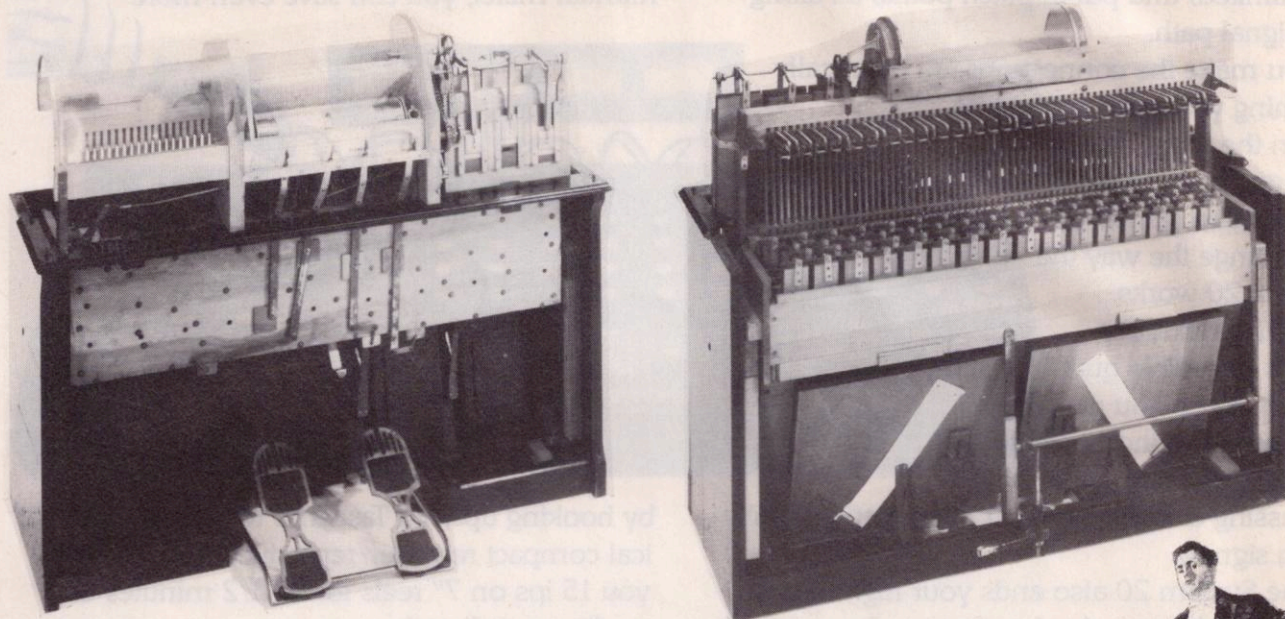


# The Player Piano

## Mechanical Evolution of the Automatic Keyboard



Front and rear views, Aeolian Pianola, a "push-up" pneumatic piano mechanism, designed by Edwin S. Votey, c. 1900.

