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Cecil Effinger and the Musicwriter

The Invention

Even as a young man Cecil Effinger (1914-1990) was fascinated by both numbers and sounds, math and technology as well as music. He earned a bachelor's degree in mathematics at Colorado College (from 1931 to 1935), but he began putting his musical upbringing and his years of independent study in composition and musical performance to use as an instructor of band instruments at the college soon afterwards.¹ At the start of World War II he became a band leader in the Army Air Force, and towards the end of the War the promising young composer was assigned to the American University in Biarritz, France. There he began to formulate an idea for an invention which had its inspiration in his experiences as a composer and which he would continue to improve upon for years:

One afternoon in October 1945, I was in Paris, France, purchasing some music supplies for the Biarritz American University. . . I happened to see in a store window a drawing instrument and something about this instrument triggered in my mind an idea relating to a means of doing music copy by machine. By that evening the basic principles of the Musicwriter . . . had been firmly established.²

After returning to the States, he began to formulate his plans to build a music typewriter. Working in the evenings and weekends, he constructed the first machine in his basement by the end of 1946, one which was a bit too large to be practical. As the inventor later recalled: "My first model was a contraption almost as large as a ping pong table. Shortly after this, a new model came along which was about the size of a card table and which worked pretty well."³

Effinger knew that the possible success of his creation depended on a clear vision of the machine's purpose and function. He carefully formulated the concept for the machine, realizing that the technical demands of positioning precisely the musical symbols must not impede the operation. He knew that, to be practical, the typewriter must be as easy for a musician to use as a standard typewriter is for a novelist:

The machine . . . must produce music symbols placed in the proper relation to each other so that the music is legible, exactly as the musician has learned to see it. . . . Another requirement of a successful machine is that the music symbols must be placed properly with speed, flexibility, and ease. The music

language is an extremely subtle *pattern* language and flexibility of character placement is particularly essential. It is extremely important that as the musician is putting notes on paper the musical thought process must not be blocked in any way.⁴

Confident that he would soon secure an agreement for the manufacture of the typewriter, and believing that there was a market for contemporary publications, Effinger began to consider opening his own publishing house. Encouragement for his idea came from Stanley Fletcher, a well-known pianist from University of Illinois. In 1947 Fletcher had written to the composer inquiring if he were interested in attacking the problems of distributing new works by contributing manuscripts to a lending library:

A group of us at the University of Illinois are considering a project which we think will be of service to contemporary composers. There are in existence many works by contemporary composers for solo and small chamber groups of instruments which lie in manuscript in the composer's files or on publisher's shelves with apparently little immediate prospect of circulation in print. . . Nor is there any organization that would permit the circulation of these works under circumstances that would protect the composer while still permitting interested performers, student composers, and other musicians to make their acquaintance.

Here is the plan we propose:

1. Indexing - compile and publish an index that will appear periodically
2. Circulation - composers would deposit one or more copies of their work in any library which would cooperate through the Inter-Library loan system.⁵

Throughout the late 1940s, Effinger had received letters from musicians eager to perform his works but unable to find the scores. A letter from J. K. Ehlert, of the School of Fine Arts at Ithaca College on 7 March 1951 is typical:

We are sorry to hear that neither the Prelude and Fugue nor the Cowboy tune are available for use this June. We have found that it has become more and more necessary for us to rent copies of newer compositions. As you undoubtedly know, publishers are restricting their works to such an extent that we find it difficult to find good new works of an advanced level.⁶

These concerns were on Effinger's mind when he wrote to Millard Huey, a friend in Greeley, Colorado, in January 1952 outlining a specific proposal for establishing the small music publishing venture. In his letter he stated:

George [Lynn] and I have to get the product picked and produced before anything else of course. Within the first year there would be need for some part time help in the selling activity. Once the firm is made known there

will be lots of activity coming and going and we can get the help we need as we need it . . . until the machines are ready. We're ready to go on this any time. As a matter of fact we're already planning in some detail the initial offerings.⁷

In another letter to a family friend, J. Martyn Walsh, he expressed optimism about the prospects for success:

There is tons of old and wonderful music which should be published and because of costs has not yet been. The machine is going to make possible lower cost publishing and I will be on the ground floor not only with the machine but with the knowledge to use it and show the way in the application. In short I want to start a music publishing firm here in Denver. I have gone into all angles, from production and printing problems and I think that eventually the thing would succeed.⁸

Instead of devoting his time to publishing music, the inventor became increasingly preoccupied with the task of finding a manufacturer for his machine. Although Effinger's plans to open a publishing house never came to fruition, Lynn eventually opened a small firm in 1962 using the typewriter.

