

# Automatic Musical Instruments in Bar and Salon

»Musical boxes« can be got today in department stores for a few euros: A small roller, turned with a crank, is equipped with pins, which pick metal reeds. There were such automatic musical instruments at first at the end of

the 18<sup>th</sup> century in Switzerland. They were cheaper than many of their predecessors, whose sound was created in some other way. Although wall clocks with built-in, small automatic organs which were calculated even for people with a low budget were produced since about 1750 in Schwarzwald. But the sounding reeds differed from the organ pipes at least by the extremely low space requirement. They were mounted in the 19<sup>th</sup> and early 20<sup>th</sup> century into numerous, sometimes cheap, sometimes expensive practical and decorative objects, as well as into mechanically moving figures, so in sewing boxes, tobacco boxes, Christmas tree stands and sounding inns in doll house form, in which dancers and musicians bustled. Even the mostly rectangular boxes were often enriched with figures, for example, with bees or Chinese people who plucked in the little bells.

A revolution in the market of automatic instruments was caused by the invention of the perforated disc at the end of the 19<sup>th</sup> century: The older musical boxes worked with the so-called pinned roller which represented nothing more in principle than the roller of the small musical mechanism mentioned above, today commercially available. However, if the rollers are manufactured now together with the sound-producing pins in a cheap casting method, so in the past individual pins should be inserted. (By the way, the pinned roller represents the oldest known controlling method of automatic instruments.) Since 1886, discs of metal were used for musical boxes. Instead of the pins, small reeds were bent out downwards. The disc offered major advantages compared to the old pin roller: it could be reproduced by machine, it was easy to replace, and it could not be damaged so easily. A pinned roller cost 10 marks, so a plate could be bought for 35 pfennigs. The exact opposite of mass production was, however, at the beginning of the development of automatic instruments: early carillons and machines with organ pipes were unique pieces that only a big city or a prince could afford. Small carillons belonged to the astronomical clocks, as they were completed in 1354 in Strasbourg, in 1405 in Lübeck, in 1419 in Olomouc, in 1441 in Lund, in 1490 in Prague and in 1510 in Munster. The clock in Strasbourg had a calendar and showed the movement of the stars. At the full hour, the Three Holy Kings passed by Mary and bowed to her; then bells sounded and then cockcrows. (By the way, the astronomical clock that is now in the Strasbourg Cathedral is from the 19<sup>th</sup> century.)

Until now, the question is not entirely cleared whether automatic carillons were mounted in smaller form at



Musical clock, Christian Ernst Kleemeyer, Berlin, end of the 18<sup>th</sup> century, cat. no. 4901 © MIM, photo: Jürgen Liepe



first into astronomical clocks, or whether they were already a part of the bells from the church and town hall towers. Such carillons are documented since the 14<sup>th</sup> century, in particular in the Netherlands.

By the end of the 16<sup>th</sup> century, a wide range of music machines is documented, which were part of the private life of princes and rich citizens. In 1589, the Saxon Electress gave her husband a Christmas crib, which was built by Hans Schlottheim in Augsburg. Mary and Joseph are sitting on a high pedestal with rich decor at the crib. If the spring-driven clock mechanism is started in movement, shepherds are passing by them. A golden ball on the crib scene opens, God the Father is visible, and a group of angels floats down. The organ placed in the pedestal plays unanimously the songs »I came here from high heaven« and »Joseph, my dear Joseph«.

