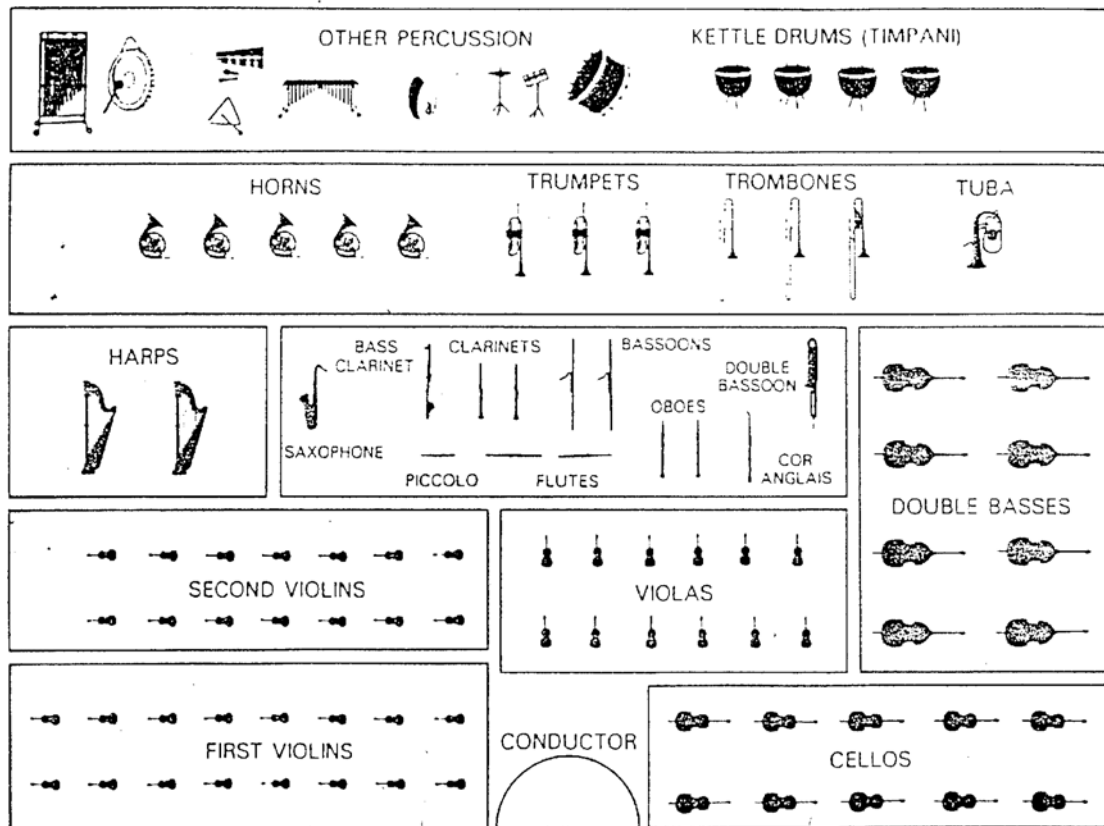


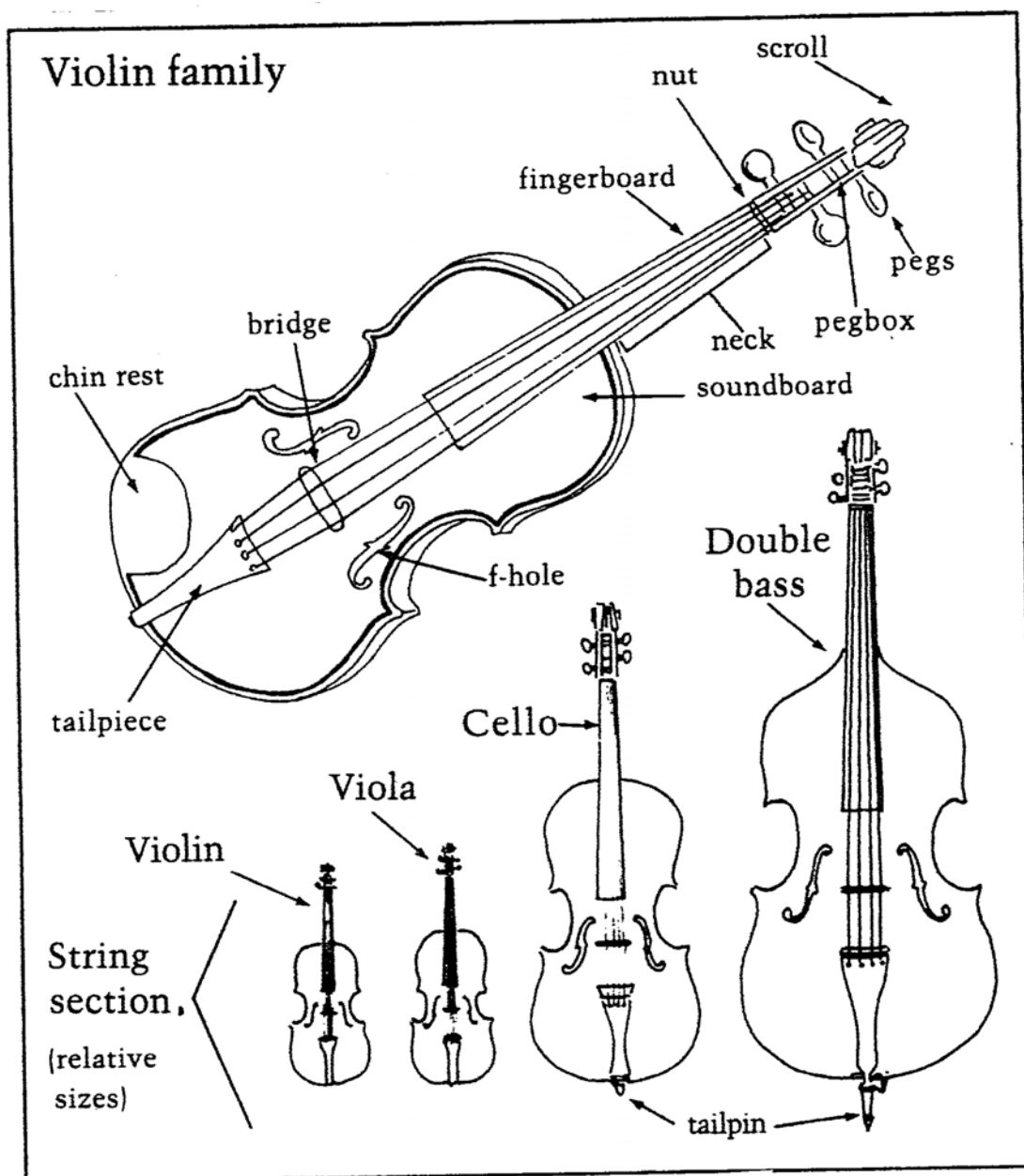
# INSTRUMENTS of the ORCHESTRA

The instruments of the orchestra are divided into four sections: Strings, Woodwinds, Brass and Percussion. If you look at the diagram of the orchestra below, you will see that there is a set number of each instrument and a set seating pattern. This was designed so that each instrument can be heard clearly and to give a sense of balance, a little like stereo sound from two speakers. Groups of the same instrument usually play the same notes, in this way the group of 16 1<sup>st</sup> violins all playing the same line of music together in unison are able to be heard over some of the louder brass instruments and also this gives a great depth of sound. One violin alone would sound thin and whispery, if you could hear it at all. The 2<sup>nd</sup> violins also play as a group, but a different line of music to the 1<sup>st</sup> violins. So we have a total of 32 violins divided into two groups and playing two different lines of music. The strings sections, with 60 players, makes up approximately 2/3 of the orchestra.