Early in the fall of 1946, Effinger began to show his ideas to typewriter manufacturers, first approaching Roy Davis, a representative of Royal Typewriters in Colorado Springs.⁹ In January 1948 he filed his first patent application and began searching in earnest for a company to manufacture, distribute, and sell the typewriters.¹⁰ He contacted International Business Machines (IBM), feeling that the prominence and size of the company made it a logical choice. IBM was sufficiently interested to provide technical consultation on the construction of a card-table-sized model later that year. The new model was functional enough for the composer to copy the parts for his Fourth String Quartet.¹¹ Although it was still a bit ungainly, he felt that the machine proved the practicality of his idea. When IBM did not offer to manufacture the machines, he approached other companies.

Effinger began to realize that he could not expect company representatives to come to him. The card table machine worked well enough but could not be demonstrated outside his home. In November 1949, he secured a \$1000 grant from the Council on Research and Creativity at the University of Colorado for development of a third model, one which would be the size of an actual typewriter. In December 1950 he finished this model.¹²

Effinger now broadened his efforts to market his invention. During the fall of 1950, he met M. M. Shaver, a regional manager with the Underwood Corporation, who was impressed with the machine and supplied him with a letter of introduction to W. F. Arnold, an executive in the New York office of the company: "This will introduce a good friend, Mr. Cecil Effinger, who has the first Musical Typewriter that is really worthwhile. Suggest you take a real look."¹³ In December, Effinger traveled to New York and began "beating the

pavement.”¹⁴ In the process he visited the headquarters of Royal, IBM, Remington Rand, and Underwood. Although several of the companies expressed interest, he returned home without any definite commitments.

Effinger continued to pursue his contacts with typewriter manufacturers from the East with disappointing results. The Royal Company examined the machine in detail, but in June 1953 Wayne K. Boulton, Supervisor of Sales Training in the New York Office, wrote Effinger communicating his company's lack of interest in a project which had a “limited initial market and practically non-existent replacement market.”¹⁵ The company also felt that the typewriter was “somewhat complicated and in order to consolidate it into [the] present product, many mechanical and tooling changes would be necessary.”¹⁶ Effinger revisited New York in September 1953 but, soon after his return home, Underwood and Remington Rand also rejected his machine.¹⁷

Throughout 1953, Effinger remained hopeful of prospects with IBM.¹⁸ As his son Gove recalled: “When we'd drive by the IBM company in Denver we were supposed to cross our fingers in hopes that they would pick up [the typewriter].”¹⁹ After a long wait, the patent was finally approved in 1954. Effinger continued to refine the design of the machine, revising it twice more by 1955. When he contacted the R. C. Allen Business Machines Company shortly thereafter, he did not try to convince the company to manufacture his machine, but rather to allow him to modify their machines to his specifications:

My model, which I have used since 1950, has been the basis of development of an electric model by IBM. They have an agreement on a non-exclusive basis. I have served as a consultant with them, and the work of testing is currently under way. I have studied your machine carefully and it will adapt easily and very effectively. As you know, there have been many attempts at solving this music writing problem, most of them pretty sad. It is high time that this music printing business be brought up to present day standards.²⁰

The Music Print Corporation

When R. C. Allen agreed to his proposal, Effinger began to work out the details of manufacturing the machines himself. He gathered a small group of supporters and, on 9 June 1955, formed a new company, the Music Print Corporation. The first board of directors included Effinger; his uncle, Robert E. Landon; his brother, Lawrence (Larry) Effinger; and Wayne Scott, a University of Colorado music student who had become proficient at demonstrating the typewriter. At the first board meeting, the group formalized their plans to begin modifying the R. C. Allen machines into Musicwriter typewriters, using special metal cast characters produced by the Hulse Manufacturing Company of Geneva, New York.²¹

The modification of Allen's machines was at first a tedious process. “In 1954, it took us 40 hours to finish a machine We had to solder each metal

character on the type arm, and put on the key buttons.”²² The first commercial Musicwriters had forty-two keys and were capable of printing seventy-nine musical symbols. The standard carriage was fourteen-inches wide, but models were also available with sixteen-inch and eighteen-inch widths. The operator worked the machine with the left hand on the knob at the end of the carriage and the right on the keyboard, therefore having to learn to negotiate the entire keyboard layout with only the right hand. To keep the operator’s left hand from cramping, oversized knobs were eventually added to the carriage. Two other features set the Musicwriter apart from the usual typewriter. The first was “a small transparent indicator in front of the carriage, marked with two red lines, the point where these lines cross giving the exact spot where the note or symbol will be printed. The second is that the carriage remains stationary until the shift bar is pressed.”²³ While Effinger called the function behind the Musicwriter “locate and print,” he often related that a friend once referred to it as “point and plunk.”²⁴

