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1. Voice

In singing the vocalcords are the soundsource: Thes two muscles are put into vibration by the air leaving the lungs; the whole body, but mainly the cavities in the head, function as a soundbody, the resonator. A resonator has two functions: it amplifies the tone and it determines the soundcolour because of the shape and material..

Voices are generally classified in high and low female- and male voices, but in practice there is more differentiation.
The voicetype is determined not only because of its range but also because of its tonecolour.
The aspect 'range' has to be looked at carefully:
'high' strongly depends on practice, and also the age at which practice has started;
'low' is for most voicetypes not very important:
most voices go lower than in practice is ever asked for, because - especiallly in combination with other voices or instruments- the voice in a low register will not be heard.

'Colour' can not be seen independently from this: a 'dark' high voice will not sound as such, a 'light' low voice will usually dissapear, etc.
(In the opera-world one distinguises voices often according to 'character': 'lyrical soprano', heroic tenor', 'dramatic' bass etc.)

As a startingpoint for discussing the different voicetypes I will use the 'classical' names and add a few as we go along.

In the 4 part mixed choirs the 2 female vocaltypes are usually notated in the G clef on the topstaff, the 2 male voices in the basscleff on the lower staff. In a 'real' score the G clef is used for the tenor part. The actual sound is an octave lower than the notattion suggests. (sometimes a small 'eigth' is put underneath the clef, sometimes two G clefs are used)

1.1 childrens voice

The range is fairly small:

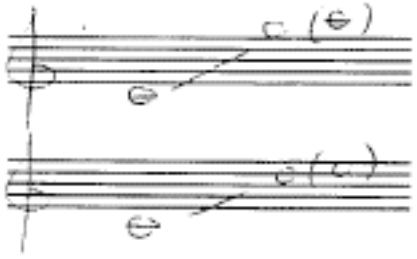
but history has proved that a right and responsible training can lead to the following range:

Extention in the lower register - as nowadays is sometimes done- is of not much use: in the low register a childs voice has no melodic qualities, because of its light character the voice is lost and even more important: it probably does more harm than it does good.

1.2 soprano

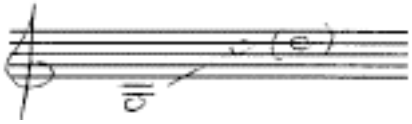
As mentioned before this is the high female voice.
With carefull training the following range can be available:

Untrained:



1.3 alto

Range:



In mixed choirs the alto stays in between the soprano and the high male voices. The female alto is in ensembles usually a 'filling' voice. Often is colour the distinguishing aspect between a non-solistic alto and a soprano. (Untrained women, women 'who can't sing anyway' and sopranos with a 'damaged' voice are often put in with the altos.)

1.4 male alto

By keeping singing in a responsible way during the voice-mutation in puberty, part of the range of the childs voice -not always - can be kept. In this case we have a male alto, with almost the same range as a female alto - the lower part of the range is not important:

There is an important difference: the male alto is a high voice with a clear colour, which makes it much more audible than the female alto: a low voice with a dark colour. In general the male alto is also more powerful.
Historically speaking, caused by various circumstances, there was not much singing being done during the

voicebreak after the Baroque period (there was not much singing by children in an organized situation anyway) resulting in the dissapearance of this voicetype.
In 'light' music, where many enthousiastic singers start at an early age,In de lichte muziek, the male alto can be heard regularly (fortunately not only in light music).

1.5 tenor

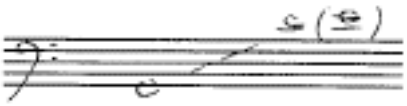
The 'classic' tenors range:

The tenor sounds an octave lower than the soprano.

1.6 baritone

These are usually male voices without the high range and the clarity of the tenor, and with the dark tibre of the bass.(the lower register is again less relevant). In practice this is the voicetype of men who are not used ro singing.

Range:



1.7 bass

The low male voice for which a combination of low range and dark timbre is important.

