



The Omnigraph Instruments

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Dave Pennes, WA3LKN, provides us with an interesting article about the unique Morse practice sets produced by the Omnigraph Manufacturing Company. —W2NI

Students learning Morse code have had a variety of commercially made practice instruments available to them over the years. Such devices included simple sounder/key learners' sets, mechanical sounders that simulated the sound of a working sounder, perforated tape devices such as the Instructograph, as well as 78 rpm and, later, audiotapes and 33 $\frac{1}{3}$ rpm records.

Among the most unusual practice devices were those manufactured by The Omnigraph Manufacturing Company in New York City between 1900¹ and 1931². As well as can be determined, the Omnigraph Mfg. Co. never produced anything other than Morse code practice devices. The company advertised in numerous telegraph, radio, and electrical publications of the day and listed several different New York City addresses. Their products were also marketed by major retailers in-

cluding Sears and Roebuck, J. H. Bunnell & Co., Manhattan Electric Supply Company (MESCO), and Wholesale Radio Service Company.³

The company manufactured a number of instruments of varying complexity, all of which had rotating aluminum discs with Morse code characters incised into the edges of the discs as raised teeth. As the disc rotated, a tracking stylus was displaced by the raised teeth, allowing an electrical contact to make and break a circuit, thus producing the Morse code characters. The instruments varied only in the number of the discs that could be stacked and whether the discs were turned by a hand crank or a clockwork motor.

It is uncertain exactly what portions of the instruments were actually made at the Omnigraph factory itself. The wooden bases, the rotating platter, and the aluminum discs may be all that the company actually produced. Accessories produced by other manufacturers were offered. A student could purchase the Omnigraph instrument alone or, for a few dollars more, could obtain a package that included a battery, sounder or buzzer, wire, and a straight key.

The Omnigraph Mfg. Co. advertised or produced at least 15 models of telegraph learning devices. It should be noted that a number of the

devices are known only by their advertisements. The instruments were mounted on wooden bases, which on most models measured 5" × 10 $\frac{1}{2}$ ". Many, but not all, instruments bore a company identification label applied to the wooden base. Some of these were decals; others were metal tags attached by small pins. The company also supplied Omnigraphs to other organizations who affixed their own names to the instruments. These included the National Wireless Institute of New York City and A.W. Gamage Ltd. of London, England. Most Omnigraphs have the notation *Patented* or *Pat.* embossed into the wooden bases. A c. 1910 Omnigraph catalogue has a diagram of a

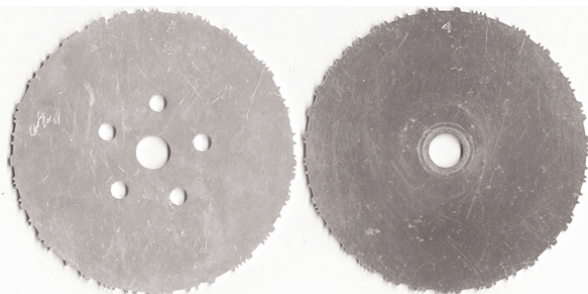


Fig. 1. At left, a typical disc from a multidisc instrument marked 9-0 (see text). Transcription of its Continental code message reads: "SEE SILAS FLA HEY ABOUT 5 AND 35 SIG W LEE." At right, typical disc (marked "6") used on a single disc instrument. Transcription of its American Morse message reads: "HR STMH FM NEW YORK 21 TO ADH YES SIG LH."

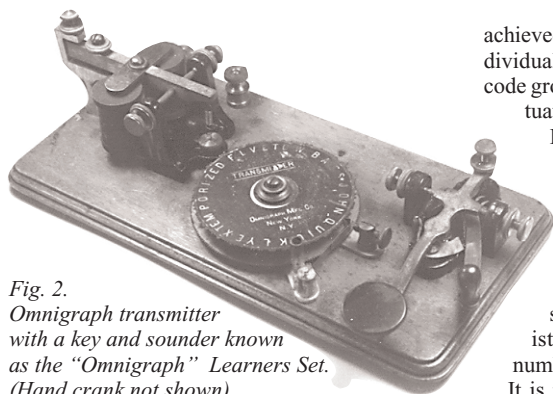


Fig. 2.
Omnigraph transmitter
with a key and sounder known
as the "Omnigraph" Learner's Set.
(Hand crank not shown).

No. 5 instrument bearing the patent date Oct. 25, 1903. The author has encountered only one example with a specific patent date, a 5-disc instrument with the date Oct. 23, 1904. (*Charles E. Chinnock of Brooklyn, N.Y., was granted a patent for the "Omnigraph" Learner's Set on October 25, 1903. A year later [October 25, 1904], he received a patent for the "The Omnigraph No.2 Improved."*—J. Casale)

The Omnigraph company used at least three different types of discs. A fourth type appeared in an advertisement but has never been seen by the author. The discs were all $3\frac{3}{8}$ " in diameter and were either $\frac{1}{32}$ " or $\frac{1}{16}$ " thick. The thinner discs, used on the single-disc instruments, had a single central hole for the spindle. The thicker ones were used on the multi-disc instruments and had alignment holes in addition to the central spindle hole (Fig. 1). The thicker discs could be used on the single disc instruments but the thinner discs were physically incompatible with multi-disc mechanism, which required the second alignment hole.