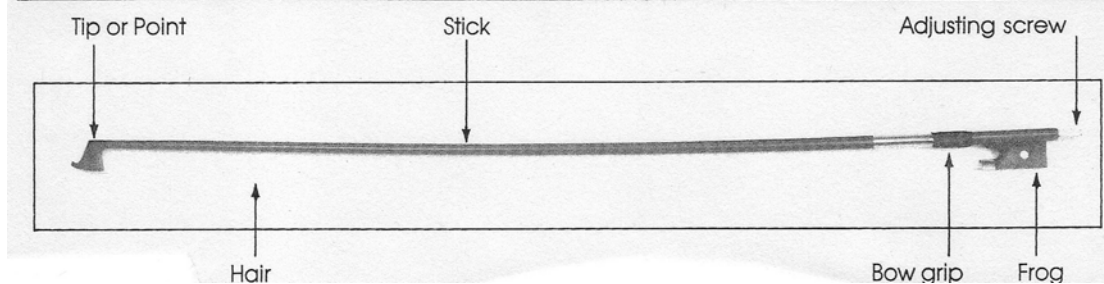


## STRING INSTRUMENTS

The Violin, Viola, Cello (short for violoncello) & Double Bass (or contrabass) are all generally played with a bow, although the strings can be plucked with a finger (pizzicato). The bow consists of a flexible wooden stick with strands of horsehair attached to each end and tightened. Rosin (a transparent gum resin) is rubbed over the hair giving it a powdery surface that more easily grips the string when it is drawn across it. This causes the string to vibrate which is what makes the sound. Each instrument has a curved back, rounded shoulders, thin body, and 4 strings. They have no frets (ridges across the neck that stop the string at set points each making a different note of the chromatic scale) and so they rely on the ears of the player to know exactly where to place the finger to stop the string. Being fretless they can also slide from one note to the next, and play notes in between those of our chromatic scale. All the modern string family are descendants of the medieval Viols.



