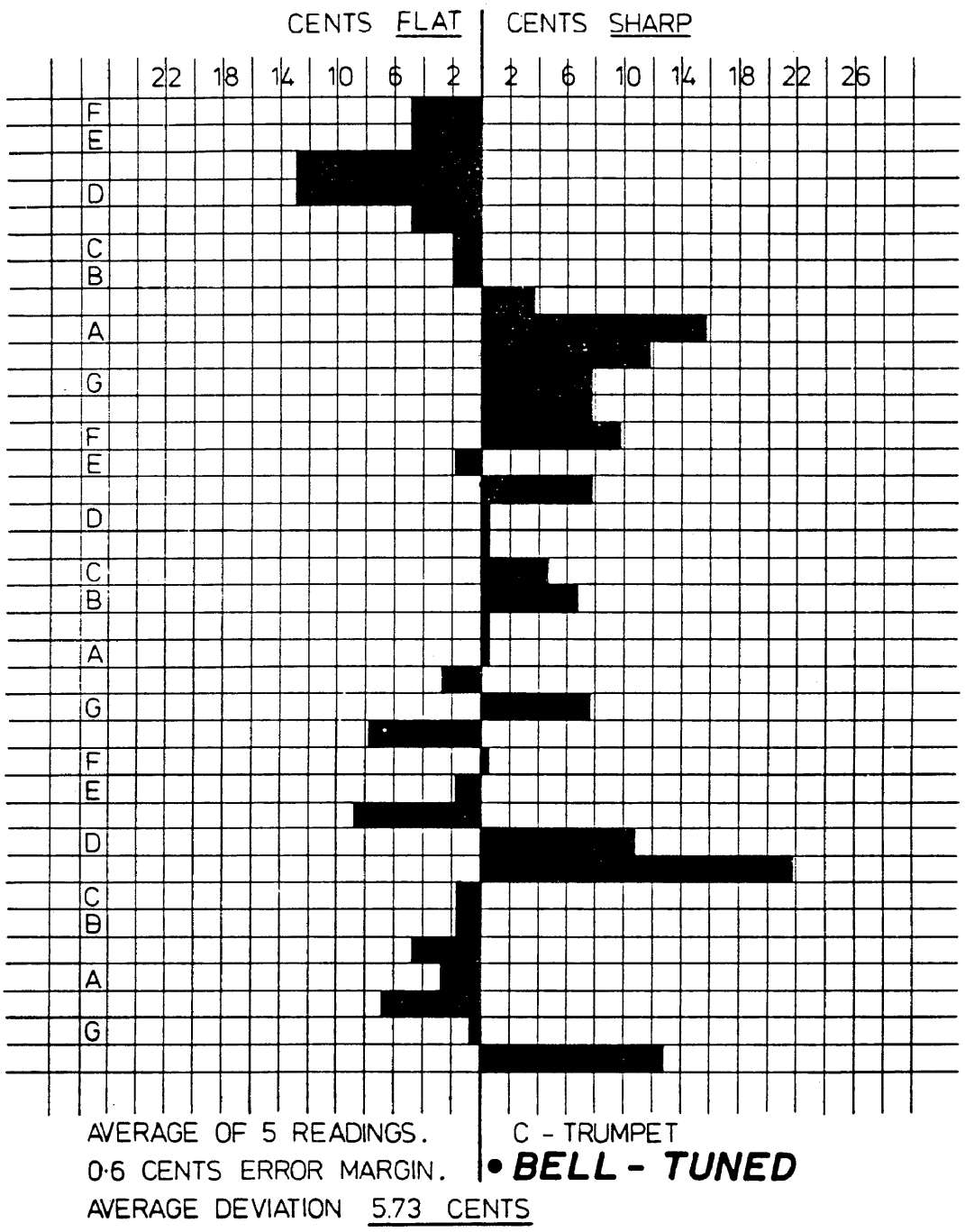