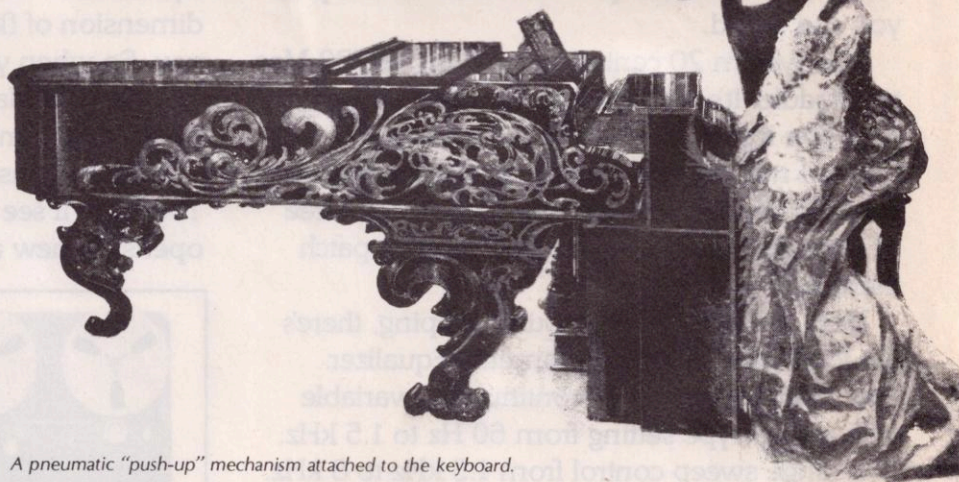
SMITHSONIAN INSTITUTION

By Shirley Wilcox

**S**EVEN-THIRTY P.M. — The whole family is gathered around a big dark polished box that dominates one corner of the living room. Conversation is at a minimum as hypnotic blasts of sound pour from the box. Sound familiar? In 1981, the box is a television, and what's coming out of it is *Charley's Angels*. In 1935 it was a radio, and everybody was enthralled by *Fibber McGee & Molly* and *The Lone Ranger*. But passive family togetherness didn't start with television, radio, or even the phonograph. In 1915 you would have found the same scene being enacted across America, only the big dark polished box was a player piano.

It was the player piano that first created the phenomenon of passive mechanized home entertainment. Up to about 1900, Americans who didn't live in cities — and this was more than 60% of the population — had little access to entertainment, except for occasional travelling shows. On a Saturday night, Ashtabula and Smithtown had to settle for Uncle John's fiddle or Cousin Effie on the reed organ.

But when the player piano burst upon the scene, even little Ned could pump the pedals, and the tune would unroll perfectly. Families gathered round, singing the lyrics printed on the perforated piano rolls: "Beautiful Dreamer," "There's A Long, Long Trail



A pneumatic "push-up" mechanism attached to the keyboard.

HARVEY ROEHL/VESTAL PRESS

A-Winding," and hundreds of other favorites by Stephen Foster, Harry von Tilzer, and other songwriters of the day. Music was available to every home, and the player piano took America by storm.

Mechanized music was brand new to the majority of Americans, but it wasn't a new idea. Strange as it may seem, the player piano wasn't really invented at all. Rather, it was the end-product of dozens of different inventions and developments that took place over centuries. After 1300, with the invention in Europe of spring-driven clockwork, it be-

came possible to contrive a musical instrument that would operate automatically. Music boxes, in which rotating wooden or metal barrels with protruding pins activated pitched tines, were a common sight in upper class drawing rooms from the Renaissance onward. In an effort to please their wealthy patrons, music box artisans evolved elaborate (and elaborately decorated) instruments that contained large repertoires of tunes.

Inevitably, barrel mechanisms were built into the keyboard instruments of the day. When Henry VIII died in 1547, the inventory



taken of his possessions listed, among many other virginals, "Item an instrument that goethe with a whele withoute playenge upon. . . ." The records of the seventeenth and eighteenth centuries contain many references to such instruments, among the other mechanical marvels of the age. A mechanical spinet built by Samuel Bidermann of Augsburg, Germany, can be seen in the German National Museum in Nuremberg. A climax of sorts may have been reached by the automaton built by P.J. Droz in 1774, a mechanical doll with the appearance of a young lady whose fingers moved on the keys of a harpsichord as the tune played.

When the pianoforte became common, barrel mechanisms were applied to it as well. In 1824, the famous London piano firm Clementi, Collard & Co. built a "self-acting pianoforte" whose keys could be played even while the spring mechanism was operating. Another device that appeared at this time was the Cylindrichord, which rather than being built into a piano was in a separate cabinet that could be pushed up to the keyboard, where a set of mechanical fingers, one for each key, would descend on cue to play the tune. This "push-up" type of player mechanism was still preferred by some manufacturers even in the heyday of the player piano. But while automatic keyboard instruments were built throughout the nineteenth century, they failed to become very popular. An exception was the street piano, also called (inaccurately, as it had strings and not pipes) the barrel organ. The beggars who wheeled these contraptions through the streets, cranking the spring mechanism to produce a tune in the hope of attracting a few coins, were called organ grinders. Street pianos generally had hard leather hammers and no damper mechanism at all, which enabled them to compete with the noise of a busy thoroughfare but which probably didn't contribute much to a mellifluous tone or a pleasing musical effect.