## PARTS OF THE BOW

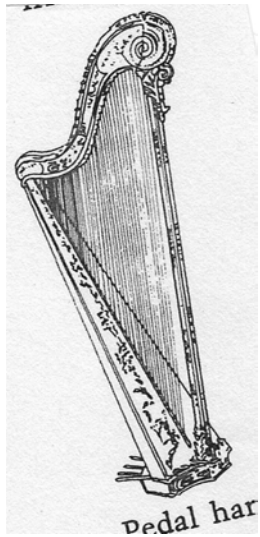


### TERMS USED BY STRING PLAYERS:

Pizzicato (pizz.)	Pluck the string with the fingers
Arco	Played with the bow
Double Stopping	Playing two strings at the same time
Triple Stopping	Playing three strings at the same time
Tenuto	Held
Portamento	Smooth gliding from one note to another
Vibrato	A small rapid movement of the finger on the string to make the note waver up and down in pitch slightly to give feeling and expression.
Spiccato	Bouncing the bow on the strings.
Sul ponticello	Playing with the bow, on or near the bridge
Sul tasto	Playing with the bow, on or near the fingerboard
Harmonic	An overtone produced by light finger pressure on the string.
Tremolo	Rapid bowing up and down, using only a tiny length of bow.
Glissando	Sliding a finger up or down the string.
Con Sordini	With mutes (small rubber stop on bridge used to muffle sound.)
Divisini	Division of that line of music into two parts so that the group playing that line split into two or more smaller groups.
a.2, a.3, a.4, etc	Divide into the specified number of parts.
Unis	All play together in unison
V (above a note)	Up bow
∩ (above a note)	Down bow
+ (above a note)	Pluck the string with the left hand
o (above a note)	Open String (no fingers of the left hand stopping the string)

The diagram below shows the tuning of the open strings of each instrument:



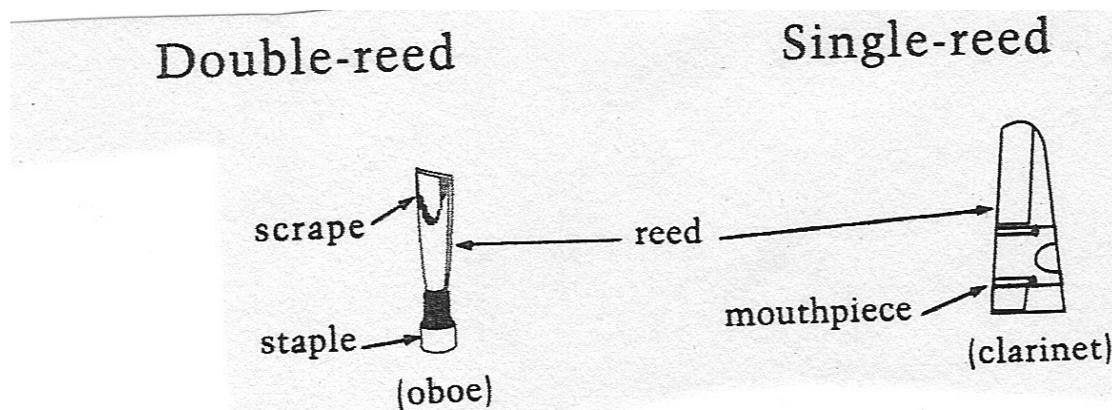


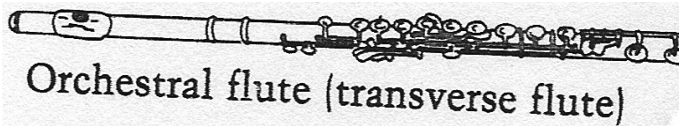
**HARP:** Harps have an arched neck at the top, which is attached to a soundboard that runs on a diagonal down to the base. A series of parallel strings run from the soundboard to the neck increasing in size as the distance between the two widens. These strings are played by plucking with the fingers. It took a long time to establish the harp in the symphony orchestra, but it has now held a regular place there since the time of Beethoven (c.1800). Harps are still found in a variety of different forms as folk instruments in Africa, Asia and Europe. The medieval harp was tuned to one diatonic scale. Strings had to be held to shorten their length if the player wanted to use notes outside the scale it was tuned to. Shortening the string could raise the pitch of the note a semitone to play accidental notes. From 1600 - 1800 harp makers worked on developing harps that could play a full chromatic scale and therefore play in any different key. The

most satisfactory solution was the 'double-action pedal harp' perfected by Sebastien Erard around 1810. Seven pedals are attached to the base of the harp, one for each note of the diatonic scale. When pressed each pedal has two positions, raising all the strings tuned to that letter name either a semitone or a tone. The modern harp now has a range from Cb two octaves below middle C to E# two octaves above middle C. Chords are often played arpeggio style on the harp and a glissando is also very effective.