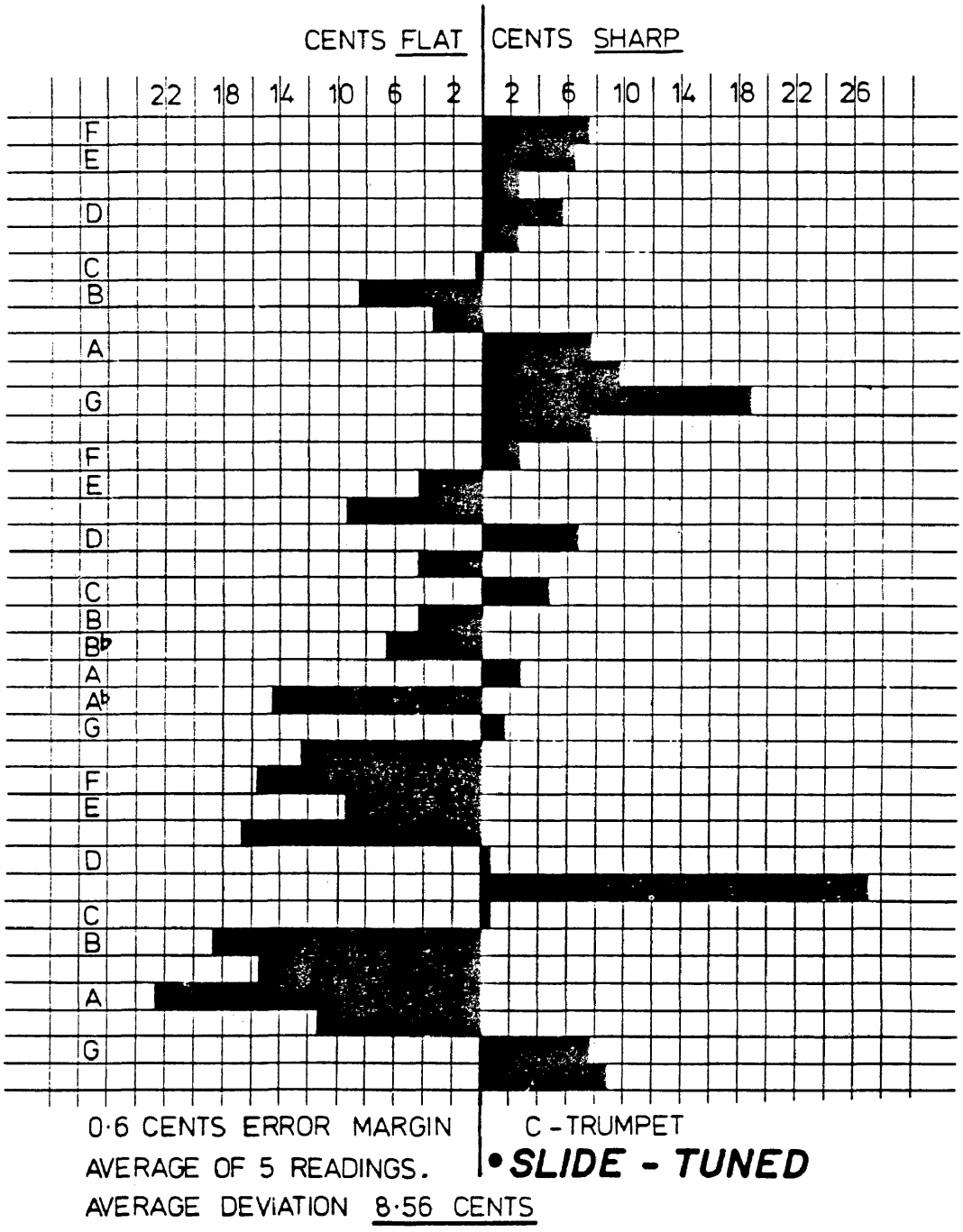