Range:

2. Bowed instruments

A bowed instrument produces its tone by the friction of the bow's hairs and the string: as a result of the friction the string is pulled aside until the tension is big enough to release it; then the bow 'get hold' of the string again, and the proces repeats itself in a frequency that we hear as a pitch.
The shorter the string, the faster this proces will repeat itself and the higher the produced tone will be.
The string is the soundsource, the soundbody is the resonator.

2.1 The bow

The bow has horse hairs. Modern bows have at the end where the bow is held, a mechanical device that put the hairs under a certain tension. The shape and the weigth of the bow depend on the instrument: the bigger the instrument the shorter and heavier the bow. On the bow resin is applied to increase the friction.

2.2 Violin
(short: vln.)

4 strings, tuned as follows:

At first without, but after the beginning of the 19th century with a 'chin support'.
The words 1st and 2nd violin have nothing to do with the construction of the instrument, they have to do with the playing-parts of the violin: in strings combinations (orchestra, string quartet etc.) the 1st violins will usually play the high voice (part), usually the most melodic one, the 2nd violins play a lower , usually more accompanying part.
Violins are notated in the G clef or violin clef'.

2.3 Alto violin
(short: vla)

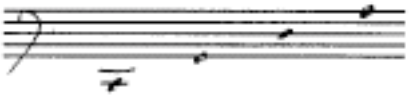
The somewhat bigger - and therefore lower - 'brother' of the violin; its four strings are tuned as follows:

(The alto's top 3 strings are the same as the the low 3 strings of the violin; the lowest string af the alto is another fifth lower.)
Construction and manner of playing do not differ very much from the violin.
Altos are notated in 'concert' using the so-called alto clef: a C-clef on the 3rd line af the staff (in high parts sometimes the G-clef)

NB: a C-clef always indicates the c', it can be put on any line of the staff, never in between.

2.4 Cello
(short: vc or vlc - from 'violoncello'-)

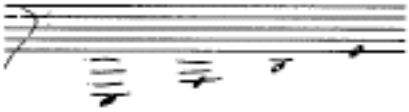
Also 4 strings, tuned an octave lower than the alto:



It is substantially bigger and can therefore not be held: the cello is played sitting and rests on a in heigth adaptable pin.
Notation is 'concert', usually in the F-clef, the high parts sometimes in the tenor-clef (= C-clef on the 4th line) or in the G-clef.

2.5 Double bass
(short: cb - from contrabas-)

Its 4 strings are not tuned in fifths -like the violin, alto and cello- but in fourths:



(A 5-string double bass has an extra low c string)
The double bass is played standing up or sitting on a high stool.
Notation is '8va', meaning that the actual sound is an octave lower than written. In high parts the tenor-clef or the G-clef is ocassionally used.

2.6 Gamba

The gamba's are a group of bowed instruments that dissapeared by the end of the Baroque period (+/- 1750). Starting in the 1950's the so-called 'Ancient Music' (music before the 'classical period: Baroque, Renaisance and Midle Ages) has become increasingly popular and therefore also the instruments and instrument types that were used originally in this music.
Because of this, the instrument is again played often (and built).

- The 'neck' has frets
- The tuning is in fourths and ane third
- There are 6 or more strings
- Looking at the construction, the main difference is that the shoulders 'hang down'.

Therefore: the double bass is originally not a violin-type but a gambat-ype instrument which is also historically correct.
The gamba is played sitting down and held between the knees (without a supporting pin)

2.7 Special playing indications

pizzicato picking the string which gives a dry, short sound (short: pizz.),
this manner of playing changes back to 'normal' after 'arco' (litt. with the bow)

glissando moving the finger over the string during playing.

sourdine a mute that dampend the vibrations of the string, it not only makes the tone softer but it also changes the tone-colour.

3. Wind instruments

In wind instruments the tone is produced by setting in motion the air within the instrument/pipe
In principle the pitch is determined by the length of the pipe, a longer pipe produces a lower pitch than a short one. (It doesn't matter if the pipe is 'rolled-up' or not) Looking at the trombone this is easy to see, with other wind instruments the pipe is lengthened or shorted by closing or opening holes in the pipe

The characteristics of a wind instrument are determined by:

- The relation between length and width of the pipe: an instrument with a more narrow pipe usually has a sound with more overtones and also the high overtones themselves (when over-blowing) are more easily produced than on an instrument with a wider pipe.
- The shape of the pipe:

  1. cylindrical: the pipe is evenly wide for the complete length:
  flute, clarinet, trumpet, trombone;

  2. conical: the pipe is narrow at the mouthpiece and gets wider towards the end:
  oboe, bassoon, saxophone, french horn, flugelhorn, tuba.