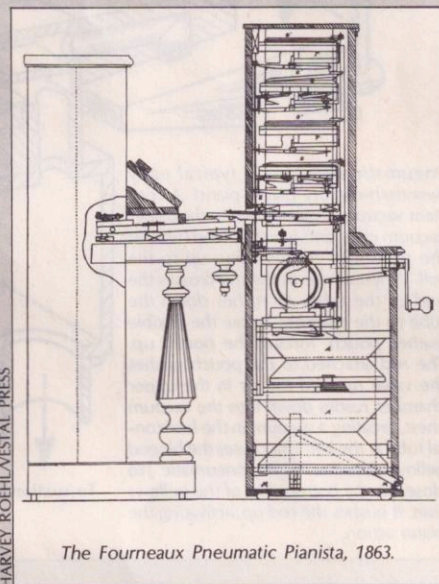
A major step in the development of the player piano was the switch from the bulky barrel with its protruding pins to the perforated paper roll. This seemingly simple mechanism also had a long history. The earliest perforated mechanisms were apparently used to control looms in weaving machinery. In the early 1700s, a Parisian named Vaucanson introduced pierced metal cylinders into the production of silk, and in 1801 another Frenchman, Jacquard, utilized a perforated roll of cardboard to control spring-powered needles, creating the type of woven fabric that still bears his name. As early as 1731, an Englishman named Justinian Morse adapted this idea to the piano, using a thin perforated board, and in 1846 a system using perforated cardboard sheets to produce mechanical music was patented in Great Britain. A Frenchman named Peytre came up with a perforated paper roll that could be wound up on two cylinders. The use of a bellows-driven pneumatic system, replacing the earlier spring-driven systems, had just as complex a history.

In 1863, a Frenchman named Forneaux pulled these stray ideas together to produce the first pneumatic piano-playing mecha-

nism. His player, dubbed the Pianista, was exhibited at the Philadelphia Exposition in 1876. It was of the free-standing "push-up" variety, and used a hand crank to operate the pneumatic mechanism. Apparently the Pianista aroused the interest of American craftsmen, because from here on the story shifts to this side of the Atlantic.

Elias Parkman Needham, of New York, had already patented the idea of using perforated sheets of paper to play a reed organ, the perforations allowing blasts of wind to activate the reeds. In 1876, a man named William Tremaine organized the Mechanical OrguINETTE Co., which manufactured such automatic reed organs. This fact is of interest chiefly because the Mechanical OrguINETTE Co. later became the Aeolian Co., one of the leading manufacturers of player pianos.

In 1880, R.W. Pain adapted the orguINETTE mechanism to a self-acting pneumatic piano



— a self-contained instrument of the type that was eventually to displace the clumsy push-up. Like many of its predecessors, Pain's first piano had a mechanism that only activated the notes in the middle register. His first self-contained player piano was a 39-note instrument produced by Needham & Sons in 1880. And eight years later, according to the records, he built a 65-note electrically operated piano.

A hundred years ago, electricity was a clumsy and unreliable force, but that didn't keep experimenters from trying to use it in automatic musical instruments. In about 1870, a patent had been issued in Wurtemberg, Germany, for an electric player piano. This apparently consisted of a series of electromagnets with movable armatures that swung across the poles, the armatures being connected by wooden rods to the wippens of the piano action. Perforated music sheets passed over a metallic roller and under wires spaced in comb fashion. When a perforation passed beneath one of the wires, electrical contact was made between it and the roller. A similar piano developed by a Swiss named Spiess was exhibited in 1868. Also in Europe, an inventor named Hipp inserted variable resistance in the circuit, which caused the electromagnets to vary in strength and thus