Fig. 4-B.


CENTS FLAT
CENTS SHARP
22 18 14 10 6 2
2 6 10 14 18 22 26
F
E
D
C
B
A
G
F
E
D
C
B
B♭
A
A♭
G
F
E
D
C
B
A
G
0·6 CENTS ERROR MARGIN
AVERAGE OF 5 READINGS.
AVERAGE DEVIATION 8·56 CENTS
C - TRUMPET
• SLIDE - TUNED

Chapter VI

Conclusions

The basic Bach C trumpet has been, and still is, the most commonly used C trumpet among professional trumpet players as well as many college students. There are, however, very few players who use a stock Bach C trumpet with a standard 25C leadpipe (none were found in the survey). The sound that can be produced from the Bach has become the standard in American orchestras, and this has made its design the one to copy for companies who would market a C trumpet. The popularity of the Bach C trumpet has prompted many designers to attempt improvements on it. Almost every builder of custom C trumpets has started by working on Bach modifications (Dave Monette, Clifford Blackburn, and Robert Osmun all worked on Bach trumpets before building their own). This is unfortunate for the trumpeters who own other makes of instruments, because very few custom modification parts are available for C trumpets manufactured by companies other than Bach.

Even though the Bach C trumpet is so widely used, the basic stock instrument is outdated. When most players purchase a new Bach C trumpet, they must also have some work done before they ever use the instrument. This can raise the cost of the Bach C trumpet considerably. If the Bach company is to remain at the top of the C trumpet market, they must invest heavily in research and development. They should also talk with the leading players to determine what they are looking for.

Some of the companies that mass-produce C trumpets have seen the need to build a better instrument, and have begun to spend a great deal of money in the area of trumpet research. Yamaha has been a major leader in the development of several new models of C trumpets, including the 6445 and two new heavy trumpets (one of yellow brass and the other of gold brass) (Woody Interview). United Musical Instrument Company, the maker of Benge trumpets, has developed a new C trumpet called the "Leonore", model 90-C. Chuck Ward of Benge has this to say about this new Benge C trumpet:

> My goal was to design a trumpet that played as well as the "top seller", but had better intonation. I feel that we achieved that goal, but marketing a new C trumpet against an established, well accepted horn is an uphill struggle. (Ward Letter)

Most designers and players recommend the following method of improving an instrument. The best place to begin is with the mouthpiece and work out (leadpipe, tuning slide, and so on) (McKie Interview). But before the trumpet player starts spending money, much research should be done. Consultation with teachers, professional trumpet players, and designers is the best place to begin. If at all possible, the player should try the equipment in a real performance situation and record the performance. Several companies will send parts out on a trial basis for this purpose.

The Modification Process

Dave Monette says that some of the problems with C trumpets are caused by the mouthpiece itself. No company makes a mouthpiece designed specifically for the C trumpet (Monette Interview).

After the player feels that he or she has found a mouthpiece that will do the job, then the search for the right leadpipe begins. This may take a great deal of time because there are so many to choose from. The leadpipe may change intonation, the amount of resistance, and, to some extent, the tone quality of the instrument. The trumpeter should not solder the leadpipe on the

trumpet the first day, but tape it alongside the old pipe and try it for a week or two. This will give the player a good chance to get used to it without spending extra money to find that the new pipe is no better than the old one.

If a new leadpipe does not raise the playing quality of the trumpet to a suitable level, a valve alignment or a new tuning slide may be the next step. Both of these areas can affect the way the trumpet blows as well as its intonation. Inexpensive modifications, such as the addition of "O" rings on the bottoms of the valves or replacing the water key with an Amado water key, may also improve the performance of the instrument.

The last area of modification is the bell. This can be one of several custom bells, a tuning bell conversion, or modifying the old bell by rounding out the bow. The bell shapes the sound and projection qualities that the instrument will produce. A tuning bell should improve overall intonation, but may diminish the instrument's projection and power.

Other possible modifications include the "Pitch Finder" and the AcoustiCoil (an acoustic insert that fits in the bottom tube of the tuning slide to improve response, range, and intonation).

Custom C Trumpets

There are several custom C trumpets now on the market, from B-flat to C trumpet conversions (such as the instruments made by Richard Lowe) to C trumpets made totally from scratch (the Blackburn trumpet). Most custom C trumpets are quite expensive, but are becoming very popular with many professional trumpeters.

Most B-flat to C conversions use some C trumpet parts, but others are made entirely of B-flat parts cut to C measurements. The Richard Lowe C trumpet is made from a Bach ML B-flat valve section (slides cut shorter) and leadpipe, and a Bach C 229 bell. The instrument is bell-tuned and may use other leadpipes.

The Osmun/Shires custom C trumpet is available with a wide variety of bells, leadpipes, and thicknesses of brass. The players may go to the Osmun shop and try all of the different components in various combinations to find the best instrument for their needs.

Clifford Blackburn builds custom C trumpets of 24 gauge gold brass (most trumpets are 14 to 20 gauge, which is much thinner than 24 gauge). The Blackburn trumpet is a heavy, powerful trumpet with very good projection. The Blackburn shop is also set up so that the player can try different bells and leadpipes and find the one that feels the best.

A custom trumpet that has made its way into the hands of more professional trumpet players than any of the other custom instruments of today is the Monette. Dave Monette makes six models of C trumpets, and has all six on display for prospective customers to play test. Mr. Monette has also published a booklet on the selection of a Monette trumpet. In a telephone interview with Charles Schlueter of the Boston Symphony, Mr. Schlueter said, "Soon all trumpet players will be playing on Monette trumpets".