  3. reverse conical: the pipe is widest at the mouthpiece and gets narrower towards the end:
  baroque recorder, traverso

Of lesser influence are:

- the tone-producing, the manner of blowing, the mouthpiece is also a factor;
- The material of which the instrument is made:

  a flute may be made of silver, wood, glass, ivory or plastic, but it will in every case sound as a flute

Traditionally the wind instruments are divided into two groups depending on the material they are made of (were made of).

3.1 woodwinds

3.1.1 Flutes

With flutes the tone is produced by blowing against the edge of the mouyhpiece. If the airstream is aimed correctly, this will lead to a very fast changing of the airpressure at the edge: a vibration. Certain frequencies will bring the air in the pipe into resonation then we hear a tone: the fundamental pitch or (when over-blowing) one of the harmonics. (Which frequencies will cause this is a very long acoustical story)
The airstream is shaped by the lips and aimed at the edge of the mouthpiece.
A tone can also be produced by putting the pipe vertically to the lips and then blowing towards the edge.
The recorder is developped from these vertical flutes: an very narrow hole is added to (pre-)shape and aim the airstream.
The effect is that the sound on a recorder is produced more easely but less controlable: on a flute the player has a lot of influence on the shape and direction of the airstream and therefore on the tone. Also the loudness is more controlable: this is the reason that the recorder has less been used in the course of the 18th century

The 'reconstruction' of the traverso (a wooden, reverse-conical flute with at the most1 or 2 kleppen) to the modern, usually metal, cylindrical instrument with many kleppen is done for the most part by a German flutist and flute-builder T. Bohm (1st half of the 19th century) and came about because of a nedd for dynamically stronger flute with a larger range.

The flutes:

- 'ordinary' flute notation in the G-clef and in *concert*: non transposed of octavided.
- piccolo sounds an octave higher than the 'ordinary' flute, notation in the G-clef an octave lower, the actual sound is an octave higher than written.
- altoflute notation in the G-clef an transposing, the alto flute is a G instrument, when the alto plays a (notated) **c**, we hear a **g**. The actual sound is a fourth lower than written.
- bassflute notation in the G-clef and the actual sound is an octave lower than written.

(Because they are less important there is no list of recorders.)

3.1.2 Single reed - instruments

Clarinets and saxophones have a mouthpiece to which a reed is attached. The tone is produced when the breath-pressure moves the reed (releases it) from the mouthpiece, counterpressure from the lips becomes sufficiently strong to let it strike back against the mouthpiece in a certain vibration
The clarinet has an almost complete cilindrical shape and a rather narrow scale, the saxophone a conical shape and a wide scale.
Clarinets are usually straigth, saxophones bended with a bell.
Exeptions: The bassclarinet which has the shape of a saxophone and the sopranosax which has the shape of a clarinet.
Notation is always in the G-clef.

Clarinets:

- small/ piccoloclarinet (Eb), notation is transposing, the actual sound being an minor third higher than written.
- clarinet (Bb or A), the notation is transposing, the actual sound being a major second or a minor third lower resp.
- bassclarinet (Bb), the notation is transposing, the actual sound being a major ninth lower than written (because of the G-clef).

Saxophones:

- soprano (Bb) notation is *transposing* the actual sound a major second lower the written
- alto (Eb) notation is *transposing* the actual sound a major sixth lower than written.
- tenor (Bb) notation is *transposing* the actual sound a major ninth lower than written
- baritone (Eb) notatie is *transponerend*: the actual sound a major tre-decime (major sixth+ octave) lower then written.