With the details of the manufacturing process being refined and company operations underway, the new company began to publicize its product. In June 1955, Effinger demonstrated his machine at the convention of National Office Machine Dealers in Denver, an event which caught the interest of *Time* magazine.²⁵ When *Time* published an article on the machine in July, the Music Print Corporation came to national attention. In the article Effinger stated that a typewriter operator could average sixty characters per minute compared to forty-five for a manual copyist. His estimation of operator efficiency was based on the increasing proficiency of the company’s demonstration expert, Wayne Scott. Scott could copy a sixty-three-page orchestral score for Effinger in forty-seven hours, and claimed he could better that rate with practice.²⁶ In the article, Effinger boasted that the advantage of the machine lay “not so much in speed as in an amateur’s ability to produce an accurate legible score suitable for reproduction or instant use on a music stand.”²⁷

The need to publicize the company and continue to work out details of manufacturing increased Effinger’s busy schedule. In July 1955, he consulted at the R. C. Allen factory in Woodstock, Illinois, and he demonstrated the machine in Massachusetts and New York. He attended the Colorado Music Educators conference on 9-11 February 1956 and the Music Educators National Conference in St. Louis, Missouri on the following week. Scott usually traveled with him to operate the typewriter. According to Effinger, the young musician was “greased lightning” on the machine.²⁸ At conventions, he always drew a fascinated crowd. As Scott recalled: “I was typing away—the Musicwriter created a sensation—and a man watching asked, ‘Can an ordinary person do this?’ I said ‘I’m an ordinary person.’”²⁹ During the summer of 1956, Effinger traveled over 7,000 miles on an East Coast demonstration trip. In November he traveled to Cleveland. By the late spring of 1957, he had visited Chicago, Omaha, Boise, and Pasadena as well as having made many local demonstrations.³⁰ His hectic schedule often demanded that Effinger now travel



Figure 1. Cecil Effinger with Musicwriter (R. C. Allen model), *ca.*1955.

by air instead of by train, as he did on his early trips in search of manufacturers.³¹ In January 1957 Music Print began advertising by placing their first ad in the *Music Educators Journal*.³² The company's claim that the machine was easy to learn was generally accepted, as the *Los Angeles Times* noted:

The manufacturers claim, probably correctly, that with two or three weeks of practice professional copyists can equal or surpass the speed of work done by hand. Far from putting the copyist out of business, the promoters believe that the Musicwriter will open a new field for specialists, just as the typewriter developed the stenographer. . . One can only shudder at the thought of beautiful but meaningless designs that could be put on paper and palmed off for music. The Musicwriter in unprincipled hands might well set off a music explosion that would at last completely obliterate the already blunted hearing faculties of the human race.³³

The financial health of the new company was at first tenuous. In August 1955, the Music Print board approved a capitalization scheme and issued stock to board members in exchange for additional cash investments. The Music Print shop set up production at 2915 Colfax Avenue in Denver and began shipping machines in early 1956.³⁴ The company began to receive orders for the new machines. E. C. Brody, at the time a foreign sales representative of the Allen company, was engaged on a royalty basis to develop foreign distribution. In November 1956 Effinger noted : "He [Brody] has ordered 9 machines, of which 4 have been shipped. . . Everything is lovely here, business is good."³⁵ Brody continued developing foreign sales with vigor. He attracted the interest of companies in Japan and began taking orders. Effinger wrote to his brother in January 1957:

Along with your letter came a letter from him [Brody] with 3 purchase orders from Japan for a total of 75 machines. You can imagine this put the offices of Music Print in quite a tizzy. I am not getting too excited about this because they haven't even seen a machine yet, but on the other hand, it is certainly a dramatic indication of possibilities. We are, of course, making every effort here to pave the way for increased production. This is going to work out quite feasibly with machines being more closely finished at Woodstock [being] an extra help here.³⁶

By April Brody had a commitment for 100 machines from the Japanese and had convinced authorities in Brazil to start an advertising campaign with literature in Portuguese.³⁷ The company formed a similar relationship with David Wexler for domestic distribution of the machines.³⁸

The company's negotiations with Brody, in New York, were handled through Larry Effinger, who had moved to New Jersey. In his business dealings, Larry was careful to respect Cecil's opinions, writing to him that: "Basic policy is in your hands."³⁹ He reported the results of his talks with Brody directly to Cecil.

Had a three hour talk with him [Brody] yesterday afternoon in his apartment. My opinion is strengthened that he is important to the Musicwriter future.

We started by going through in some detail a stack of correspondence in six languages. That's impressive enough. Even more impressive was to see the follow-up he does on each lead. Not just a matter of scattering of shot with the hope of hitting. He is a remarkably energetic and well-directed person.