Trumpet players today are faced with a wide variety of performance situations and an increasing difficulty level in the music they perform. The modern trumpeter uses the C trumpet for a great deal of this work from solo performance to chamber music and symphonic playing. Today's trumpeter is very fortunate to have these craftsmen working to improve the quality of the C trumpet.

The selection of a C trumpet is a very individual process, and takes careful consideration by each performer. The trumpet player must take into account his or her strengths and weaknesses, playing characteristics, and the type of performance situations most frequently encountered. There is no one C trumpet that is right for all styles or players, and each individual must test play instruments to find the best trumpet for his or her needs. The search for a good C trumpet is a frustrating

and sometimes expensive process, but will prove to be an invaluable investment once the right instrument is found.

Appendix I

Survey of Professional Trumpet Players and Trumpet Instructors

KEY TO ABBREVIATIONS:
LP = Leadpipe
TS = Tuning Slide
TB = Tuning Bell
WK = Water Key

Bernard Adelstein, Cleveland Orchestra.	Bach, 25A LP, 239 Bell, Reeves Alignment, Bb TS, and Pitch Finder.
K. Craig Bircher, Omaha Symphony.	Blackburn, 19-350 LP, MA24 Bell, Yamaha Valves.
Mel Broiles, Metropolitan Opera.	New Besson Meha.
Walter Chesnut, Univ, of Mass.	Bach Bb cut down to C by Richard Lowe, Lunenberg, Mass. Bach Bb LP, 229 TB Bell.
George Coble, Buffalo Philharmonic.	(1) Benge #90C prototype, 22 Bell Raw brass(2) Monette (no model #) (3) Selmer C75.
Thomas Crown, Chicago Lyric Opera.	Bach, 25H LP, 229 Bell.
James Darling, Cleveland Orchestra.	Bach, 229 bell Bb 25 LP w/ TS fit over the LP by Giardinelli, Opening of LP also opened by Giardinelli.
Steven Erickson, Omaha Symphony.	Bach, 25S LP, 229 Bell, Amado WK, TS cut longer than normal.
Mark Gould, New York City.	Bach, 25A LP, 229 Bell.

Randy Grabowski, Univ. of N. Iowa.	Bach, 25H LP, 229 Bell.
David Greenhoe, Univ. of Iowa.	(1) Bach 25S LP, 239 Bell, (2) Blackburn custom 20 gauge ambronze.
John Henes, Chicago.	Monette MC-96
Charles Hois, Pittsburgh Symphony.	Bach, 25H LP, 229 Bell.
Raymond Mase, American Brass Quintet.	(1) Bach, 25H LP, 229 Bell, Bb TS, (2) Bach, 25A LP, 229 Bell.
Jack McKie, Pittsburgh Symphony.	(1) Yamaha 6445S (Stock) (2) Bach, 7A LP, 238 GB Bell.
Chuck Metsger, Francisco Ballet. the	Bach, Bb 25 LP w/ TS fit over San LP, 239 Bell, Reeves Valve Alignment.
Tony Plog, Los Angeles.	Bach, Malone C1 LP, 229 Bell, Malone TS, Malone Spacer ring on third valve casing.
Charles Schlueter, Boston Symphony.	Monette, model # MC-61X Raw Brass.
Dennis Schneider, University of Nebraska, Lincoln.	Bach, 25S LP, 229 Bell, Reeves VA, custom TS made from Mirafone Horn TS .470" bore.
Alan Siebert, San Diego Symphony.	Bach, Melone C2 LP, 229 Bell.
Roger Sherman, Pittsburgh Symphony.	Bach, Blackburn 1B LP, 229 Bell.
Susan Slaughter, St. Louis Symphony.	Bach, 25A LP, 239 Bell, Willaims VA Midwest Music St. Louis.
Daryl Stehlik, Omaha Symphony.	Bach, 25H LP, 229 Bell, Amado WK, TS brace removed, front bell brace removed, tuning spacers in LP.

Steven Tripolino, Wartburg College.	Bach valve section, Blackburn MA 24 Bell, Blackburn 19-350 LP, Blackbun TS.
John Ware, New York Philharmonic.	(1) Yamaha 6445X Prototype. (2) Bach, Schilke LP w/ TS fit over the LP, Bach 239 Bell.
Ralph (Skip) Wagner, San Francisco Ballet.	Bach, Bb 43 LP, Bb 43 TB Bell, Bb TS.

Appendix II

Designers, Manufacturers, and Distributers of Custom C Trumpets and Modification Equipment

Atkinson Brass Instruments, 447 S. Glenoaks Boulevard, Burbank, CA 91502 Dept. E. Custom trumpet leadpipes.