Also an automatic organ is the barrel organ, the »hand organ«. It is related to pieces like the princely Christmas crib, but socially, as an instrument of wandering beggars, represents the opposite pole. In accordance to the design, the difference is that the crib is powered by the clockwork, but the barrel organ, however, by a human rotating a crank. The crank is already part of the automatic organ of the Hohensalzburg Castle, which was built around the middle of the 16<sup>th</sup> century. Here is the difference to the barrel organ in its handiness that makes the comfortable change of place available. All of these properties: the simple drive, the setting of polyphonic music on the pinned barrel, which saves a musical education to the »player«, the portability predetermine the barrel organ as the instrument of a large group within the street trading. By the way, musical ambition was even here not excluded: the human determines by rotating the tempo of the music and its nuances. The barrel organ is documented since the end of the 17<sup>th</sup> century as an instrument of travelling musicians (or also of pilgrims who ask for a nickle). It was already invented perhaps by the universal scientist Athanasius Kircher, who explained a range of automatic instruments in his *Musurgia universalis* of 1650. He already describes the common method until the 20<sup>th</sup> century to accommodate multiple pieces of music on one and the same pin roller: there are spaces between the »claves« (keys levers), which scan the roller; the pins, which belong to just not wanted pieces, move here in the empty space. When the roller is moving sideways it is fixed in the new position by entering a bolt in a notch of the axis extended outwards, so other pins will reach under the levers, lift them and open the path of the wind in the pipes. The bellows are shifted by the same crank movement that puts the pin roller in rotation. – Older barrel organs contain only the flue pipes looking like flutes. Such instruments were used, among other things, to accompany the singing of murder ballades. In our century, loud reed voices were added to the flue pipes.

If the barrel organs are mainly professional instruments, so their steel-spring-driven writing secretaries



Barrel organ, Richard Töpfer, Berlin, around 1913, cat. no. 4745

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being often in clocks and build-in relatives like these, were more representatives of house music. (The word »representative« is here right, of course, only conditionally: the house music was not displaced by automatic instruments, no more than later through recordings.) Domestic, fully automatic small organs in clocks sounded independently after the bell sound. In it they looked like the astronomical clocks and the *carillons* in churches and public towers. But also the music could be activated as required.

In the 18<sup>th</sup> century, in addition to the musical, comparatively cheap wall clocks from Schwarzwald, there were also magnificent hall clocks with musical work for the nobility and rich citizens. There were either harp clocks or flute clocks. Technically, the harp clocks worked similarly as the carillons: for the preparation of the touch, each pin removes the respective hammer head from the touching site; for the bells, it is the weight of the hammer head, which causes the touch. At harp clocks, springs let hammer-like metal lever pluck against the strings; the hardness of the »hammer head« causes rather harp-like than piano-like sound. Flute clocks basically correspond to the wall clocks from Schwarzwald: they contain small organs; the levers connected with the individual pipes are »played« by the pins of the rotating roller in the same way, as the keys of the normal organ by an organist.

That whole overtures, yes, multi-movement sets could be used on the relatively small rollers of flute clocks, was based on an invention by Vaucanson, according to which the pins for the individual sounds follow

themselves in the screw thread. Since hereby the lever («clavis») of the respective sound remains in the same place, the roller must be continuously laterally moved through an appropriate mechanism. – In the 2<sup>nd</sup> half of the 18<sup>th</sup> century, Berlin was considered to be a centre of manufacturing such sounding hall clocks. Evidence is based on a harp clock and a flute clock of our museum (cat. no. 4900 and 4901). C. P. E. Bach, Haydn and Mozart have composed for such instruments.

Automatic, weights-powered organs had a function in the public too: in restaurants, they entertained the guests. They belong in this respect to the precursors of the orchestrion. Johann Nepomuk Mälzel, a friend of Beethoven, was the first, who built orchestrions, which are worthy of this name. (He brought the metronome on the market too.) »Wellington's victory« by Beethoven is composed for such automatic orchestra. However, here not the instruments of the orchestra can be heard, they are imitated by whistling. To the flute-like flue pipe come now such ones with resounding reeds, a similar development as at the barrel organ. There were really only the percussion instruments. Here, something has changed with later orchestrions; with the addition of melody-enabled percussion instruments (carillon, xylophone) and strings, the proportion of only imitated instruments was reduced. Our orchestrion from Berlin-Karlshorst that Joseph Rump built towards the end of the 19<sup>th</sup> century (cat. no. 5247) consists mainly of a piano; a xylophone, two small drums and a cymbal come to these as more »genuine« instruments. A mandolin is imitated, after all, with the help of strings: these are plucked in the tremolo by little hammer with wooden unclothed (so hard) heads. The company Hupfeld Orchestrion (cat. no. 5007), built around 1920 in Leipzig, contains also a piano, in addition a carillon, large and small drums, wood block drum, cymbal, Charleston cymbal and triangle. This includes three imitated instruments: a »lotus flute« and a »saxophone«, which are imitated with labial pipes or resounding reeds, and a »harp«, which was brought to the sound by damping of the piano keys. The part of »original instruments« is, of course, connected with the determination of the orchestrions: if Mälzel's orchestrion imitated a symphony orchestra, so the name of Hupfeld's instrument is »Hupfeld Symphony Jazz Orchestra«; Rump is limited to the replacement of a small band, as it played in large pubs. If this Orchestrion works still with a pinned barrel, as medieval instruments do, so the orchestrion by Hupfeld is equipped with pneumatic control: A paper tape glides over a block with wind tunnels, which are used to trigger the individual sounds, to regulate the sound volume, the vibrato, the damping. The channels include a suction air field, produced by an electromotor. If a perforation of the strip overlaps with the opening of a wind tunnel, the atmospheric air comes through. It causes through one or more valves, that the bellows, which is immediately connected to the playing instrument, is connected with the suction air flow, tightens and causes the sound in this way. The advantages of the pneumatic