alter the speed of the hammer motion. As in the case of some later developments in the pneumatic piano, however, the variable resistance was introduced into the circuit as a whole rather than into the separate circuits leading to each magnet, which limited its effectiveness. Another problem with the electric players was that they tended to singe the paper rolls, enlarging the holes. Attempting to overcome this defect, William and Henry Schmoel of Philadelphia patented a music roll with notes printed in metallic ink for electric players, but this idea was never pursued. Nor was a later system that used brass ribbon rather than paper rolls. Because they weren't always grounded, electric players gave off showers of blue sparks as they played. Spectacular, but not especially safe.

The real beginning of the player piano boom came in 1897, when Edwin S. Votey developed a push-up player for the Aeolian company. His first model, which played on only a few keys, is now in the Smithsonian Institution. His next operated more than 50 keys, but was so large and cumbersome it hid the piano. With further refinements, the mechanism was patented in 1900, and dubbed the Pianola. Like Kleenex and Jello, the term "pianola" was a brand name owned by a single manufacturer, but was adopted by the public as a generic term. Aeolian's competitors gave their instruments such names as Amphion, Auto-Piano, Autotone, Playotone, Air-o-Player, and Harmonola, but to the public, they were all pianolas. As interest in the pianola snowballed, piano manufacturers overcame their reluctance to build the player mechanisms into the piano's own cabinet, and the player piano as we know it appeared.

Contributions to the technology of the player piano were made by other inventors as well. Merritt Gally's cam, patented in 1881, was essential for the player, as it is to today's electric typewriter. When pressed lightly on a rotating roller, the cam causes great force to be exerted on a lever. The lever then activated the piano hammer. Melville Clark of Chicago had many patents for improvements in the player; he was the first to build a player unit that operated over the entire 88-note range of the piano. An agricultural machinery repairman, John McTammany of Worcester, Massachusetts, patented many improvements on Forneaux' designs, but later lost his patents to exploiters. McTammany died in 1915, claiming to the end that he had invented the player piano. The inscription on his tombstone at Canton, Ohio, continues to claim this honor for him. George B. Kelly in 1886 developed a slide-valve wind motor which was eventually used to drive the spools for the music rolls. Other improvements — a host of them — continued to be patented until about 1906.

Eventually these developments fused into a pneumatic instrument driven by pedals ("Long, full strokes are recommended") which worked a bellows to create a vacuum. Vacuum pressure both drove the roll forward and, released through the holes in the roll, activated the levers that drove the hammers against the strings. The early pneumatic players had used perforated "tune sheets," a kind of large flexible cardboard, until Emil Welte of Germany had the bright idea of using the