Vincent Bach Corp, Box 310, Elkhart, IN 46515. 800-348-7567. Bach trumpets, Bach leadpipes, bells, tuning slides, and other Bach parts.

Benge Brass, United Musical Instruments U.S.A., Inc., 33999 Curtis Blvd., Eastlake, OH 44094. (216) 946-6100. Benge trumpets.

Blackburn Trumpets, Route #1 Box 175-A, Decatur, TN 37322. (615) 745-7337. Custom built trumpets, leadpipes, bells, tuning slides, tuning bell conversions, and custom work on instruments other than Blackburn trumpets.

Der Blaserspezialist, GroBherzog-Friedrich-Str. 56, D-6600 Saarbrucken 3, (0681) 6 37 00. Special manufacture of trumpets according to individual specifications.

The Brasswind, 50741 U.S. 33 North, South Bend, IN 46637. 800-348-5003. New and used instruments, Bach leadpipes, bells, and some custom work.

Brass-Woodwind Wonderland, 1322 S. Wabash Ave., Chicago, IL 60616. (312)922-6394. B-flat to C trumpet conversions, and other custom work.

Calicchio Trumpets, 6409 Willoughby Ave., Hollywood, CA 90038. (213) 462-2941. Custom built trumpets.

Jerome Callet, 633 West 130th Street, New York, NY 10027. 800-527-4676. Callet "Hand-Tuned Trumpets", leadpipes for Bach and Blackburn trumpets. Custom work by Peter Bronfman.

Giardinelli Band Instrument Co., 151 W. 46th St., New York, NY 10036. 800-457-7200. New and used instruments, many parts, and custom work of all kinds (tuning bell conversions, leadpipe modifications, B-flat tuning slides to C).

Jack Holland Productions, 2722 S. Brentwood Blvd., St. Louis, MO 63144. (314) 962-2005. Pitch Finder.

Las Vegas Trumpet Company, PST. 3606 S. Highland Ave., Las Vegas, Nevada 89103. (702) 368-0490. New instruments, custom trumpets, bells, leadpipes, and tuning bell conversions.

Richard Lowe, Lunenburg, Mass. (May be reached through Walter Chesnut, 114 Farmington RD., Amherst, Mass. 01002.) Builds C trumpet from Bach ML B-flat valve section, C 229 bell, and B-flat leadpipe.

Bob Malone, 2484 S. Sepulveda Blvd., Los Angeles, CA 90064. (213) 465-1294. Leadpipes, tuning slides, third valve extention ring, and custom work.

David G. Monette Co., 323 W. Randolph St., Chicago IL 60606. (312) 427-3388. Custom-built trumpets.

Ed. Myers Co., 1622 Webster St., Omaha, NE. 1-800-228-9188. Replacement parts for most instruments.

Don Novy, 1234 S. Quince Way, Denver, CO 80231. (303) 751-0673. The AcoustiCoil acoustic sound reinforcement device.

Osmun Brass Instruments, 438 Common St., Belmont (Boston), MA 02178. 800-223-7846. New and used instruments, leadpipes, bells, tuning slides, custom built trumpets, and custom work (bell modifications, tuning bits, screw bell conversions).

Pilczuk Accusonic Co., 1100 Orchard Way, Poswell, Georgia 30075. (404) 587-3581. The "Chromatic Chambered Leadpipe".

Bob Reeves, 711 North Ridgewood Place, Hollywood, CA 90038. (213) 465-1294. Valve alignments, valve modification (on Bach trumpets).

Schilke Music Products, 529 S. Wabash Ave., Chicago IL 60605. (312) 922-0570. Schilke trumpets, some custom work, tuning bells.

Richard Smith Musical Instruments, Ltd, 110 The Vale, London N146AY, England. Smith-Watkins Custom Trumpets from hundreds of possible design configurations.

Ted Woehr, Brass and Woodwind Shop, 519 Carothers Ave., Carnegie PA 15106. (412) 276-6899. Mirafone horn to trumpet tuning slide (.470" bore), custom work and rebuilding of Bach trumpets.

Yamaha Musical Products, P.O. Box 7271, Grand Rapids, Michigan 49510. New Yamaha trumpets, and Yamaha replacement parts.

Appendix III

Appropriate Literature for the C Trumpet

The following is a brief list of solo, chamber, and orchestral music that is often performed on the C trumpet. Much of this music is written for trumpets in other keys and must be transposed by the performer (a technique in which all trumpet players need to be proficient). Trumpet parts are written for different keyed trumpets as a tradition, and not necessarily for the instrument that works best.

