THE REPRODUCING PIANO ROLL

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OCCASIONAL PAPERS

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DEPARTMENT OF EDUCATION
PREFACE

The lecture, as printed here, is substantially the same as that delivered during a series celebrating the 50th anniversary of TAFE in the Australian Capital Territory.

It was given at the Canberra School of Music and, since I had ready access to both replay and visual equipment, was copiously illustrated both by slides and recordings.

The slides consisted of photographs of a number of reproducing pianos and their actions. Recordings were played to illustrate famous pianists as heard on these pianos, as well as to break up the monotony of my voice. I chose the following recordings:

GRAINGER: Symphonic Etudes (Schumann)
LHEVINNE: Rustle of Spring (Sinding)
HOPMANN: Valse Caprice (Rubinstein)
             Valse Bluett (Schuett)
FREIDHEIM: Paganini Etude (Liszt)
ROSENTHAL: Carnival de Vienna (Rosenthal)
RACHMANINOFF: Scherzo in Bb minor (Chopin)
BUSONI: La Campanella and Feux Folletts (Liszt)

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There is by now a long history of mechanical musical instruments in our culture, including barrel organs, mechanical virginals, mechanical orchestras, musical boxes (both cylinder and disc), organettes, calliopes, musical clocks, musical watches, pianolas and various other contraptions. Some of these have fascinated composers and musicians, whilst others have been in the rather rarified province of specialist collectors.

The Reproducing Piano

Unique among all such inventions is the reproducing piano - not only for its high level of design, refinement and sophisticated technology, but primarily for its incredible capacity to 'reproduce' the playing of the great pianists that recorded upon it.

Let us once and for all separate the reproducing piano from its very poor relation, the pianola. The latter is truly a mechanical instrument; the eventual music that comes from it is under the control, or lack of it, of the operator. The former is a real recording system that captures the various constituent characteristics of the pianists who played on it.

Josef Hofmann wrote about the earliest of the reproducing pianos thus:

"The incomparable Welte-Mignon art piano has opened an eventful future before the musical world. Henceforth the piano player will be on a level with the productive artist in regard to the imperishability of his work. What a loss it means to us not to have had the reproducing piano long ago. But what a blessing it will prove to future generations."

What seemed self-evident to the pianists of the day is now a controversy; how authentic are the sounds that come from a reproducing piano? It must be understood that with the gradual encroachment of
acoustic and then electrical recordings, reproducing pianos fell into misuse. The expensive instruments were stripped; the complex mechanisms were allowed to fall apart or perhaps even worse, to play badly.

With these delicate adjustments no longer functioning correctly, the latter-day musicians listening to these pianos could not take them seriously as representing the heights of pianistic art at the turn of the century and later. Even today, with the resurgence of these reproducing pianos, many musicians regard them with scorn and have, as yet, to be convinced of their value.

Another difficulty facing us is that the actual number of first class reproducing pianos was never great. The cost (up to 4,000 dollars and more) ensured that only the well-to-do could afford to have one in their home. This factor was compounded by the practice of various roll makers allying themselves with certain piano manufacturers. Just imagine that if, today, you could only play EMI records on one Hi-Fi system and had to buy a completely new system to play RCA records! That was precisely what was happening in the reproducing piano field, so that, simply to keep up with the three big-name makes, a collector would have to have three grand pianos in his house. The price of the actual rolls was often exorbitant: normally they sold for two to four dollars but some Welte rolls cost 20 dollars.

The recent revival of interest in the reproducing pianos has not spread to the serious musician, although inroads are being made in that area. Many of my musician friends have yet to be converted to the notion that the reproducing pianos contain a repository of a valuable - and lost - performing tradition.

Apart from the three big names in reproducing pianos - Welte-Mignon, Duo-Art and Ampico - smaller companies also made some impact on the market. For example, some years ago when I was researching rolls made by Busoni for my book about the famous composer/pianist, I was in close contact with my friend Denis Condon in Sydney; an acknowledged world
expert on the whole question of reproducing pianos, Denis has a fabulous collection of rolls and instruments, and I have been privileged to hear many rare performances. However, the point of the story is that Denis had uncovered two rolls of Busoni playing the Bach 'Chromatic Fantasia and Fugue', made for the DUCARTIST piano: a German production of the Philipps company. We could not find a piano to play these rolls, and, in fact, I have never heard them.