### WOODWIND INSTRUMENTS

The woodwind family of instruments are given this name because they have developed from instruments that used to be made of wood. No though most are made of metal or plastic. What makes them all similar is that they have a length of tube covered by a series of holes. Covering different holes (originally with the fingers, but now by pressing keys that push down a padded cover) causes the length of tube before the air can escape to lengthen and change the note. Except for the flute, all woodwind instruments use reeds to create the vibration of air into the tube. A reed is a thin flexible sheet of cane. As air is blown onto the tip of the reed it causes it to vibrate against the ridges of an opening that it covers (single-reed instrument) or against another reed (double-reed instruments).





Orchestral flute (transverse flute)

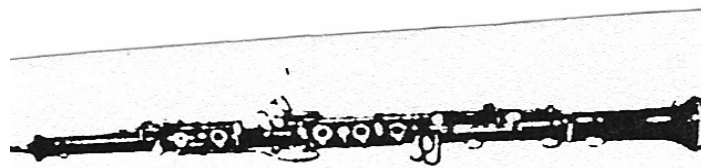


Piccolo

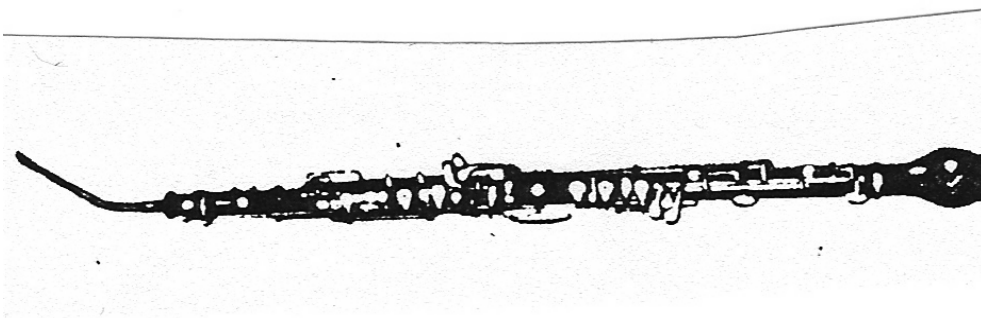
**FLUTE & PICCOLO:** The modern transverse of 'side-blown' flute is made of wood or more commonly metal and is built in three sections known as the head joint,

middle or body joint and the tail or foot joint. The head joint contains the mouthpiece which is basically just a hole in the tube across which the player blows air. The body and tail joints are fitted with a key-system that the player presses to cover the holes. The bottom of the instrument has an open end. The piccolo is a smaller version of the flute and sounds an octave higher.

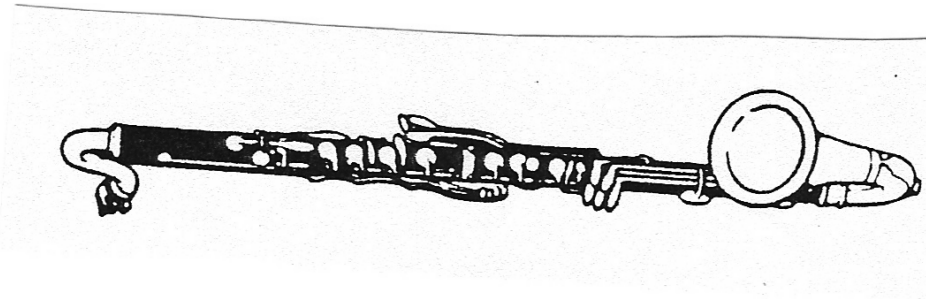
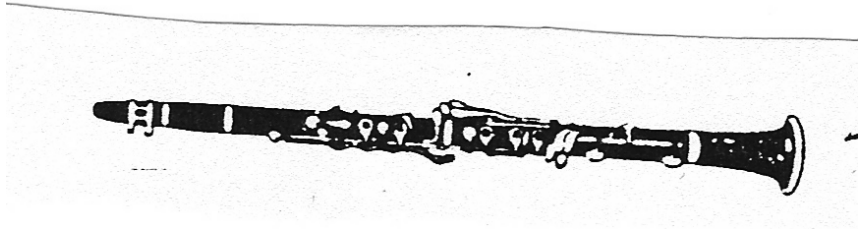
**OBOE** A soprano double-reed instrument developed in the 17<sup>th</sup> century. The instrument has three sections and a conical bore (I.e. it has a cone shaped inside, getting narrower towards the top). The player forces air through a narrow opening between the two reeds which are mounted on a staple and held tightly by the lips. The orchestra tunes to the note A played by the oboe as it can't go out of tune and is high pitched enough to be heard clearly.