3.1.3 Double reed-instruments

For oboes and bassons the mouthpiece actually consists of two reeds, tied together. The tone is produced because breath-pressure forces the reeds apart from eachother, while counter-pressure from the lips becomes sufficienly strong so that they strike back together again in a certain vibration.
The oboe has a conical shape and a rather narrow scale.
The bassoon has a fairly conical shape and a scale even more narrow than the oboe.

The instrument is played through an S-shaped small pipe; characteristic is also the folded (like a hair-pin) tube ending in a narrow bell (the upper part of the instrument).

- oboe: notation in the G-clef and in *concert* (sounds as written).
- alto oboe: notation in the G-clef and also in *concert*

  (this instrument is often called 'English horn' !)

- bassoon: notation in the F-clef and in *concert*

3.2 Brass windinstruments.

The brass windinstruments produce their tones by blowing the air through squeezed-together lips. The air-pressure makes the lips come apart but as a result of muscle-tension they come back together again. This proces is comparable with bowing a string. When the frequency of this proces equals one of the 'own' frequencies of the air-column in the tube, a resonance frequency (a tone) is produced.

When producing a tone, the lips are supported by a mouthpiece. Horns have a deeper mouthpiece than the other brass instruments.

3.2.1 Trumpet

It has a narrow scale and a cilinder-shaped tube that can be 'rolled-up' or folded in various ways. Since the first half of the 19th century trumpets are built with a valve system. By pressing of one or more of these valves the tube is lengthened and the tone lower.
The most-used trumpet is the Bb one, notation in the G-clef and *transposing*, the actual sound being a *major second lower* than written.

3.2.2 Flugelhorn (also: Bugel)

It looks like a trumpet but has a conical shape and a rather wide scale. Therefore the tone is warmer, softer than thr trumpet. Flugelhorns do not go as high as the trumpet.
Notation etc. is the same as the trumpet.

3 .2 .3 Cornet

Looks very much like the trumpet but with a conical shape. The cornet is more easily playable than a trumpet but its tone is less pure, more rough.
Notation etc. again the same as the trumpet.

3.2.4 Trombone

has a cilindrical tube and an even more narrow scale than the trumpet. By sliding the tube, it is lengthened and the tone becomes lower. Its construction has not been very much changed since the Renaisance; ther are however trombones with valves (the valve-trombone of course)more suitable for fast musical passages.
The 'normal' trombone is the original one, notation in the F-clef and *non-transposing* (in concert). For very high parts the tenor-clef (a C-clef on the 4th line) is sometimes used.
Ther is also a basstrombone, notation the same as the (tenor) trombone.

3.2 .5 Horn (French horn)

differs from the trumpet and the trombone -except the trechter like mouthpiece - in the very narrow scale at the beginning of the tube and the shape which is partly conical, partly cylindrical. The bell is very wide.
The horn uses the G- and F-clef and is notated in F: so the notation is transposing, the actual sound is a perfect fifth lower than written.
'Horns' (in English) is sometimes used for 'windplayers' that play on a concert or CD. When a 'real horn' is meant, the word 'French Horn' is often used.

3.2.6 Tuba

is in fact a large (so: low) flugelhorn: conical shape with a wide scale. It sometimes has a fourth valve and can go very low.
Notation in the F-clef and in concert (non-transposing).

3.3 Playing aids and manners

3.3.1 Mutes

There are various mutes that produce very different sounds (tonecolours).
They are only usable on brass instruments, mainly on the trumpet. A (french) horn can also be 'stopped' by the hand: this does not only influence the tonecolour but also the pitch: it can go a halfstep up or down.

3.3.2 Fluttertongue/Flatterzunge

This is speaking a rolling -r- while blowing. It causes a somewhat rapy sound, a' damaged' tonecolour. On flutes it causes a kind of fast tremolo.

3.3.3 Growling

Typically a trumpet effect, in combination with a mute. The brass equivalent of Louis Armstrongs way of singing.

3.3.4 Glissando

is the 'stepless' sliding through intervals. On a trombone this can be done between large intervals, on most instruments glissandi can be played between smaller intervals using the ' embouchure', the grip of the lips on the mouthpiece.

3.3.5 Cuivré

is the loud, trumpetlike sound that can be made on a horn.