This story highlights the problem of non-compatibility of the differing systems but I would now like to stress that all the makes shared some common characteristics. They all used the roll much like a computer tape. The roll was a storer of precise information which operated a totally automatic electric system.

The Piano Rolls

If we look at a representative roll from any of the manufacturers, the following 'information' would be present:

(a) The perforations on the roll would establish the order, duration and spacing of the notes.

(b) Wiggles running on both sides of the roll, looking much like a sound track on a film, contain coded details covering such things as the soft pedal put down, the sostenuto pedal and the normal sustaining pedal. Other wavy lines control such factors as dynamics, often separated into treble dynamics and bass dynamics, allowing for varying balance between hands.

(c) Even such things as one note played louder than the rest of a chord were accounted for. In the early days this was achieved by a very small time displacement but, later on, systems such as the Ampico coped with this problem with no compromise.

Companies even put out test rolls with which one could make sure that the equipment was functioning correctly, much like a test record today.
To carry the analogy with a modern recording even further, pianists signed and approved their master roll after hearing it played back, only then were the rolls mass produced. Editing could be done on the roll and wrong notes cut out. It is curious to contemplate that this sort of thing is done these days with magnetic tape editing but, of course, it was simply impossible in the early days of the gramophone record. The 78 records had to be cut in a complete side, the 'take' lasting about four minutes.

The cutting of the final master roll was the result of interpreting the various graphs created by the artist on his initial recording. This took trained musical personnel many weeks to carry out.

Types of Pianos and Restoration

Although most reproducing pianos were grands, there were some uprights fitted with the appropriate mechanism. For instance, the Duo-Art was available with Weber uprights. The mechanism worked on the same principle but was of course laid out quite differently. The suction pump used in both grand and upright models operated slowly and was very quiet. As the market, towards the thirties, became more and more geared for the rich, various serious attempts were made to accommodate reproducing mechanisms into smaller, cheaper pianos. One of Ampico's last efforts was a spinet model player (using Steck, Knabe or Fischer pianos); the ultimate is miniaturisation. Alas, these efforts came too late to save the reproducing pianos from oblivion.

The uprights were loaded with rolls in much the same way as ordinary pianolas. Some quite fine reproducing uprights were, in later years, confused with ordinary pianolas. However, if one loads a pianola with a true 'expression' roll, the extreme outer notes will tend to play continuously, as they will be activated by the film-track like wiggles.

(1) As far as I could ascertain, the Welte rolls were unedited and truly represented the accuracy of the performance; other companies would edit rolls if requested by the artist.
The grand pianos were loaded in slightly varying ways, the spool boxes being usually either under the keyboard or in front of it.

It is quite amusing to note on many of the pianos of the period, all sorts of gold medals awarded for this or that quality. Exposition awards were a form of advertising gimmick of the late 19th and early 20th century. Many exhibitors were granted automatic gold medals in return for entering an exhibition (and of course paying to do so). The actual medals were not of gold but rather too often of cheap bronze, carefully inscribed 'Gold Medal'.

But no amount of medals or other attempts could rescue these instruments. Added to other factors already given, the 'Great Depression' was the final nail in the coffin and the instruments had to wait for about 40 years for their renaissance to commence.

The restoration of these pianos needs great patience and knowhow. Apart from 'normal' wear such as termites, dampness, weather and drinks (poured into the innards), the miles of rubber tubing are particularly subject to perishing. The adjustments needed after general restoration has been carried out are precise and delicate, and not for the amateur. But, given all that, reproducing pianos can be restored and maintained.

What worries me is that such work is still in the hands of enthusiasts. No systematic effort has been made by our musical educational institutions to preserve the specialized knowledge gained after years of private research. As collectors pass on, their successors often have to start from scratch once again.

The rolls too need restoration, a painstaking process. But at least to help us along, we now have some special cutting machines that will make excellent copies of existing rolls and thus renew rolls already crumbling with age.