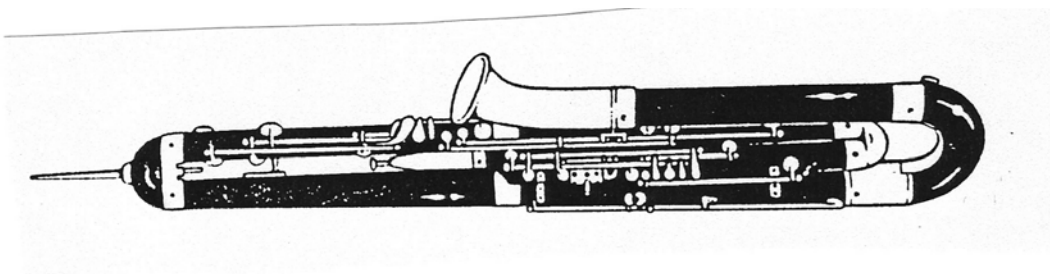
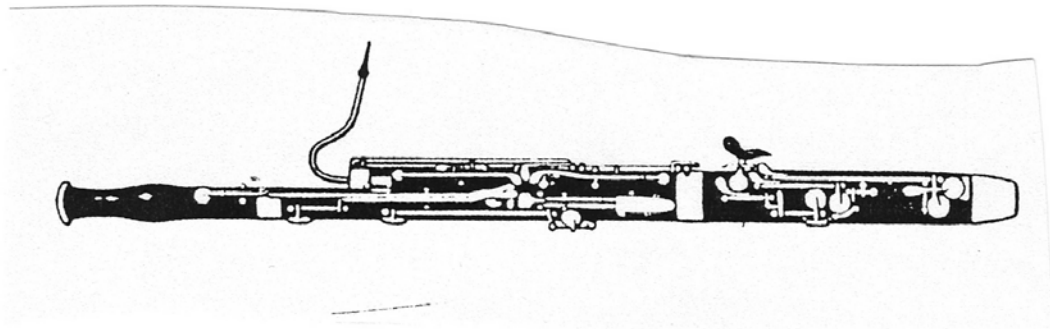
**COR ANGLAIS (ENGLISH HORN):** This is a double-reeded instrument very similar to the oboe but is a transposing instrument a 5<sup>th</sup> lower than the oboe with a darker, more muted tone. It has a rounded end called the bell.



**CLARINET & BASS CLARINET:** A single-reed woodwind instrument with a cylindrical bore, made in a wide range of sizes and pitches from the soprano in Eb, to the contrabass in Bb. Most orchestras have clarinets in A or Bb of an soprano range. The bass clarinet is also in Bb an octave lower than the standard clarinet.



**BASSOON & DOUBLE BASSOON:** A tenor or bass, double-reeded instrument with a long, jointed, doubled (bends back on itself), conical body and a long curved mouthpiece known as a bocal..



## BRASS INSTRUMENTS

The brass sections is situated at the back of the orchestra. These instruments are much louder than the strings and woodwind and their notes can carry a long distance easily. Players of brass instruments change the way they shape their mouth to produce different notes. They can produce 15 different notes with these different mouth positions, this is called the harmonic series. The harmonic series is made up of a fundamental or lowest note and then various notes of its chord i.e.: When a valve is pressed on the instrument it adds an extra piece of tube into the instrument that the air must go through. This changes the fundamental note and gives another harmonic series of 15 notes. All brass instruments except the horn use a cup shaped mouth piece. The notes are made by air vibrating in the tube and then being amplified by the bell. The very early brass instruments had no valves and could only play in one harmonic series, they then had 'crocks' which were pieces of tube that were added in to the instrument to change the harmonic series, but they weren't very popular with composers who had to leave several bars rest to allow time for the players to fit the correct crock onto the instrument.



**TRUMPET:** Early trumpets were a straight cylindrical piece of tube with a cupped mouthpiece, as they could only produce one harmonic series it was only at the very highest notes where most of a scale could be formed and so in the 18<sup>th</sup> century music of such composers as Bach and Haydn they wrote very high difficult virtuosic music for their trumpet players. In the 19<sup>th</sup> century three valves became standard adding in three extra lengths of tube and making it much easier to make a chromatic scale and play a much greater variety of lower notes.

**FRENCH HORN:** Consists of a small cupped mouthpiece attached to a curved conical tube usually coiled in circles ending in a flared bell. Early instruments used crooks to change the pitch of the fundamental. Like all the brass instruments these crooks took time to change and the composer had to allow for this in the music he wrote. The player could also lower the note available by 'stopping', using his fist



inside the bell to block some of the air, this also changed the tone of the instrument giving it a more muted sound. The modern orchestral horns come in either F or Bb and have three valves to open and close lengths of tube allowing for several different harmonic series. There is also a smaller higher horn in F of an alto range that is sometimes used to play the older Baroque music which was often written very high in the top octave of the original instruments range, which was the only way it could make a complete diatonic (major/minor) scale.