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4. Keyboard instruments

4. 1 Piano

'Piano' is an abbreviation' of 'pianoforte', meaning 'strong-weak'. This name clearly shows why it was invented, in the 18th century, starting in the Classical Period, one needed an instrument with more dynamic possibilities than its predecessor, the cembalo.
The new possibility to be able to play loud or soft ,was very important. This was made possible by the hammer mechanism.

For the piano the string is the soundsource, which is brought into vibration by the hammer that strikes it. At first this mechanism didn't work very well because the hammer did not come back in the proper position fast enough, - it was therefore not possible to play the same note twice rapidly after eachother. In the course of the 19th century this problem was solved with a complex hammersystem which is still in use nowadays. The soundboard is of course the resonator.

The need for instruments with a bigger range and more dynamics, starting from the Classical Period, can also be seen in the development of the piano.
The range was expanded from 5 octave in Mozarts life to more than 7 now. For a bigger sound thicker strings were needed, with a higher tension. In the lower octaves the (steel) strings are wound with copper - end therefore much heavier the before-, but also the higher strings have become thicker. Furthermore in this erea each key will strike 3 strings at once.

These changes caused a much greater tension that could not be held by a oure wooden construction. From +/- 1825 the strings are strung on a cast-iron framework, the lower strings diagonally, so crossing the strings of the high tones. This crossing-strings construction also influenced the sound: the tone is enriched because also nearby strings will resonate.
The tonecolour is determined moostly by the material the hammerhead is made of: at first this was leather, later on felt. (the condition of the felt is of course very important).
As we know the strings in a concertpiano are horizontally. By pressing the right pedal all dampeners are lifted off the strings. The struck tones will keep sounding but also the resonance will become richer: all not-struck strings may resonate with the struck-strings.
By pressing the left pedal the whole mechanism will shift causing the hammers to hit two or even one string instead of three. The sound will be softer with a clearly fifferent colour.
When a concert piano has three pedals, the middle one will serve to keep the dampeners on the strings that are hit at the very moment the pedal is pressed. Only those tones will keep sounding while the other (later-struck) strings will function normally.

In a (home) piano the strings are vertical. A different mechanism is necessary, making it impossible to have a shifting system. By pressing the left pedal the hammerheads are brought closer to the strings, the speed will be slower and the tone softer.
The right pedal functions the same way as the concert piano's does. A possible third pedal brings a piece of felt between the hammerheads and the strings, dampening the sound strongly (the study-pedal).

4.2 Cembalo

As said before, the cembalo may be considered to be the predecessor of the piano, the most difference being that it cannot be played 'loud and soft'; furthermore its range is much more limited, usually four sometimes 5 octaves.

By pressing a key a mechanisme is put into motion which makes a 'pick' move upward and pick the string. When the key is released the pick is lowered and picks the string again, immediately dampened by a piece of felt.

Most cembalos have at least sets of two strings that can be put into action by a simple shifting mechanisme. Each set of strings has a slightly different sound. A set as a whole can be tuned an octave higher (a so-called ' 4-foot register').
Big cembalos have two keyboards placed above eachother, each one having multiple sets of strings that can be played 'coupled'.
All this allows for a kind of sudden change of dynamics.

In a cembalo the strings are horizontally behind the keys which causes the wingshape of the instrument.
In a spinet the strings are angled towards the keys and the instruments will have a triangle or pentangle.shape.
In a virginaal the strings are in an angle of 90 gegrees to the keys. Because the strings are longer than the width of the keyboard, you get a rectangular box with a smaller keyboard.
Spinet and virginaal are much smaller and therefore also in sound.
They are usually equiped with one set of strings (register).

4. 3 Organ

By pressing a key the valve of the pipe that goes with this key, is opened. The pipe is blown because the air can enter the pipe from a reservoir that is kept under pressure, nowadays with an electro-engine.
For every pitch a key needs at least one pipe, a group of pipes with the same soundcolour we call a register.Some registers have 3 or more pipes for every tone. Just like teh normal windinstruments the sound is determined by the shape and the scale of the pipes.
Some registers do not produce the expected pitch but one or two octaves lower or higher, plus maybe also a fifth higher. This is indicated as follows: the normal registers are '8-foot registers (8' register): the length of the pipe of the lowest C on the keyboard is 8 feet (approx. 3 meters). Registers that sound an octave lower, have pipes twice as long and are therefore called 16-foot registers. Registers two octaves lower are 32-foot registers. Registers one octave higher are 4-foot registers etc.
Most registers have pipes that are blown like a recorder, others have metal reeds.
Most pipes are made of metal, the rest made of wood.

