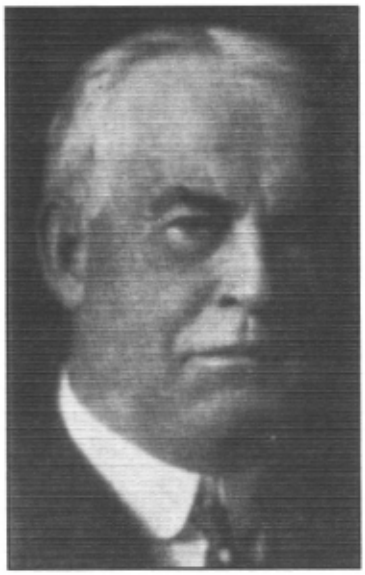
The American Society of
Mechanical Engineers

The Q-R-S Marking Piano

A National Historic Mechanical Engineering Landmark

Designation Ceremony
Q-R-S Music Rolls, Inc.
Buffalo, New York
March 18, 1992

Historical Significance



Melville Clark
(c. 1850 - 1918)

The player piano played an important part in American commerce and culture in the early 20th Century. Before the days of radio and high-fidelity phonographs, its widespread use brought both popular and classical music into the lives of millions, enriched piano manufacturers and music publishers, and inspired musicians from Fats Waller to Igor Stravinsky.

It was in the late 1890s that the concept of a self-playing piano began to capture the imagination of inventors and the public, and several different player mechanisms were marketed. The dimensions of the paper rolls that contained the music for these players were not yet standardized.

Piano designer and inventor Melville Clark, born near Rome, New York about 1850, reasoned that a standardized roll size which encompassed all 88 notes on the piano keyboard would unify and strengthen the keyboard industry. His **Apollo Player Piano** of 1901 was the first instrument built to the new 88-note standard, and by 1908 the entire industry had followed his lead.

Apollo Player Piano
(c. 1908)

The player piano was the first widely successful consumer device to encode its data in binary format, configured in the piano rolls. Punching rolls for the player piano required the creation of a master roll to serve as a pattern for

the high-speed duplicating machines called perforators. For many years master rolls were created through the tedious process of hand-punching directly from sheet music. Specially trained workers translated the printed notes into the appropriate holes.

Hand-punching master rolls, c. 1910

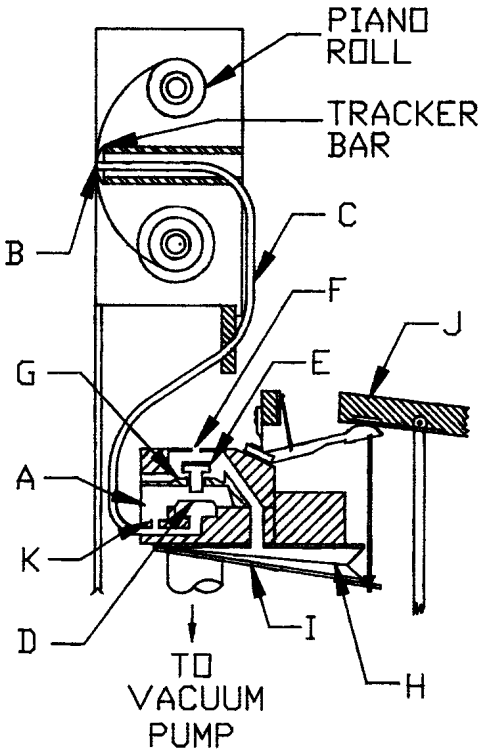
In 1912, Clark invented the Q-R-S Marking Piano which made it possible to record the master roll data from live performances rather than hand punching from sheet music. Hailed as a breakthrough and used by the QRS Music Company from 1912 to 1931, it not only added a human dimension to piano rolls but also made possible the preservation of historic performances by early jazz and blues artists. The Marking Piano ushered in the heyday of the player piano, which was to last through the Roaring Twenties. Sales peaked in 1926, when over 10 million QRS rolls were sold.