**DOUBLE HORN:** The double horn is actually two horns put together to make one.



They are usually the orchestral horns in Bb and F with a 4<sup>th</sup> valve to change between the two. The tone of the horn can be altered in one of two ways, pushing your hand inside the bell of the instrument while playing, which makes it quieter, or by using a mute which gives it a more mellow sound. Mutes are devices placed in the bell of the instrument to change the muffel or alter the sound. For brass

instruments there are a number of different kinds of mutes depending on the kind of tone that is desired. Some examples are the Harmon mute, Cup mute, Straight mute and Solotone mute.

**TROMBONE:** Instead of valves or crocks to change the length of the tube, the trombone has a slide mechanism. There are seven positions that the slide can be placed at, each giving a new harmonic series. A mute can be used in the trombone giving it a very harsh and sinister sound. Trombones are the only instrument in the brass section that do not transpose. As well as the slide mechanism, the tenor to bass trombone has an extra length of tubing that can be brought into place using a small thumb lever. This makes the tube longer and therefore the notes lower, turning it into a bass trombone. There are three trombones in the symphony orchestra, two tenor and one tenor to bass.



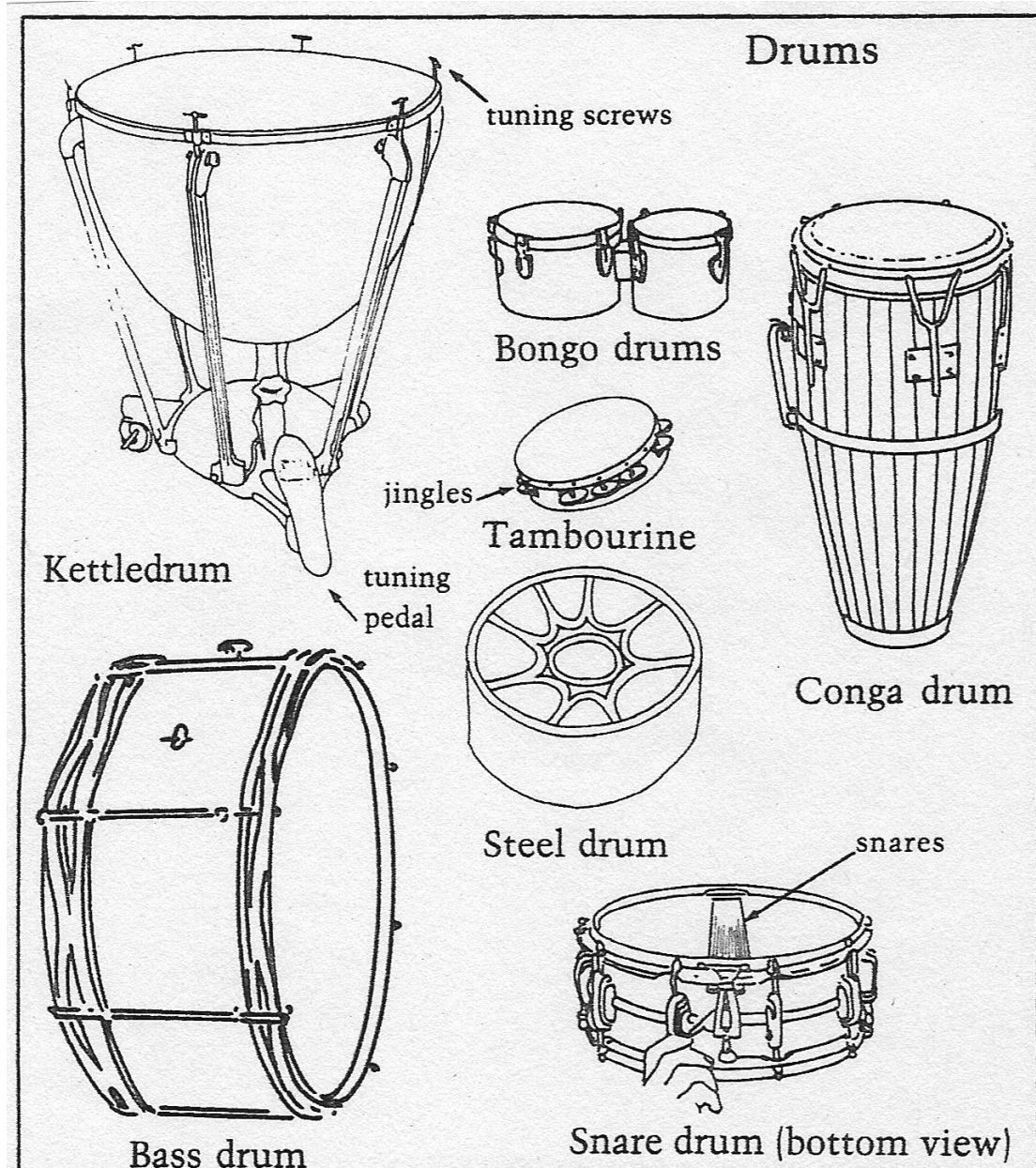
**TUBA:** The Tuba was invented in 1820 and is the largest, lowest sounding and youngest of the brass instruments. The double tuba is like a horn and trumpet put together. The tuba usually plays the bass line, only very rarely getting to play a melody or solo part.