Hupfeld Symphony Jazz-Orchestrion, piano with self-playing equipment, Ludwig Hupfeld, Brothers Zimmermann A. G. Leipzig, Düsseldorf, around 1920, cat. no. 5007 © MIM, photo: Jürgen Liepe

system extend far beyond those, which the replacement of the roller in musical boxes brought through the metal disc: the pneumatic was not only space-saving and ensured silent, exact function, it allowed to vary the volume of the piano much rather than the roller. It was now easy to play long pieces of music. The »recording medium« was cheaper, could be copied more easily and replaced; the latter was also automatically: Our Hupfeld orchestrion plays in a row six different paper tapes, each containing up to three pieces of music.

Orchestrions replaced the bands in more or less »fine« restaurants and dance halls (early kind of workplace devastating »rationalization« in musical field). The function of the automatic »Welte-Mignon grand piano« which was constructed by Karl Bockisch (patent of 1904) was, however, another. Here, not the musician should be replaced; rather it was necessary to hold the interpretations of famous pianists or conductors for the middle-class home. We don't know how the recording equipment worked, because it was lost in the Second World War. The punched paper tape which controls the playback, contains the following information: The time sequence of the sounds is given by the location of the holes in the moving paper; six levels of the sound volume can be continuously achieved through holes at the edge of the paper at any time, and separately for the left and right half of the piano keyboard; more holes on the edge cause the pedal functions. A last imperfection is especially that with simultaneous pluck of sounds within the bass or descant their sound volume is the same: melody sounds cannot be high-

lighted under circumstances, the sounds of a chord cannot be graded. Also, a house music instrument of the middle class, but with other objectives, is the American Pianola by Aeolian Company; a similar instrument called phonola was produced by the company Hupfeld in Leipzig: it was often built as »Vorsetzer«, i.e. it can be put before a normal pianoforte, for whose keys the pianola has a wooden »finger« respectively. If now the »player« pedals, so the paper tape movement continues and causes the touch of each finger. The tape reflects only the musical text; the player generates the nuances of the sound volume primarily with the feet, with his hands he provides expressive acceleration and deceleration and grades the sound of bass and descant against each other. The »automatic« is used here not to replace the people, but just to make even technically very difficult, actually professional works for piano accessible to the music-making lovers. – A cheaper version of the Pianola represents the crank piano: Here the cranking person can increase the tempo, but the music gets louder at the same time, whether the person wants or not.

In turn, the »Orchestrelle« by the Aeolian Company, related with the Pianola in the same time, is an instrument of the gentle aristocratic world: It is an automatic harmonium, whose stops imitate the instruments of the orchestra. The owner can feel almost as conductor with the playing of symphonic works – he regulates tempo and sound volume. Even Emperor Wilhelm II possessed such an Orchestrelle.



Calliope musical box, Calliope music work, Leipzig, around 1900, cat. no. 4973 © MIM, photo: Jürgen Liepe



Aeolian Orchestrelle, The Aeolian Company, New York, around 1900, cat. no. 4584 © MIM, photo: Jürgen Liepe