Brody is not a "corporation" man. He's not smooth. But he's a terrific merchandiser. And he has a sense of what makes American business tick.⁴⁰

Larry's correspondence communicated his enthusiasm for Cecil's project. He urged Cecil to commit more money and resources to the development of the company in fear that the idea might be stolen by a competitor. He felt that a rapid response to the initial interest in the machines would reap tremendous benefits for the company and for Cecil's eventual freedom from financial worry.⁴¹

Now, Cec my hope for you is not that you become a business tycoon but only that this idea of yours will give you financial independence so that you can give what you have to give to the world. I think the only way this can come about is to let the magic work. Give Mitchell and Betty [McFall, Music Print Corporation technician] and Brody more opportunity and more responsibility wherever possible; their success is what will benefit Music Print. The deeper involved they become, the better.⁴²

The price of the typewriter in 1956 was \$300. By 1960, prices had risen with two models available, the Musician's Model at \$420 and the Publisher's Model at \$465. In 1962 a Studio (portable) Model was added to the line. This machine was unusual in that it was wholly produced by Smith Corona except for the final type alignment and engraving of key buttons. The sales figures for the company show that, after producing on the average slightly more than a hundred machines per year in the 1950s, the company was manufacturing over 200 machines per year by the middle 1960s.⁴³ After this time Musicwriter sales stabilized around these levels before dropping off in the 1980s.⁴⁴

Although Music Print successfully produced Musicwriters at a respectable rate for a company with only four employees, Effinger was always looking for new opportunities for his inventive energy. In 1960, he collaborated with Lejaren Hiller from the University of Illinois to interface a Musicwriter with a computer, a project funded by the University of Illinois Research Board.⁴⁵ Hiller and Effinger were aided in the project by Robert Oliver, a University of Colorado professor of engineering graphics and design, who provided the circuitry and solutions to most of the mechanical problems. The result of their efforts was a machine which simultaneously punched a roll of computer tape as the operator typed each musical symbol, essentially memorizing the



Figure 2. Robert Oliver, Cecil Effinger and Lejaren Hiller with Musicwriter interfaced with computer in 1960.

operator's motions. The keystrokes to type the page of music could then be replayed from the computer tape.

Hiller's desire was to feed the information on the computer tape into the Illiac I computer for further manipulations. He envisioned that the computer would be able to automate tasks, such as extracting individual performance parts from the score, transposing music to other keys, transcribing old music into modern notation, and redesigning the page format. Hiller felt that "the composer today has to handle all these and many related problems by inefficient hand methods which consume much of his energy, time, and money—when he has it."⁴⁶ Although Effinger intended to pursue this project with his University of Colorado colleague Charles Eakin, their grant proposal to construct such a machine at Colorado was not approved. The joint project was, however, the first step in Hiller's experiments to develop a computer-aided music notation system. The later development at Illinois of the Plato computer music notation system in the early 1970s while not directly connected to this experiment was, at least philosophically, linked to Effinger's work.⁴⁷

Effinger's final adaptation of the principles of the Musicwriter came in 1988 when the company introduced a machine based on a modified IBM Personal Wheelwriter typewriter. IBM produced the special type wheel with Effinger's personally designed type face and modified the machines to have an internal 60 kilobyte memory capability. An optional 720 kilobyte floppy disc drive provided additional storage capacity to the machine which the company called the Portable Musicwriter.

More Inventions

In 1966 Effinger received a request from the Denver-based Gates Rubber Company to produce a machine which would be able to type schematic symbols, and, in 1968, Music Print manufactured a few of these specialized typewriters for the company. In that year the company suggested that Effinger work on a machine which would allow engineers to type text directly onto large engineering drawings. As a result of this request, Effinger developed what he called the free-platen, or Open End, typewriter.⁴⁸ To accommodate oversized drawings, Effinger worked out a design in which the platen would not interfere with oversized paper. In his design, a free-floating platen, held in place by gravity, was controlled by an electro-magnetic motor which, in different models, either attached to the end of the platen or moved it by an arrangement of rollers. As with all of Effinger's inventions, the key was simplicity. The operating principle was gravitational. Effinger secured the first patent on the invention in October 1973 and Music Print soon began modifying IBM correcting Selectric III typewriters into Open End Typewriters.⁴⁹ A large part of the machine's success was linked to its ability to write and correct on a variety of media, small and large sheets of paper, mylar, linen, and vellum. In 1983, an Olympia typewriter was modified with the open-ended design and