### PERCUSSION INSTRUMENTS

Percussion instruments include all kinds of drums, cymbals, xylophones, anything that you hit to produce the sound. They can be divided into two categories: tuned and untuned. Tuned being a percussion instrument that can play a specified note, or play a tune. Untuned being all the drums, cymbals, etc that make a noise rather than a specific note.

**TIMPANI or KETTLE DRUMS:** These were brought to Europe from Arabia by the crusaders in the thirteenth century. They are made of pig or calf skin stretched over a metal cauldron. The six or eight taps around the edge are used to tighten or slacken the skin to change the pitch of the note they produce. Modern instruments have a foot pedal that adjust the skin so that the player can accurately change the note of the drum during a performance. The timpani come in several different sizes and are the only drum that can play a note of a definite pitch, making it a tuned percussion instrument.





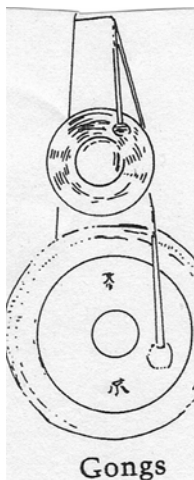
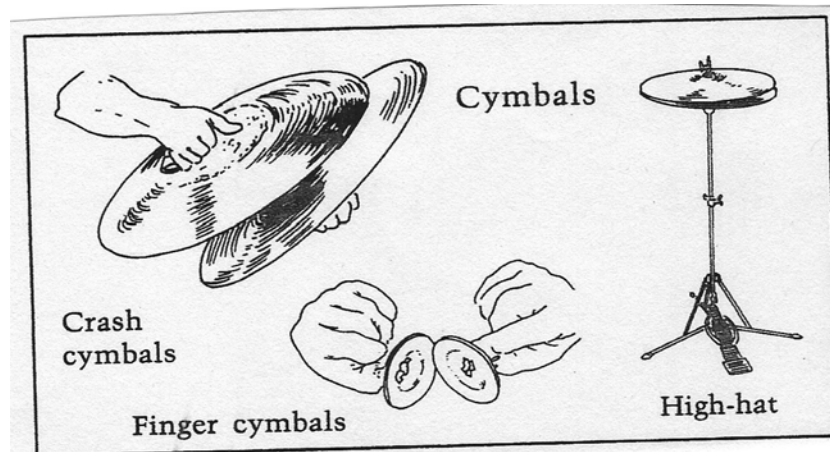
**SIDE or SNARE DRUM:** This drum has metal strings stretched tightly across the lower head of the drum which gives it a sharp, bright sound with a slight rattle.

**BASS DRUM:** This is 4 times larger than a snare drum and is played with a large wooden stick padded at one end to form a ball.

**TOM TOMS:** A set of high pitched drums like the ones on top of a drum kit.

**SLEIGH BELLS or JINGLE BELLS:** A collection of small metal bells attached to a handle.

**CYMBALS:** These are two circular metal plates that are crashed together vertically with a sliding motion, or struck with a drum stick. They have leather straps for handles so that they can vibrate freely.



**GONG:** This came to the orchestra from Asia. It is a heavy metal circle with a turned in rim, a knob in the centre, and hangs from a cord so that it is free to vibrate. It is usually struck with a soft padded stick and gives a deep metallic boom of a definite pitch.

**TAM TAM:** Along with the timpani and the bass drum the tam-tam provides the bass in the percussion section. The tam-tam is often confused with the gong, but there are a number of significant differences between the construction and sound of the two instruments: The tam-tam is a relatively flat disc with a rim around the edge and, unlike the gong, has no knob in the center. Apart from this it has no definite pitch,