There are various sorts of organs in many sizes:
Normally 2 or 3 keyboards and pedals, but 4 or 5 keyboards do exist. Per keyboard a large number of registers are possible. An organ may have thousands of pipes. Organs are built from the Middle Ages; the sound is constantly adapted to the ruling taste and musical ideals, usually very different from one region to another.

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5. Various instruments

5. 1 Harp

The concertharp, as it is in use since +/- 1810, has 47 strings tuned in de scale of Cb major over a range of 6 1/2 octaves. The notation is the same as the piano notation: 2 staffs, in the G-clef and F-clef.
There are 7 pedals; each pedal has a mechanism raising the string a halfstep twice by shortening the string: by stepping on the C-pedal all C strings will be raised to c, by stepping on it again all c-strings will be c# etc.
The normal situation would be 'pressed once', with all pedals like this the scale of c-major will sound.
You could say that the harp is a diatonic instrument by nature, real chromatism is not possible.

Playing indications:

- *arpeggio* '= harplike'; fast broken chords are very easy on the harp.
- *glissando* sliding of the fingers across all strings.

  A chromatic glissando is - as stated above - not possible, glissandi over all major- and minor scales are possible and also over a number of 4 - and 5-voice chords by tuning certain strings enharmonically equal. (For a C- Eb - F# - A chord the D-pedal will be tuned to D#, the G-pedal to Gb and the B-pedal to B#)

- *Harmonics* The string will be touched with the .mouse' of the hand, while usually the thumb is plucking the string. (A tone an octave higher will sound.)

The little harp has less strings than the big concert harp and also are the mechanics to shorten the strings are limited: every string cab be shortened only once by switching a hook by hand.
Starting harpists and amateurs usually play this instrument.

5.2 Guitar

Notation in the G-clef, the sound however is an octave lower than written.
The 6 strings are tuned as follows:

The actual sound is:

The guitar is played with the fingers, a pick, fingerpicks and also a 'bottleneck' may be used: a metal pipe over a finger of the left hand which is moved across the strings (slide-guitar).

There are many different guitar types:

- the 'normal' electric guitar (=solid-body)

  The vibrations of the strings are transformed in an element (pickup) into electrical vibrations. The strength of the tone has to be taken care of by an amplifier. The sound is - for the most part- determined by the pickups the rest of the equipment and the way the instrument is played, but also partly by the material the massive soundbody is made of.

- the 'semi-acoustic' electric guitar (=hollow-body)

  The soundcolour of this guitar is of course more determined by the soundbody than is the case with its 'solid' brother. It is sometimes called the 'cello-guitar' because of its f-holes instead of a round soundhole in the middle.
  Much used in jazz.

- the akoustic guitar

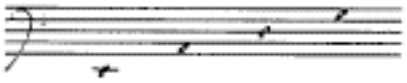
  When equiped with nylon strings we speak of a 'Spanish' guitar, the version with metal strings is used widely in popular music (Western guitar).
  On a 12-string guitar two parallel strings are used instead of six, the four highest parallel strings an octve higher than the regular strings (the 4-foot effect), the lowest two pairs are tuned equal.
  The 'dobro' has a round metal front plate.

- the '(electric pedal) steel guitar' (used to be called: 'Hawaian-guitar')

  It stands horizontally on 4 legs; with pedals the tuning and therefore the chordtype is changed, a little bit like the harp.
  The pitch is changed by sliding across the strings with a piece of metal pipe, this causes the typical 'slide effect'.