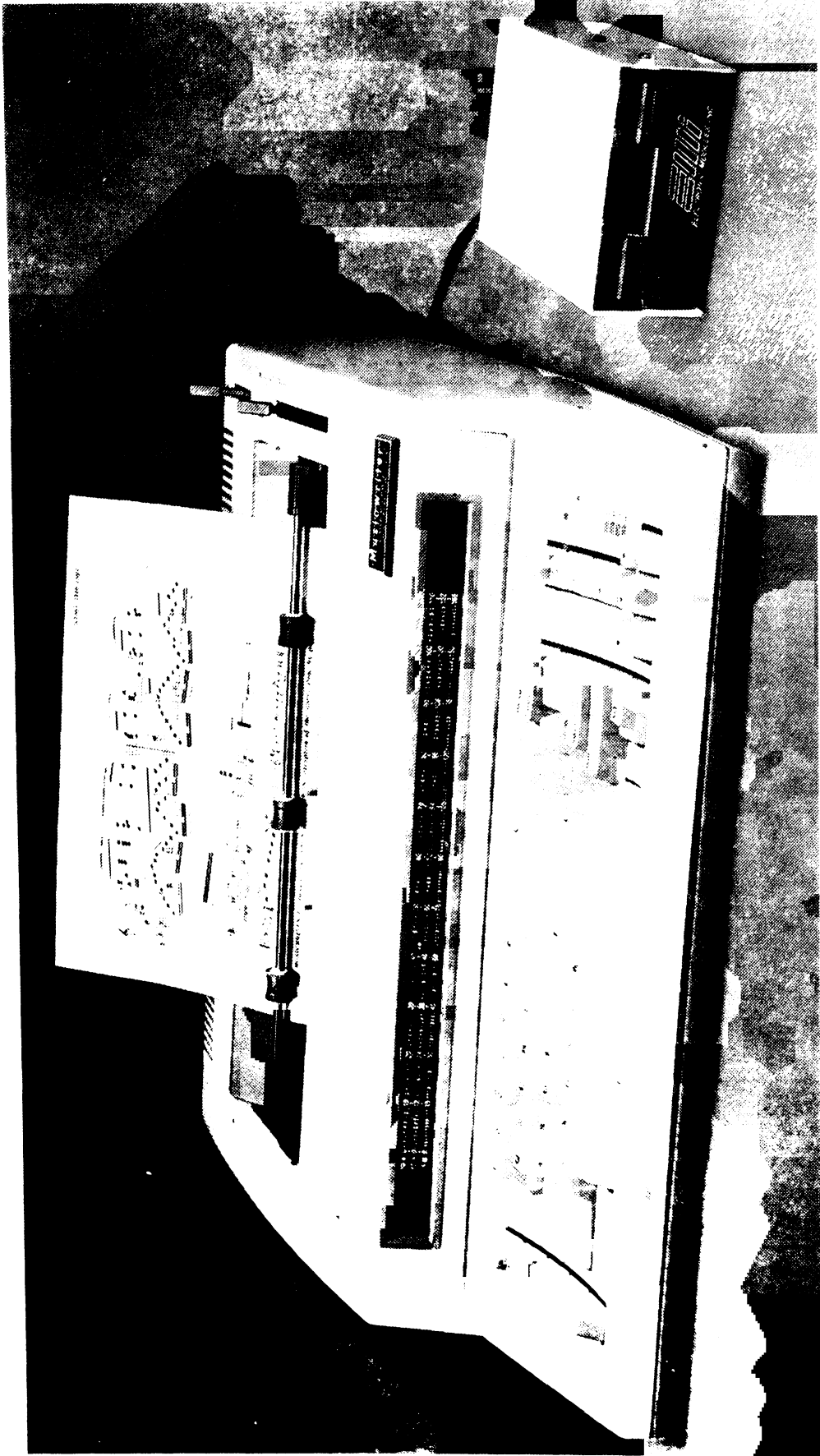


Figure 3. The Portable Musicwriter with attached floppy disk drive.



Figure 4a. Comparison of typefaces, preproduction model, *ca.* 1950.



Figure 4b. Comparison of typefaces, the first R. C. Allen model, *ca.* 1956.
(from *Tone Poem on a Square Dance* score)

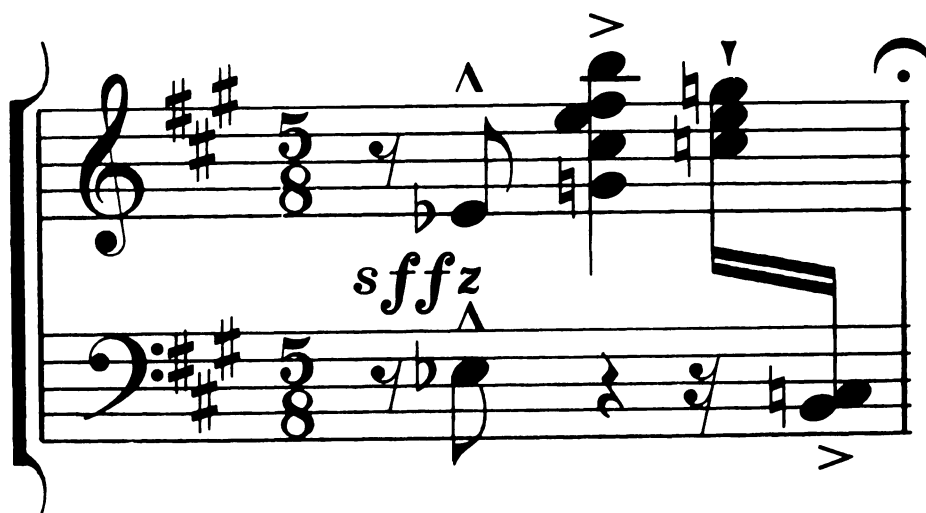


Figure 4c. Comparison of typefaces, the Portable Musicwriter, *ca.* 1988.

interfaced with a microcomputer to provide memory capabilities. These typewriters were manufactured until 1993.