I am intrigued by the possibility of using the computer in this restoration process; I see no reason why the encoded information on the rolls cannot now be fed into a computer, and the reproducing process modernized in such a way as to be to some extent electronic. Perhaps
via the creation of synthesized piano sound, the whole cumbersome apparatus of the pneumatic tubes could be circumvented. But to my knowledge, no such work has as yet been carried out or initiated.

The Welte-Mignon

I would now like to spend a little time discussing each of the big name makes. We must begin with the Welte-Mignon, which has the distinction of being the very first of the reproducing pianos, with a most imposing list of artists in its catalogue: Claude Debussy, Manuel de Falla, Gabriel Fauré, Alexander Glazounov, Gustave Mahler, Alexander Scriabin, Richard Strauss, Eugen d'Albert, Ferruccio Busoni, Teresa Carreno, Ernst von Dohnanyi, Edwin Fischer, Arthur Friedheim, Ossip Gabrilowitsch, Rudolph Ganz, Walter Gieseking, Alfred Grunfeld, Josef Hofmann, Frederic Lamond, Wanda Landowska, Arthur Nikisch, Guiomar Novaes, Vladimir de Pachmann, Ignace Jan Paderewski, Egon Petri, Raoul Pugno, Alfred Reisenauer, Olga Samaroff, Emil Sauer, Xaver Scharwenka, Artur Schnabel, Bernhard Stavenhagen, and Felix Weingartner, to name only the more distinguished.

The name Welte Mignon (or 'small') was coined to distinguish the reproducing piano from the huge orchestrions made by the Welte Company. The first pianos made around the turn of the century, made its debut in the form of an upright cabinet without a keyboard which played solely by the agency of piano rolls. But since most people wanted an instrument which they could play upon normally, as well as using it as a reproducing piano, Welte next manufactured what became known as a Vorsetzer ('sitting in front of').

The Vorsetzer was a mechanism that had to be wheeled up to the keyboard of a piano. It contained a row of mechanical, padded fingers at keyboard height, as well as felt-covered 'feet'. When fed with the appropriate roll, it performed on the piano before it. Although Vorsetzers were manufactured by Welte right throughout their reproducing piano days, most people preferred the less cumbersome and more familiar built-in models.
The original Welte recording units were a model of simplicity and ingenuity. They consisted of a roll of specially thin, electrically sensitive paper marked off into 100 parallel running lines. Over each line there was poised a little wheel of soft rubber, with pointed edges. Each wheel had its own ink supply. Under the keyboard of the recording piano was a mercury trough and connected to the underside of each key was a rod of carbon. As the pianist played and a key was depressed, the rod was dipped into the mercury trough, thus electrical contact was made between the trough and an electromagnet connection to the corresponding rubber wheel in the recording unit. The force of the blow was in direct proportion to the registered current. The pianist's pedalling and other playing functions were captured in a similar way.

After the pianist had finished, the paper was run through a special chemical bath for 'fixing' all the inked markings of variable length and width, depending on the duration and loudness of the note. The ink was electrically conductive and this first master was replayed to the pianist for his approval. If all was in order, the master was sent off to the factory so that the punched paper master could be created.

The Welte collection poses an added problem as there were no less than three different types of rolls, named after the colour of the paper upon which they were cut. The original Welte rolls from 1904 were red, wider than the standard roll 11 1/4" - they were in fact, 12 7/8 inches wide - also they played from bottom to top, instead of vice versa!

Green rolls were a later development (1925) of normal width and normal track, but the expression perforations were completely altered. They were non-compatible with the red. American Welte rolls were white and were actually a copy of the red Welte on standard spools, and were compatible with red players. This only gives one a glimpse of the enormous problems that a collector of rolls faces.

Edwin Welte has left some amusing reminiscences concerning the artists they recorded. The company must have had quite considerable artistic insight, for they recorded Debussy, Mahler and Granados, when these composers were hardly commercially viable propositions. The Mahler
rolls — and he recorded four items — hardly sold ten copies of each in the early years. Debussy was — typically — an egomaniac and announced to Welte that "there have only been produced so far in the world two great musicians, Beethoven and me".

Albeniz and Grieg were reluctant to record at all. Grieg played three little pieces (not very well) and laughingly disclaimed from doing any more, saying that other people played his music better than he did. He was right. Albeniz brought along Frank Marshall and wanted Welte to record Marshall playing Albeniz, rather than the composer. Marshall did this and other work for Welte.