Retired from service in 1931, the Marking Piano was restored in 1971 and has since been used to record performances by a variety of world-class artists, including Liberace, Peter Nero, George Shearing, Eubie Blake, Marian McPartland, and Ferrante & Teicher.

Liberace records on the QRS Marking Piano, 1972.

Other roll recording devices were developed in the United States and abroad at about the same time. The QRS Marking Piano is the only known example still in existance and still used commercially.

Technical Background



Cross section of a typical player piano action.

A brief explanation of the player piano will clarify what the QRS Marking Piano does.

A player piano actually consists of two machines: A regular piano, and a player mechanism. In a regular piano, a human finger must press a key to operate the piano action. In the player, a **pneumatic** substitutes for the finger. A pneumatic is a very small bellows with one fixed leaf and one movable leaf. The fixed leaf is glued to a vacuum chamber; the movable leaf is glued to a striker finger, which strikes the piano action. There is one pneumatic for each piano key, and each pneumatic is connected by a tube to a corresponding port in the tracker bar over which the roll passes. The roll is read at the tracker bar.

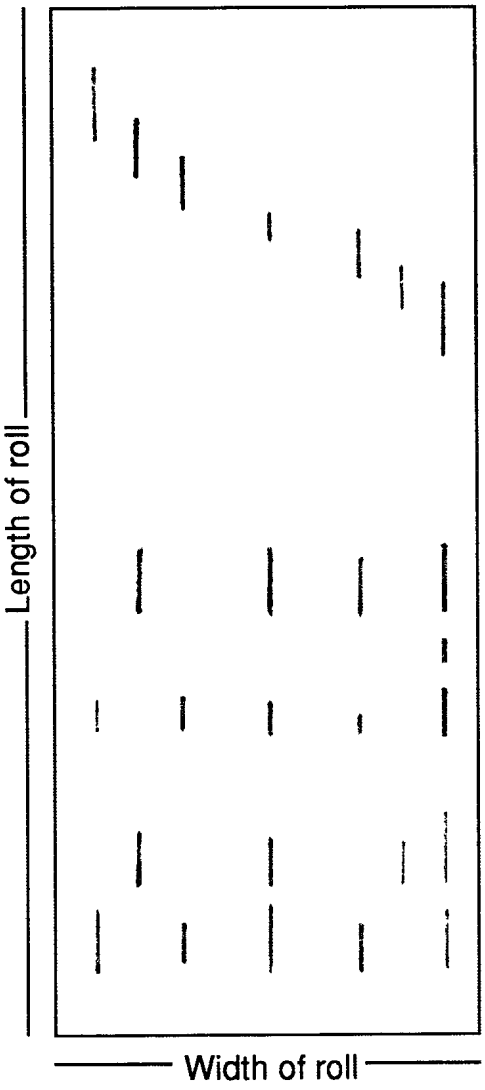
See the diagram above left. When someone pumps the player piano foot pedals or switches on the motor, the air in chamber **A** is drawn out; a vacuum exists there.

When a perforation in the piano roll uncovers the port **B** in the tracker bar, air rushes in through **B** into tube **C.** The leather pouch **D** rises, because it now has atmospheric pressure below it from **C** and vacuum above it from **A.** As **D** rises it lifts valve **E,** closing opening **F** and opening port **G,** which connects the pneumatic **H** with the vacuum chamber. The vacuum collapses the pneumatic **H,** causing its movable

leaf **I** to rise. This causes the striker finger to operate the piano action **J,** and the respective note is played.

When the roll perforation has passed, the bleed **K** exhausts the air under pouch **D.** Valve **E** seats itself, the pneumatic opens, and the note is ready to play again in a fraction of a second.