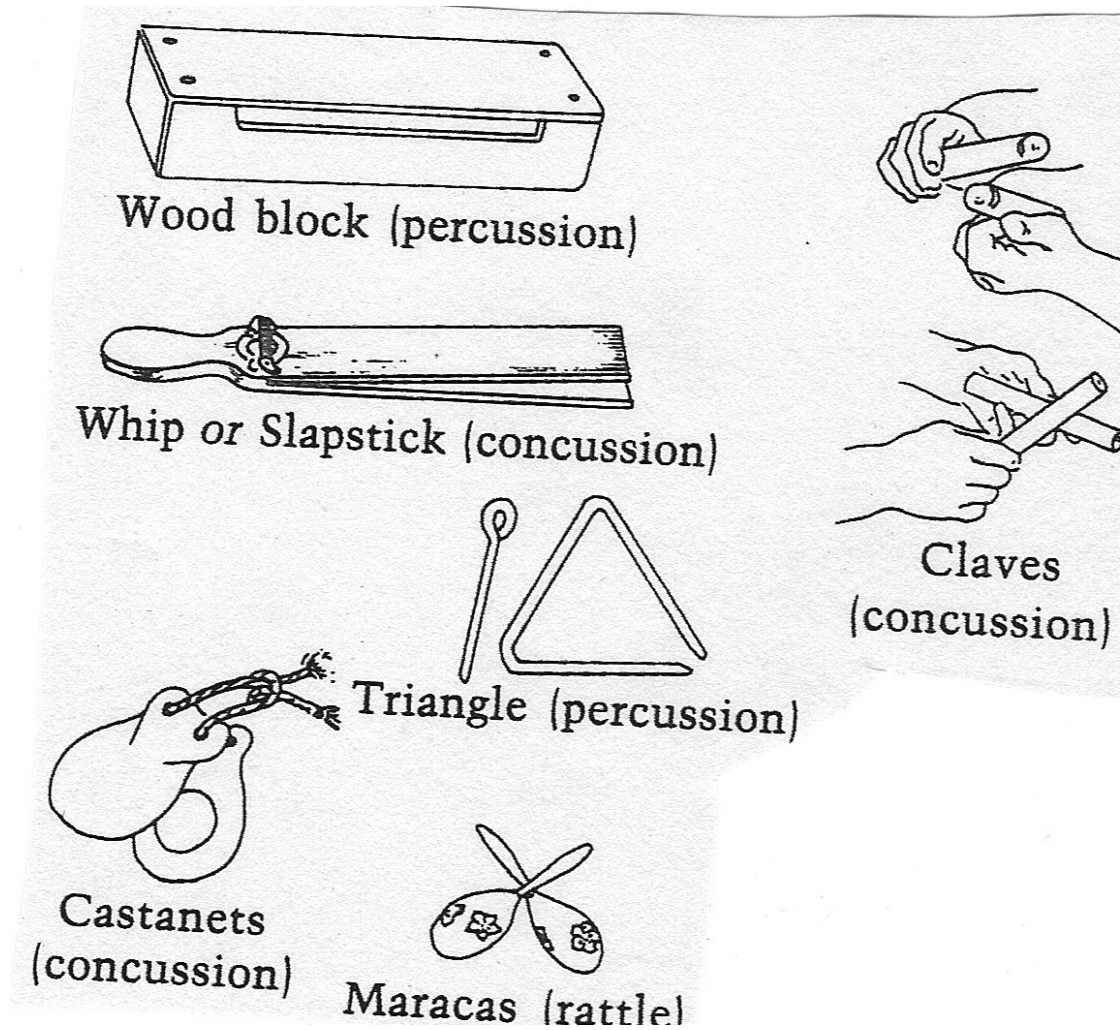
although the pitch of different sized tam-tams does vary, of course. The tam-tam hangs in a metal frame and requires a series of quick repetitive hits getting harder to make it vibrate and therefore sound. The tam-tam originated in china. In western-style symphony orchestras the tam-tam has only been in use since the end of the 18<sup>th</sup> century. In the 19<sup>th</sup> century Romantic composers used the tam-tam more and more frequently, so that it became established as an orchestra instrument at the turn of the 20<sup>th</sup> century. In music of very recent times it has even been used as a solo instrument.

The tam-tam is struck with a variety of mallets, and depending on the mallet and the playing technique has a timbre ranging from dark to screeching to majestic.

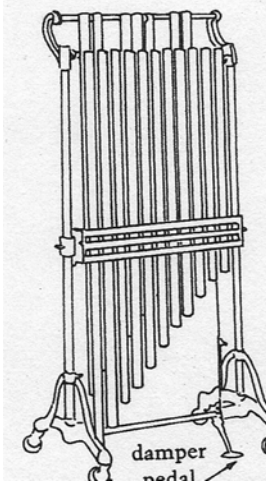
**TRIANGLE:** This is a steel rod bent into the shape of an open triangle. It is held by a string and struck with a metal beater giving a clear bell like sound of indefinite pitch.

**TEMEL BLOCKS or CHINEESE WOOD BLOCKS:** These are skull shaped hollow blocks of wood, painted in fantastic dragon head patterns and graded in size.

**WHIP or SLAP STICKS:** Two lengths of wood hinged at one end and clapped together to produce a sound.



Tubular bells



**TUBULAR BELLS:** These are long metal cylinders hanging in a frame. They are struck near the top with a wooden mallet and sound very like church bells.

**GLOCKENSPIEL:** This German word means 'bell song'. It is a small instrument placed on a table. It has steel bars that are usually struck with hard rubber mallets, but sometimes they are played with a keyboard.

**XYLOPHONE:** Consists of hardwood bars of increasing length laid out in two rows like the black and white keys on the piano. Each bar has a tubular resonator underneath. The bars are struck with mallets and give a hard dry hollow sounds of definite pitch, one octave higher than written.

**VIBRAPHONE:** This looks similar to a xylophone but has metal plates which are struck with a soft headed mallet. The vibrations are picked up and amplified electrically.