Apart from idealistic projects, Welte also had his share of hits. One was Olga Samaroff. She was Leopold Stokowski's first wife who became a very well known player and teacher. Her real name was Lucy Hickenlooper but she was wisely persuaded that a Russian, rather than a Texan name, was a good idea for an aspiring pianist.

Paderewski, the biggest hit, was the most difficult of all. He would not reply to letters. Also he kept people waiting for hours before regally descending the staircase in his apartments dressed in velvet robes. When the subject of fees came up, however, he was apparently quite precise in his demands.

The story of the rediscovery of the Welte rolls after the war is quite romantic in itself. Richard Simonton, the American who was responsible for the first attempts to record these rolls on modern LPs, had to achieve this in post-war Germany, with all sorts of difficulties, including suspicious authorities who saw any tapes as possible military secrets being conveyed. Simonton had at times to indulge in actual smuggling operations to get the first master tapes to America.

Edwin Welte and his artistic manager Karl Bockish were still alive, although the Welte factory was totally destroyed in the air raids on Freiburg. The factory was close to the railway station, which was of course a prime target. Fortunately, Welte had had the foresight to
recognize his master rolls as priceless historic documents and had them stored away in a remote parsonage in the Black Forest. Welte himself was in dire straits, and Simonton had to send him food parcels, literally to keep the man alive. These first LPs done on early Columbias, are now only a curiosity. The sound is not good nor the rolls flawless, but they did demonstrate what had to be done.

It is a source of wonder, tinged with incredulity, that the world of today is allowing these rolls to sink into oblivion and, within our lifetime, possibly to disappear. The fact that rolls of paper contain life like reproduction of the playing of some great artists is in itself incredible, even in this great technological age.

To realize that no organized attempt has been made to ensure the preservation of this legacy, complete and in now-possible high fidelity, is to recognize the criminal. A few LPs containing Welte rolls have appeared, but considering the available riches of the catalogue, these are just the small beginnings of what could be a project of paramount importance.

The Duo-Art

The Duo-Art first appeared in 1913, although the basic mechanism had been developed as early as 1903. The production was American based, but the Aeolian Corporation maintained recording studios in London and showrooms ranged as far afield as Melbourne and Madrid. A huge range of pianos carried Duo-Art reproducing mechanisms; the case styles ranged from extremely conservative to baroque, with custom made pianos available to match any decor. The company existed until just before the outbreak of World War II. It was both vigorous and adventurous, artistically and mechanically. The catalogue, like Welte's, is huge.

The mechanical innovations are fascinating, although many came too late to save the company from the crash in the thirties. There were coin operated Duo-Art machines which were the juke boxes of the day. These
were installed in public and semi-public places. Some models for home use were fitted with remote control and automatic playing systems. These could play up to 10 rolls in a pre-set order and even cope with the changes of speed which individual rolls demanded.

It should be explained here that the Duo-Art rolls did not all play back at a constant speed, the duration and speed of the roll being to some extent inter-dependent. Some rolls played for as long as 30 minutes, exceeding our LPs by quite some minutes per side. Thus, large scale piano works which would have required tedious interruptions on the 78 r.p.m. records, could be heard as an entity.

A contemporary information comment put out by Duo-Art regarding the above, reads:

"The world of music at your fingertips - this is literally the privilege of the owner of the Duo-Art piano with the new Concertola. Simply touching a button beside the title of the music you choose, magically makes the piano play the selection, or you may enjoy the entire programme without interruption, with a repetition of any selection or the complete programme as the whim of the moment dictates. All this may be done without moving from your chair, without going near your piano. With only the tablet near you, you may control your programme of Paderewski, Bauer, Hofmann, the lighter classics, the latest musical comedies, lively dance tunes, any favourite selection. And yet should you or any guest wish to play the piano between numbers, its action will be found perfect, for Duo-Art piano primarily is designed for hand playing."