The Marking Piano more or less reverses the process. When a pianist strikes a key its corresponding pneumatic closes, and in doing so it presses a stylus against a roll of piano roll paper being pulled over a cylinder covered with carbon paper. The result is an exact graph of the playing of the pianist. Technicians then cut out this roll by hand and copy it mechanically to produce the master. Presently, master information is stored on computer floppy disks instead of the paper master rolls in use from 1900 to 1985.



Detail of a recording from the Marking Piano, shown actual size. The horizontal (across the roll) position of a mark indicates which *note* it represents. The leading end of a mark indicates *when* that note was struck. The length of a mark indicates *how long* the key was held down by the pianist.

Description

The recording machinery of the QRS Marking Piano is housed in a mahogany cabinet, approximately 34”H by 35”W by 17”D. Included are a variable-speed electric motor for roll drive and a rotary vacuum pump. Standard width (11 - 1/4”) blank piano roll paper is loaded into the machine on a spool containing up to 80 feet and threaded to pass over a wooden cylinder. A sheet of carbon paper is wrapped around the cylinder, the carbon facing outward; a cam propels the cylinder along a screw in order to bring fresh carbon paper into place at frequent intervals during recording. The roll paper is pulled by and collects upon a take-up spool.

A series of styli are suspended horizontally above the roll paper at the point it passes over the carbon cylinder. Each stylus is attached to the moveable leaf of a small striking pneumatic, each of which in turn is connected by a tube to a valve beneath each key on the keyboard of the attached Melville Clark grand piano. When a key is depressed, the corresponding pneumatic is evacuated and instantly collapses. Its attached stylus then presses firmly on the upper surface of the moving roll paper as it passes over the carbon cylinder. A carbon mark is thus made on the underside of the paper, indicating the identity of the note; the relative time the note was struck; and the duration for which it was held. When the key is released the pneumatic reopens and the stylus rises to its original position.

Ragtime pioneer Eubie Blake observes the workings of the Marking Piano, 1973.

The History and Heritage Program of the ASME

The ASME History and Heritage Recognition Program began in September 1971. To implement and achieve its goals, ASME formed a History and Heritage Committee, initially composed of mechanical engineers, historians of technology, and (ex-officio) curator of mechanical engineering at the Smithsonian Institution. The Committee provides a public service by examining, noting, recording, and acknowledging mechanical engineering achievements of particular significance. The History and Heritage Committee is part of the ASME Council on Public Affairs and Board on Public Information. For further information please contact the Public Information department, American Society of Mechanical Engineers, 345 East 47th Street, New York NY 10017, 212-705-7740.

The Q-R-S Marking Piano is the 103rd National Historic Mechanical Engineering Landmark to be designated. Since the ASME Historical Mechanical Engineering Recognition Programs began in 1971, 149 Historic Mechanical Engineering Landmarks, six Mechanical Engineering Heritage Sites and three Mechanical Engineering Heritage Collections have been recognized. Each reflects its influence on society, either in its immediate locale, nationwide, or throughout the world.

An ASME landmark represents a progressive step in the evolution of mechanical engineering. Site designations note an event or development of clear historical importance to mechanical engineers. Collections mark the contributions of a number of objects with special significance to the historical development of mechanical engineering.

The ASME Historic Mechanical Engineering Recognition Program illuminates our technological heritage and serves to encourage the preservation of the physical remains of historically important works. It provides an annotated roster for engineers, students, educators, historians, and travelers. It helps establish persistent reminders of where we have been and where we are going along the divergent paths of discovery.

National Historic Mechanical Engineering Landmark
The Q-R-S Marking Plano
1912

The Q-R-S Marking Piano was one of the first machines to produce master rolls for player pianos by recording actual performances. Invented by Melville Clark (c.1850 - 1918), it is still in service. Each key of a modified piano is pneumatically connected to a stylus in the recorder. As an artist plays, each stylus marks its note on a roll of paper being pulled over a cylinder covered with carbon paper, faithfully recording the performance. Upon completion of the recording, the carbon marks are cut out and a production master is made from this roll.

Acknowledgments

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