The literature listed in this section is only a small portion of the vast repertoire suitable for the C trumpet, and should serve as a starting place for the trumpeter new to the C trumpet.

Solo Trumpet Music

Adams. "Sonate for Trumpet and Piano." Comes with parts for B-flat and C trumpet.

Butler. "Excursions into Time." For C trumpet, percussion, and tape.

Broiles. "Vernal Equinox." For trumpet in C and piano.

Copland. "Quiet City." For trumpet, English horn, and orchestra (B-flat trumpet, part but works very well on C trumpet).

Doppelbauer. "Sonata for C Trumpet and Organ."

Gallois Montbrun. "Sarabande et Finale." For trumpet in C and piano.

Hindemith. "Sonate for Trumpet and Piano." Written for B-flat trumpet, but many players perform this piece on the C trumpet.

Hubeau. "Sonate for Trumpet and Piano." Comes with parts for B-flat and C trumpet.

Hummel, (Bertold). "Sonatine for C Trumpet and Klavier." (Bertold Hummel is the great great grandson of Johann Nepomuk Hummel).

Hummel. "Concerto." For trumpet and orchestra in E or E-flat major. (Some players use a C trumpet to perform this piece in the original key of E major.)

Jolas. "Episode Troisieme, for Trumpet in C." For trumpet alone.

Jolivet. "Concertino for Trumpet, Piano, and Strings." (C trumpet part).

Jolivet. "Concerto No. 2." For trumpet and orchestra (C trumpet part).

Plog. "Animal Ditties." For Trumpet, Piano, and Narrator (C trumpet part).

Sampson. "Mysteries Remain." (B-flat trumpet part with organ, but works well on the C trumpet.)

Suderburg. "Chamber Music VII, Ceremonies for Trumpet and Piano" (C trumpet part).

Tomasi. "Concerto for Trumpet and Orchestra" (C trumpet part).

Chamber Music for the C Trumpet

Albinoni. "Suite in A." For brass quintet (C trumpet parts but may work better with a higher key trumpet on the first part).

Bach. "Air on the G String, from suite No. 3 in D." For brass quintet (B-flat parts but works well on the C trumpet).

Bach. "Fantasie." For brass quintet (C trumpet parts).

Bach. "Prelude and Fugue in G Minor." For brass quintet (C trumpet parts).

Bolling. "Toot Suite." Uses C trumpet for the first movement.

Bozza. "Sonatine." For brass quintet (C trumpet parts).

Casella. "Sinfonia." For C trumpet, clarinet, cello, and piano.

Gabrieli. "Canzona per Sonare No. 2 and No. 3." For brass quintet (B-flat parts but works well on the C trumpet).

Hopkins. "Brass Quintet I." C trumpet parts.

Moussorgsky. "Hopak." For brass quintet (C trumpet parts).

Poulenc. "Sonata for Horn, Trumpet, and Trombone" (C and B-flat trumpet parts).

Renwick. "Dance." For brass quintet (C trumpet part).

Stravinsky. "Fanfare for a New Theatre." For two trumpets in C.

Walker. "Music for Brass." For brass quintet (C trumpet parts).

Orchestral Literature
Commonly Performed on the C Trumpet

Beethoven. "Leonore Overture No. 2." Written for trumpet in E-flat.

Beethoven. "Leonore Overture No. 3." Written for trumpet in B-flat.

Copland. "Appalachian Spring." Written for trumpet in B-flat.

Debussy. "Fetes from Nocturnes." Written for trumpet in F.

Hindemith. "Symphonic Metamorphoses on Themes by Weber." Written for trumpet in B-flat.

Mahler. "Symphony No. 5." Written for F and B-flat trumpets.

Mussorgsky. "Pictures at an Exhibition." Written for trumpet in C.

Ravel. "Daphnis and Chloe". Written for trumpet in C.

Respighi. "Pines of Rome." Written for trumpet in B-flat.

Schumann. "Symphony No. 2." Written for trumpet in C.

Shostakovich. "Symphony No. 5." Written for trumpet in B-flat.

Strauss. "Till Eulenspiegel's Lustige Streiche." Written for trumpet in F.

Stravinsky. "The Firebird." Written for trumpet in C.

Stravinsky. "L'Histoire du Soldat." Written for trumpet in B-flat and cornet in A.

Tchaikovsky. "Symphony No. 4." Written for trumpet in F.

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