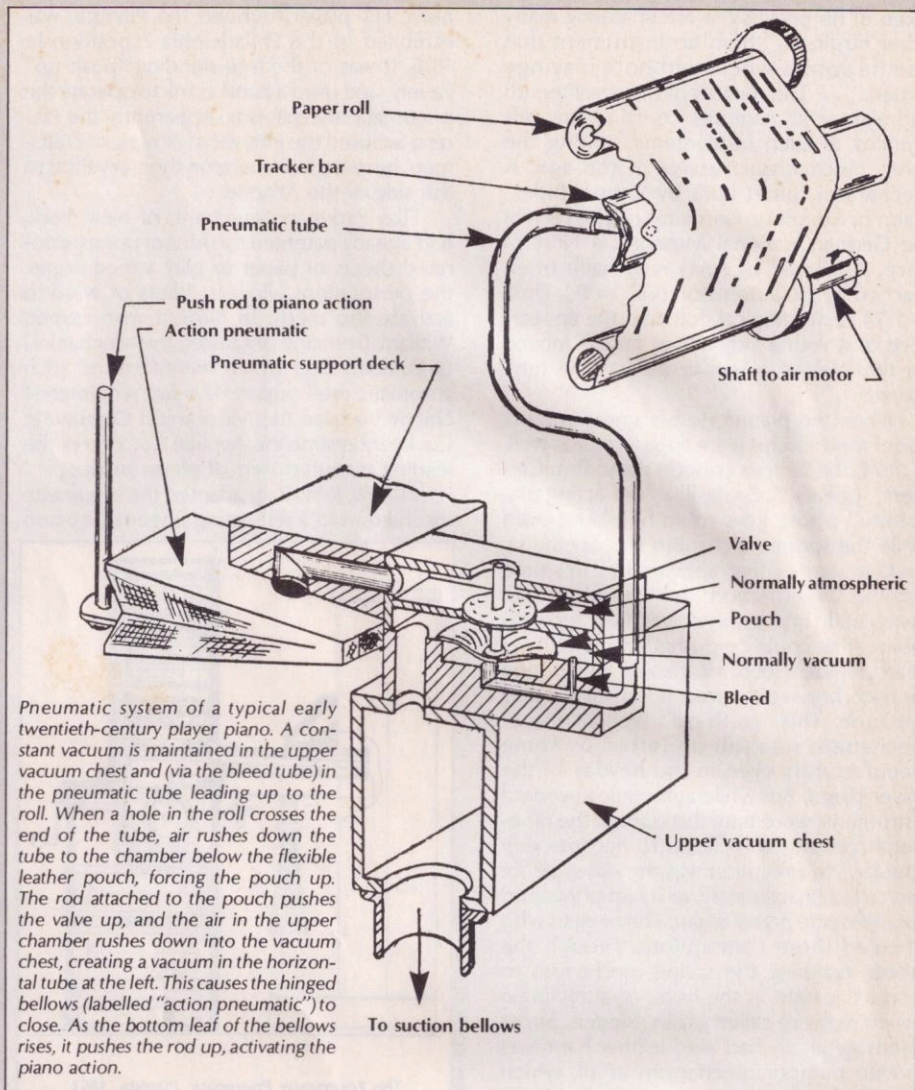


# The Player Piano

paper roll.

Paper rolls, however, did not play well in damp weather until a low-expansion paper was introduced in the early 1900s. Also, notes that were held for a long time required long slits in the paper, and the slits pulled apart and tore easily until someone figured out how to accomplish the same musical effect with closely spaced perforations. These modifications turned what had been a curiosity into an instrument with universal appeal. Anybody who could thread a roll onto the spool could play any number of musical selections perfectly without the troublesome necessity of musical training.

Advertisements of the day made much of this point. In 1905 the piano store of J.T. Wamelink & Son proclaimed, "Perfection Without Practice. How many thousands of American parlors contain that shining monument to a past girlhood — a silent piano. Do you wish to enjoy your piano? This can be accomplished by owning a Cecilian Piano Player." In a 1902 ad in *Cosmopolitan*, we read, "The Pianola solves the problem of music in the home. Within the home, where there is a Pianola, music reigns supreme, and every member of the household may be a performer. . . . Before the Pianola came, how very few there were who even caught a glimpse into the grand world of harmony. Toiling laboriously to reproduce a small part of the great compositions of the masters, even the best pianists were sadly limited. The iron rules of technique, the inexorable necessity of long hours spent in daily practice, forbade pianists the pleasure of roaming at will throughout the world of music. To all the rest of human kind the masterpieces of the grandest art that is known to man were buried treasures. This is what the Pianola does for man. To those who never yet have felt the fascination of pouring forth the best emotions of their souls in music, or those who *used to play*, but have been weaned by



FROM REBUILDING THE PLAYER PIANO, BY LARRY GIVENS, COURTESY VESTAL PRESS.

other cares from practice, it brings a joy that any time before it came the wealth of all the world could not have bought." [*Italics in original.*] Advertisements were wordier in those pre-electronic media days, but certainly no less grandiose in their claims!

Initially musicians, and particularly piano teachers, disapproved of the pianola, but as it swept the nation, bringing music to homes that had never before known it, interest was stimulated as never before. The number of piano pupils increased rather than decreasing. And year by year the number of player pianos grew. In 1905 less than 6% of all American pianos were being manufactured with pneumatic intestines. In 1915 the figure had risen to 25%, and by 1919 players constituted a staggering 53% of the nation's annual piano output.