As part of an imaginative promotions campaign, Duo-Art was featured as 'soloist' with many of the leading American orchestras and conductors, including the New York Symphony conducted by Walter Damrosch, the Philadelphia Symphony conducted by Leopold Stokowski, the Chicago Symphony with Eric DeLamarter, the San Francisco Symphony with Alfred Herz, the Detroit Symphony with Ossip Gabrilowitsch, the Cleveland
Orchestra with Nikolai Sokoloff, the Cincinnati Symphony with Eugene Ysaye, and the New York Philharmonic with Josef Stransky and Rudolph Ganz as conductors. I give this imposing list of the major orchestras and conductors of the day to show once more that the reproducing piano was taken seriously by the leading music practitioners of the day. The concerts, at which the machine was soloist, were very popular.

Concerto rolls for replay at home were recorded by the pianists, who would also fill in the intermediate tutti passages. Sometimes, a multi-tracking technique was used if the solo part was purely decorative, so that the sound approximated that of the concerto being played with a 2nd piano fulfilling the orchestral role.

Other rolls branched out from the solo pianist idea and included performances of famous pianists playing 4-hand pieces. A form of 'Music-Minus-One' was also catered for, in that one could purchase lieder accompaniments or even piano parts of chamber music works and play against it. Some rolls had gaps in them which the home pianist had to fill in, before the recording pianist again took over.

By far the most interesting development in the Duo-Art catalogue was the concept and execution of what became known as the 'Audiographic' roll - a roll with pictures, autobiographical and biographical information, programme notes, analysis, etc. Apparently, a notion first put forward by the Aeolian Company in England. It enjoyed its widest circulation and production in that country, although such rolls were also made in America. Projects included such things as the complete sonatas of Beethoven.

Audiographic rolls were informally divided into a number of categories: Biographical rolls which contained detailed information at the head of each roll and Analytical rolls which had a commentary running through the roll. One could stop the roll at times to read and digest what was written and then go on to hear the music examples. Percy Grainger recorded the Grieg Piano Concerto on an Analytical roll whilst Stravinsky put down, in six Biographical rolls, the complete Firebird ballet.
Running Comment rolls, with brief notes to be read as the roll played, included such things as Arthur Rubinstein playing the Debussy 'L'Isle Joyeuse'. There were also Annotated rolls, with a veritable music appreciation course on the roll. One could hear Eugene Goossens and Cyril Scott performing their own piano music on these. Finally, there was even a short series of Children's Rolls, which included items such as Harold Bauer playing the Schumann 'Album for the Young'.

The Ampico

The last and most sophisticated of the big three was the Ampico, which, particularly in its last pianos such as the Model B, achieved a very exact electrical registration and coding of all the parameters making up a pianist's rendition. Especially ingenious was the control over crescendo and steps of intensity, which could be re-enacted with great fidelity. The pianists had a control on them marked 'Subdued - Medium - Brilliant' which are a counterpart of our treble-bass and volume controls.

The latest Ampicos even contained a device called an Ampichron (again paralleled by our Digital Clock Radio), which could be so programmed as to play given rolls at certain times or else could give out chimes. Ampico (short for American Piano Company) was launched at a historic concert, described in the 1926 issue of the 'Purchaser's Guide to the Music Industries':

"The first formal presentation of the Ampico was made at a public recital at the Hotel Biltmore in New York City, October 8, 1916. At this recital Leopold Godowsky played two numbers, each of which was re-enacted on the Ampico by means of a record roll previously made by the artist. The recording duplicated Godowsky's touch, tone colour and phrasing so exactly as to be indistinguishable from the performance of the artist himself."
The text goes on to say, after listing other appearances of the Ampico with orchestra:

"...and on February 3, 1920, there was given in Carnegie Hall, New York, a remarkable concert, at which five of the world's greatest pianists, Godowsky, Levitzki, Moiseiwitsch, Ornstein and Rubinstein, appeared in joint recital, in which their playing was heard in direct comparison with its repetition by the Ampico. This most exacting test resulted in a complete triumph for the Ampico."