Effinger's next musical invention was the result of an overnight inspiration in 1968. Observing University of Colorado choral conductor Warner Imig conducting one of the composer's works in rehearsal, he approached Imig with a criticism concerning a slowing of the tempo in a section of the piece. Imig felt that he was not slowing down and argued that they had each heard the tempo differently. Effinger went home that night, pondered the problem, and by the morning had found a solution. He rushed down to a sporting goods store and purchased an ordinary stopwatch. Scratching the numbers off the face, he calculated his own markings and scratched them in. The next day he again attended the rehearsal. According to the inventor:

After Imig had finished the piece, Effinger approached him and said, "Warner, your tempo is still too slow." Imig knew by the tone of Effinger's voice that something was up.

"How do you know?" he asked.

Effinger showed him the tempo on the stopwatch. Imig peered at the contraption for a brief moment and then said, "I want one." He was the first to own a Tempowatch.⁵⁰

The principle behind the operation of the Tempowatch is familiar to any musician. The tempo of music is determined by counting the number of conducted beats over a brief period of time and then calculating beats per minute. The Tempowatch simply does the mathematical calculations for the operator. While counting in tempo, the operator starts the watch and stops it six beats later. The tempo of the music is then indicated by numerals printed on the watch face. Although the principle behind its operation may be simple, the Tempowatch is the only device of its kind to be manufactured to date.

The Impact of Music Print Corporation

Although the Music Print Company never achieved the kind of financial success that Larry Effinger envisioned, for three-and-a-half decades it faithfully served the needs of the music publishing industry. It is undeniable that the manufacture of the Musicwriter, and similar machines, came during a time of great change in the music printing industry. When first seeing the Musicwriter, Boris Goldowsky commented that the time would come when accurately typed music copy would be *expected* for all performance uses.⁵¹ One of Effinger's goals was to put the ability to produce print-ready plates for publication into the hands of universities, public school music departments, composers, teachers, churches, and publishers. The manufacture of over 5,000 typewriters in the thirty-five years of Music Print's existence was a large step in this direction.⁵² In 1965 Effinger estimated that over half of the choral and band music and eighty percent of the music textbooks being printed at the time were being done on the Musicwriter.⁵³ He stated:

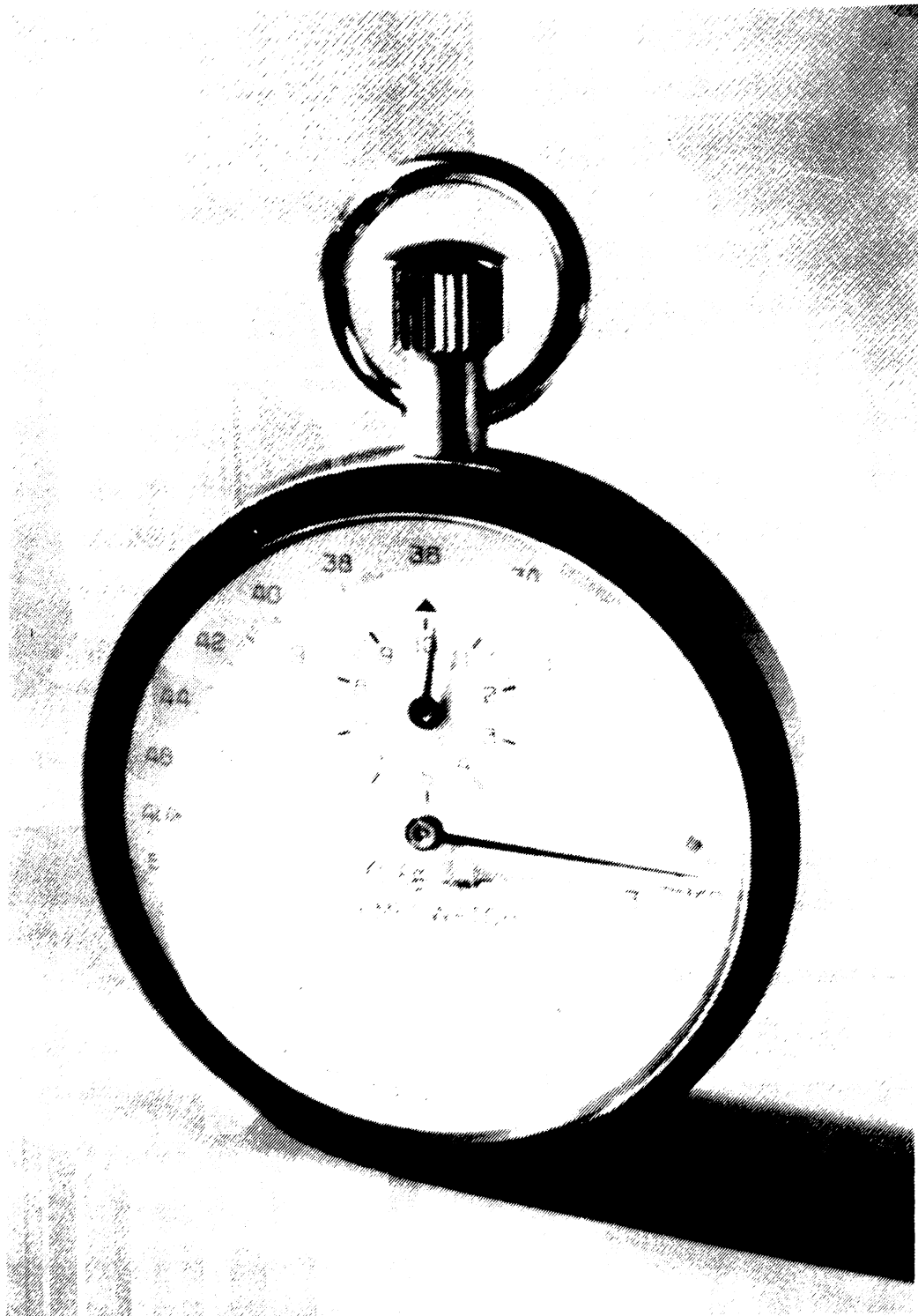


Figure 5. The Tempowatch.

The greatest thrill for me is that the Musicwriter is beginning to serve a real need in the music profession. . . . If the Musicwriter can, in some degree, bring musical composition and copying to a point comparable to 20th century methods in other fields, then this is the best reward.⁵⁴

Although today, in most cases, computer typesetting has replaced the Musicwriter, Effinger's invention proved that machine production of the highest quality music copy was possible. Indeed, his experiments with Lejaren Hiller were the first attempts to interface computers with a music notation device, a concept with far-reaching repercussions in today's technology. All of Hiller's goals for the computer manipulation of musical notation have become realities. Effinger's Musicwriter unquestionably played a major part in the revolution of the process of printing music.

This chapter from the forthcoming book, *Cecil Effinger, Composer and Inventor*, appears through the permission of Scarecrow Press.

NOTES

1. Born in Colorado Springs, Colorado, Cecil Effinger began his musical studies at age 10 as a violinist but eventually switched to oboe. Through his private study in composition with Frederic Boothroyd in the 1930s, he became instructor of music at Colorado College in 1936. He directed the 506th Army Band at Fort Logan in Denver during World War II. Effinger eventually became a full professor at the University of Colorado College of Music in 1956. Throughout his life he produced in all 31 orchestral works, 5 symphonies and 2 little symphonies, 45 chamber works, 49 choral works, 6 quartets, 3 operas, 3 oratorios, and 3 cantatas. His works are housed in the Composers' Archives of the American Music Research Center, University of Colorado, Boulder, Colorado.

2. Cecil Effinger, "The New Musicwriter," *Pan Pipes*, 49/2 (January 1957):30-32.

3. Ibid.

4. Ibid.

5. Stanley Fletcher, letter to Cecil Effinger, 9 June 1947, Cecil Effinger Archive, American Music Research Center (CEA), Box 63.

6. J. K. Ehlert, letter to Cecil Effinger, 7 March 1951, CEA, Box 63.

7. Cecil Effinger, letter to Millard Huey, 7 January 1952, CEA, Box 63.

8. Cecil Effinger, letter to J. M. Walsh, n.d. (approximately 1951 dated by subject matter), CEA, Box 63.

9. Informal historical document, single page, Music Print Papers at the Music Print Offices, Boulder, Colorado (MPP).

10. 23 January 1948

11. *Pan Pipes*, 49:30-32.

12. This model is most likely the one still in existence at the Music Print office. The typewriter, fashioned from a Smith-Corona machine, has the precision positioning mechanism of the later R. C. Allen model but has crude key buttons to indicate the characters glued on. Although the typeface is not as refined or elegant as that on the later commercial models, the operation of the typewriter and positioning of characters is extremely functional.

13. M. M. Shaver (Regional manager of the Underwood Typewriter Corporation) letter to W. F. Arnold, 24 November 1950, CEA Box 63.

14. Cecil Effinger, letter to Roy Anderson, 26 October 1953, CEA, Box 63.

15. Letter from Wayne Boulton to Cecil Effinger, 3 June 1953, CEA, Box 63.

16. Ibid.

17. J. A. B. Smith, Underwood Corp., letter to Cecil Effinger, 2 October 1953.

18. Cecil Effinger, letter to Rose Marie Grentzer, 21 October 1953, CEA, Box 63.

19. Gove Effinger, taped interview, April 1992, CEA, Box 62.

20. Cecil Effinger, letter to J. T. Carlson, 2 February 1955, CEA, Box 63.

21. Ibid.

22. "Musical Typewriters Win Wide Acceptance," *Denver Post*, 18 April 1965, E1, CEA, Box 58.