One further mechanical refinement was possible, and shortly it was achieved. This was the reproducing piano — essentially a machine for exactly duplicating the dynamic nuances and pedalling of a concert artist. Several different systems were used for capturing dynamics. One developed by Edwin Welte and Karl Bockisch in Germany utilized a special keyboard with a trough of liquid mercury beneath the keys. Attached to each key was a spring-mounted electrical probe

that dipped into the mercury to a distance proportional to the force with which the key was struck. The electrical resistance of a current passing through the probe was then translated to the proper holes in the paper roll. Recordings were made for Welte by many of the great pianists of the day, including some who never recorded for the infant phonograph, such as Edvard Grieg, who made several rolls before his death in 1907. The Welte rolls were played on a sophisticated push-up player called the Welte Vorsetzer.

A decade later, Aeolian introduced their reproducing system, called the Duo-Art. Less advanced in design than the Welte system, the Duo-Art added nuances to the playing after the fact: The pianist first recorded the notes of his or her performance, playing as the roll unwound, and then afterwards went back at leisure and added dynamic indications, which were encoded in a special row of holes at the edge of the roll. Aeolian's competitor in the reproducing piano business was the American Piano Company, whose acronymous Ampico system was designed by Charles Fuller Stoddard. In the mid-'20s, Ampico hired Dr. Clarence Hickman to re-engineer the Stoddard reproducing system; his work resulted in the Ampico Model B, the

THE WORLD'S FOREMOST PIANISTS  
Record Their Playing Exclusively For  
**THE DUO-ART**  
Reproducing Piano



**I. J. Paderewski**



**Josef Hofmann**

ON these pages are pictured a few of the world's most famous pianists who record their playing exclusively for the Duo-Art. The significance of their choice does not require emphasis. The supremacy of the Duo-Art is world-wide.

**THE AEOLIAN COMPANY**



**Harold Bauer**



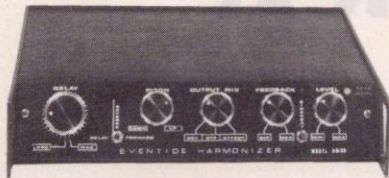
**Ossip Gabrilowitsch**

HARVEY ROHM, VESTAL PRESS

Ad for Duo-Art reproducing piano, c. 1915.



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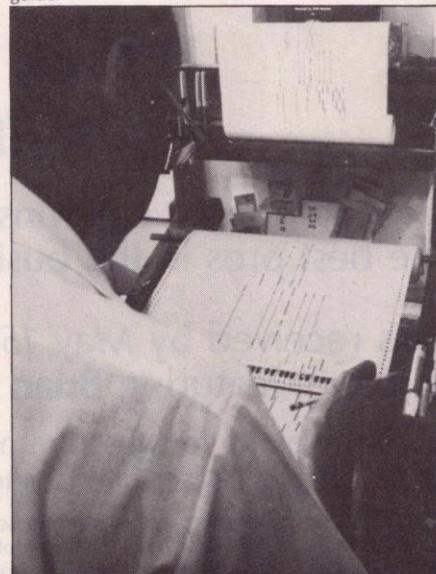
## THE PLAYER PIANO

ultimate manifestation of a technology that was already becoming obsolete.