Such tests of the Ampico's accuracy were often conducted with machine and pianist behind screens, so that no visual distractions were allowed to interfere with purely listening judgements. Prominent critics such as Ernest Newman confessed themselves unable to tell man from machine. Philip Hale, then well known writer for the 'Boston Herald', wrote, in a long review:

"The Ampico piano made remarkable reproductions of the characteristic interpretations of these pianists. At times the pianist would stop playing; the Ampico would go on as if he were not idle. Then the pianist would again take up the wondrous tale. In some instances the performance by the Ampico of the whole composition was identical with the original; in other instances the Ampico surpassed what had gone before, and thus did justice to the pianist when he had fallen below his own standard. Especially noteworthy were the many charming nuances. Not for a moment was there any suggestion of rigid, inflexible, purely mechanical mimicry. The playing was as free, elastic, spontaneous as though a gifted mortal were the performer."

Horatio Parker, now known to history primarily as Charles Ives' teacher, wrote in the 'Boston Transcript':

"It is customary to call this recording, this reproduction, the mechanical process of a material age; but to the pianist, at
least, there is a very personal element, while the listener needs only a little imagination to make it uncanny."

The Ampico took over some of the productions of Ludwig Hupfeld and we should perhaps at least give brief mention to this very important European make. The Hupfeld rolls, also known under the names DEA and Triphonola, boasted an impressive catalogue. They were brought onto the European market early, not long after the Welte. Hupfeld never achieved the market that Welte did, but the machines were coupled with excellent German pianos such as Bluthner, Ronisch and Grotrian-Steinweg. Hupfeld also made some vorsetzers, but the DEA was the crown of his achievements. Although now rare to find one in good working order, it was beautifully engineered and the components, in quality, were probably superior to any other make.

Other Systems

Other systems that achieved some distinction, and are worth serious consideration by the musician, are:

1. The Artecho (also called the Apollo and the Celco). An American production, the rolls were produced by the QRS company. Some Artecho rolls were re-processed Welte rolls, some taken from Ampico. The system had many features in common with Ampico.

2. The Artro-Angelus (usually called simply 'Angelus'): another American production. This one had some features in common with Duo-Art. Although definitely a minor name, it had a number of recordings made specially for it by big name artists. Its catalogue includes Leopold Godowsky playing his complete 'Triakontameron' i.e. 30 roll set!

3. I have already mentioned the Ducartist pianos (also known as Duca or Ducanola). These were made by the Philipps company in Germany. Their impressive catalogue contained about 2000 different renditions.
There were also other, more obscure makes which are probably of interest to the specialist rather than to the general music-lover.

Composers have evidenced interest in reproducing pianos in its heyday, not only by recording upon it, but also by using it as a compositional tool. Busoni did a special transcription of a Mozart overture for it; Stravinsky originally intended to use such pianos in 'Les Noces', but was defeated by the problem of synchronization. Henry Cowell wrote pieces especially for it, which could not be played by human hands, containing huge clusters and intricate rhythms. (2) The contemporary American composer Nancarrow continues to use reproducing pianos, singly and in combination, for many of his works.

The Importance of Reproducing Piano Rolls

So we have come full circle to my first question: how authentic are the sounds that come from a reproducing piano? My ultimate view of this whole question is this:

(a) Rolls are valuable at least as a guide to the way these giants of the past played. If the roll moves without slipping, then we have a record of the speed and rubato of the playing, at the worst.

(b) At its best, the other more subtle parameters of the playing are almost wholly reproduced.

(2) There is a story about one of these Cowell rolls. Most large music shops had reproducing pianos set up to demonstrate to the intending buyer. In one of these, the salesman for a change, inserted a roll of a Cowell piece for the next victim. He obviously knew nothing of Cowell as a composer, for when the interested member of the public asked to hear the piano and the roll was activated, it began by playing a cluster which comprised every note on the piano. The salesman, very embarrassed, switched the machine off with the apology that "he was very sorry but it was working perfectly well this morning."
(c) There is no doubt that different adjustments by different people to the reproducing mechanism do create slightly differing resultant performances, therefore the claim that these rolls are fully comparable to the modern recording, must be taken with a grain of salt.

(d) With infinite care, with resources of first class grand pianos, unlimited time to work on the machines and perfect the replay, startling results may be obtained. (Witness the excellent series of records put out by the BBC of Ampico rolls, the Klavier label records and the Welte Treasury records, to mention those I consider the best.)

(e) We owe it to ourselves and to future generations, to capture as many of these performances as we possibly can on record and tape, and to make them known to a wide circle of pianists and music lovers.