23. "Music on the Keyboard," *Times Educational Supplement*, 7 February 1964, n.p., CEA, Box 58.

24. Sarah Hoover, "Typewriters Designed for Musicians, Engineers," *Boulder Daily Camera*, 27 December 1981, 57.

25. *Time*, 11 July 1955, 35.

26. The piece in question was *Tone Poem on a Square Dance*, Minutes of Music Print Board Meeting, January 8, 1957, MPP.

27. *Time*, 11 July 1955, 35.

28. *Boulder Business Report*, March 1983, 7.

29. Ibid.

30. Cecil Effinger, letter to Larry Effinger, 17 November 1956, personal papers of Corinne Effinger.

31. "Gil [Gilbert W. Mitchell, general manager] and I will be in Chicago and Woodstock around the 8th of February; then I plan to fly, I hope, to Newark late on the 13th and be in your vicinity

flying back to Denver, probably on the 18th." Cecil Effinger, letter to Larry Effinger, 26 January 1957, CEP.

32. Cecil Effinger, letter to Larry Effinger, 17 November 1956, CEP.

33. "Automation Arrives, Composers Cheer," *Los Angeles Times*, 2 October 1960, 42.

34. The headquarters of the company moved to 828 Pearl Street in Boulder in 1958, to 2450 Central Avenue in Boulder in 1980, and to the Effinger house in 1990.

35. Cecil Effinger, letter to Larry Effinger, 17 November 1956, CEP.

36. Cecil Effinger, letter to Larry Effinger, 5 January 1957, CEP.

37. Cecil Effinger, letter to Larry and Helen Effinger, 20 April 1957, CEP.

38. Founded in 1920, David Wexler and Co. of Chicago is a distributor of musical instruments and accessories. At that time the company carried a catalog of over 9,000 items. The Musicwriter was given a full-page ad in their 500-page catalogue which was distributed to over 10,000 retail outlets.

39. Larry Effinger, letter to Cecil Effinger, 27 November 1957, CEH.

40. Ibid.

41. Ibid.

42. Ibid.

43. Sales figures based on royalties paid to the University of Colorado from records of the Music Print Company.

44. In 1983, Effinger stated that the company was producing approximately 250 machines annually. This figure most likely included both Musicwriters and Open End typewriters (see ensuing discussion). *Boulder Business Report*, March 1983, 7.

45. Hiller, a pioneer in early experiments in computer applications for music composition, was perhaps best known for his *Illiad Suite for String Quartet* (1957). "Effinger Collaborates in Inventing New Punched-Tape Musicwriter," *Boulder Daily Camera*, 9 June 1960, 26.

46. "Effinger Collaborates in Inventing New Punched-Tape Musicwriter," *Boulder Daily Camera*, 9 June 1960, 26.

47. Use of the Iliac I computer with the musicwriter interface was discontinued in 1961. Personal communication from James Beauchamp. Hiller had moved to the State University of New York, Buffalo in 1968. Stanley Sadie, ed. *New Grove Dictionary of Music and Musicians* London: Macmillan, 1980, s.v. "Hiller, Lejaren" by Gilbert Chase.

48. The platen is the roller which holds the paper in place and moves it through the carriage.

49. H. B. Van Valkenburgh (patent attorney), letter to Cecil Effinger, 23 October 1973, MPP.

50. *Boulder Business Report*, March 1983, 7.

51. *Pan Pipes*, 49:30-32

52. Manufacturing numbers were estimated from production totals on Print Corporation documents, MPP.

53. Due to his obvious enthusiasm for his invention and his tendency to use any opportunity for promotion, Effinger's estimate is most likely overly generous. Many musical typewriters had been invented previous to Effinger's beginning with the first practical typewriter patented in 1833 by Xavier Progin. Although a few of the typewriters before Effinger's found temporary success, for a variety of reasons, they were abandoned. Of these a machine invented by Armando Dal Molin and patented in 1946 in Italy was perhaps the most successful. Dal Molin and his small company manufactured the machines until the late 1950s when he decided to concentrate on the production of finished copy for publishers. Dal Molin's claim that "by 1956 the process had taken over the New York City area and by the early 1960s it had spread to the rest of the country where it now accounts for 90% of today's market" must be contrasted with Effinger's similar claims for his machine. Perhaps Dal Molin included Effinger's machines in his estimates, as he mentions "the process" and not specifically his machines. Effinger's machine most certainly enjoyed a greater international success than any previous model, since Dal Molin did not attempt to sell his machine to this market. Stanley Sadie, ed. *New Grove Dictionary of Music and Musicians*. London: Macmillan, 1980, s.v. "Printing and Publishing of Music" by H. Edmund Poole.

54. "Musical Typewriters Win Wide Acceptance," *Denver Post*, 18 April 1965, E1.

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