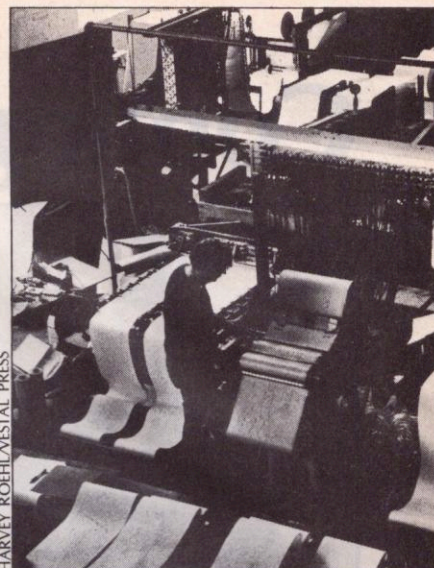
The Ampico and Duo-Art reproducing pianos were of some importance in documenting the keyboard performance of the concert virtuosi of the day. From about 1916 to 1925, virtually every important pianist was under contract to one or the other of these two companies, and rolls exist that were cut by Paderewski, Rubinstein, Horowitz, Rachmaninoff, Prokofiev, Ravel, Stravinsky, Mahler, Saint-Saëns, Richard Strauss, and many others. Not only were such rolls made, they were used in a number of concerts as a substitute for a live performer in a concerto performance with a symphony. Such leading conductors as Walter Damrosch and Leopold Stokowski lent their batons to these promotional efforts. [Ed. Note: For more on reproducing pianos, see *Keyboard*, Mar. '80.]

Early player pianos used rolls of various widths — 58-, 65-, 70-, 82-, and 88-note systems were all in use. It wasn't until 1919, at a convention in Buffalo, New York, that the designs were standardized. Rolls were to be made in either 65- or 88-note format, and all rolls were to be playable on the pianos of any manufacturer. Thousands of selections were available on piano rolls, which gave rise to piano roll lending libraries open to subscribers in New York and other large cities. As early as 1914 the public library in Kansas City, Missouri, had 500 piano rolls in its music library as the result of a private gift. The production of piano rolls peaked in 1926, when some 50 manufacturers cut 50 million rolls. But even then, the player piano's days were numbered. The phonograph and the radio had begun to offer stiff competition in the home entertainment market, and the Great Depression, which would put such high-ticket items as pianos out of reach for millions of American households, was just around the corner. Production of the player pianos themselves fell from a peak of 205,000 instruments in 1923 to 428 instruments in 1935. By 1938, there were no new players being built.

*Editing a piano roll by correlating holes with keyboard guide.*



HARVEY ROEHL/VESTAL PRESS



*Production perforator in a piano roll factory.*

In the early 1950s, though, people started discovering the dusty, unused player pianos in garages and basements across the country. Such firms as QRS [1026 Niagara St., Buffalo, NY 14213] quickly jumped back into the production of piano rolls to meet a renewed demand, and soon the production of pianos themselves began again on a more modest basis. Aeolian went back into production in 1956, and they were followed by the Universal Piano Company of Los Angeles, Kimball of Jasper, Indiana, and Wurlitzer of DeKalb, Illinois, all of whom are currently producing players. According to industry figures, nearly 10,000 players were sold in 1980. In a related development, Marantz [Superscope, Inc., Chatsworth, CA] markets a reproducing piano called the Pianocorder that uses the space-age technology of digitally encoded cassette tapes to operate an electromagnetic player mechanism.

For those who prefer to rebuild vintage instruments, Aeolian [2718 Pershing Ave., Memphis, TN 38112] also offers a one-week course to teach technicians how to service both the new player pianos and their more run-down older relatives. Those who can't get to Memphis for this course can check out *Rebuilding The Player Piano*, by Larry Givens; Vestal Press [Vestal, NY] publishes this book, as well as reprints of some of the original service manuals for player pianos from the 1920s. Parts are available from the Player Piano Company [704 E. Douglas, Wichita, Kansas, 67202].

The nostalgia for ragtime piano and the widespread interest in antiques of all sorts may keep the player piano on the scene for many years to come, but it's not likely that it will ever again take the place of television! Sooner or later, though, as the history of home entertainment shows, *something* will — probably something whose component parts inventors are already tinkering with today. Fifty years from now, a few small companies may be cranking out modest numbers of televisions (complete with specially manufactured vacuum tubes) for those who look back fondly on the good old days of the 1980s.

HARVEY ROEHL/VESTAL PRESS