- the bassguitar

  Notation in the F-clef, the actual sound being an octave lower than written.
  The 4 strings are tuned an octave lower than the guitar:



The actual sound is:

6. Drums, percussion

6. 1 Drumkit

A drumkit exists minimally of:

- bassdrum a big drum on its side, played with a footpedal; the basis for beat and tempo.
- snare(drum) a small, fairly flat drum on a stand that has a number of strings (snare) underneath that can be strung. Is usually played with sticks or 'brushes'.
- hi-hat 2 small cymbal on a stand that can be struck together with a pedal, can also be played with sticks or brushes. It has many soundcolour possibilities.
- toms (or 'tom-toms') usually 2, 3 or 4 somewhat higher drums, the bigger the lower the tone. Usually played with sticks for 'fills' etc.
- cymbals on a stand in many variaties and sizes. Played with sticks or brushes, again many soundcolour possibilities.

Notation for drums on a staff without a clef. The different parts of the drumkit are divided as follows - the lines are counted from down to up -:

- cymbals: *above* the 5th line, so above the staffe lijn.
- hi-hat: *on* the 5th line
- toms: *between* the 4th and 5th, ont eh 4th and between the 3rd and 4th.
- snare: *on* the 3rd line
- bass: *on* the 1st line

Sometimes a different notation is used.

6.2 'Classical' percussion

- big drum has two skins with a diameter of approx. 70 cm, a cilinder of approx. 50 cm high. Usually played with a stick with a soft 'head'.

- snare drum can be compared with the snare in a drumkit. Developped from the military drum with a higher cilinder (the 'side drum').
  There is also a variation without the 'snares'.

  timpani a sort of kettle with one skin. By means of tuning screws along the skin or (nowadays) a pedal mechanism it can be tuned to several pitches. At the moment up to 5 different sizes are used in a symphony orchestra.

- cymbals slightly curves metal plates, diameter 40 to 50 cm. Are struck together, sometimes placed on a stand and struck with a stick.

- tamtam this is not a drum but a fairly big, slightly curved and flat in the middle metal disc hung in a rack. It is played with a stick with a soft head. The sound is a noisesound with a very rich spectrum.

  People usually call it a 'gong' but this is actually a different instrument.

- gong just like the tamtam a hung metal plate, the difference is the curved edge a the 'bump' in the middle. This cause a much more defined pitch than the tamtam does. Gongs are used in sets of various sizes (and pitches).

- 'tubular bells') very accurately tuned metal pipes, hung in a rack. They are struck with a special hammer.

6.3 Mallets

'Mallets' are actually the sticks with which the instruments with soundbars are played. The bars are lined up like the piano keyboard. The principal of these instruments was known for long in Africa and the Middle East. tyhe technique of playing these mallet-instruments is very much been developped these last couple of years; it is sometimes played with 2 sticks in each hand.

- xylophone has wooden soundbars with resonators; the typical xylophone sound is caused by the used 'hard' sticks.
- marimba is actually a bass-xylophone, the typical sound caused by much softer sticks.
- xylorimba a combination of xylophone and marimba.
- vibraphone has metal soundbars. The vibrato in the name of the instrument is made by discs that- driven by an electro-engine - rotate inside the resonatortubes. They alternately open and close the tubes, the engine is switched on with a pedal (actually a metal bar underneath the instrument and within reach from every playing position. It is played with medium soft sticks.
- glockenspiel metal soundbars with resonators, a high pitched clear and penatrating sound. There exists a version played by a keyboard.
- celesta A keyboard glockenspiel with thicker soundbars and therefore a thinner and less penatrating sound.

Glockenspiel and celesta are mainly used in the symphony orchestra.

6.4 Percussion

- bongos 2 - sometimes more - small, rather flat drums played by hand. Are tuned in slightly different 'pitches'.
- congas 2 - sometimes more - small but high, getting narrower downward, drums played with the hands. Tuned in slightly different 'pitches'.
- claves 2 'hard-wooden' staves that are struck together. Gives a loud, high-pitched tick.
- maracas 2 hollow 'bowls' with a grip, inside dried seeds.
- cowbell a bell struck with a stick, gives a loud dry and short tick.
- tambourine is in fact a very flat drum with one skin and bells in the rim.
- triangle a triangle shaped curved metal stave, hung on a string which allows it to sound very long after being struck.