Close inspection of the discs suggests that they were manufactured by a process similar to the duplication of keys. This would produce a disc with closer dimensional tolerances than if it were stamped from a die.

Discs were available for both American Morse and Continental code. The number of characters on any individual disc varied from 12 to 36, with the lower number of characters allowing for slower code speed in the beginning lessons and the closer spaced characters for more advanced lessons (1). The speed of rotation of the discs was user modifiable, of course, allowing further control of sending speed.

Code was sent using the "Farnsworth Method," meaning that the individual Morse code characters were uniform in dot and dash length and spacing with slower code speeds

achieved simply allowing more time between individual characters. Practice sessions included code groups, random characters, numbers, punctuation, and short messages.

Discs that were used on multidisc instruments (5- or 15-disc models) were designated with an alphanumeric numbering system consisting of a number followed by a letter between A and O accounting for the 15 discs in the series (2). Other discs were designated simply by number. A set of 15 discs exists that is labeled A through O with no number designation.

It is not known with certainty, but it is suspected, that the discs for single-disc instruments bore numbers only whereas the discs for instruments employing multiple stacked discs bore the alphanumeric designations. Alphanumeric discs are known up the "9" series, but it is not known if more than 9 sets of discs exist. The lowest-numbered series of discs (series 1 and 2 for example) had simple code groups whereas the highest-numbered series (8 and 9) had more complex messages including numbers and punctuation characters.

Nine alphanumerically labeled sets of 15 discs may exist for both Morse and Continental code for a total of 135 discs for each code. The highest numbered-only disc encountered by the author is "19," so apparently at least that many exist. The only way to tell Morse from Continental discs is to inspect the discs visually, looking for the characteristic Morse characters that were distinct from those in the Continental code.

Additional discs could be obtained from Omnigraph at modest cost. The company also permitted students to exchange their discs for different ones for a 2-cent per disc postage and handling fee. If a student ordered extra discs for a 5 disc instrument, it is suspected that he would receive the next set of discs in the 15-disc sequence.

Transcription of discs has shown that some have been mislabeled. I know of a "7-L" disc that is the same as a "7-I" disc in my own collection. I also have several alphanumeric discs with the letter crossed out and another letter stamped next to it as a correction. Another disc has its letter designation applied upside down. Such inconsistent and erroneous labeling of discs suggests that the process was not automated, and that human errors were not rare.

The author's own experience and reports from other collectors indicate that most discs encountered are the thicker ones used in the multidisc instruments. The six thin discs in the author's possession are all American Morse.

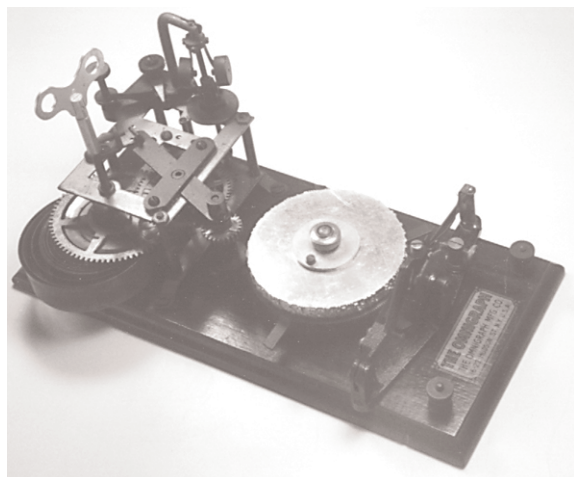


Fig. 3. The "Omnigraph No. 2 Junior" was reported to be the most popular model sold. A buzzer was included in the purchase price of \$12.50; for \$14 the device came with a key and sounder, battery, wire, and a learner's manual.

Another feature of some of the Omnigraphs is their use of a spring-driven windup clock motor. An interesting adaptation is the use of a flying-ball governor mechanism to maintain constant speed in the face of a marked increase in the instantaneous loading, as when the stylus tracking mechanism moved from one disc to a higher disc in a stack. In reality, the sending speed slowed as the tracking stylus moved to a higher disc, and frequently would flub the first character on the higher disc.

As the stylus descended the stack of discs, it would frequently skip the adjacent disc and track to a lower one. This may have been caused by wear on the cam mechanism. The clock motors on different instruments varied slightly in design over the years but all had the flying ball governor and a friction speed control mechanism.

An experienced clock repairman has commented that the clock motor resembles a Seth Thomas clock mechanism of the era with the addition of the governor, and that most likely Seth Thomas provided the clock drives for the Omnigraph. The motor mainspring is still readily available as an off-the-shelf item from clock repair parts sources and can easily be installed as a replacement on existing instruments.

The simplest Omnigraph device consisted of a single disc mounted on a platter which was rotated by use of a hand crank. Advertisements in 1909 listed this model as "The Omnigraph Transmitter No. 1." The single disc supplied with the instrument had American Morse characters which sent the statement: JOHN QUICKLY EXTemporized FIVE TOW BAGS, which incorporates all 26 letters of the alphabet into one sentence. No numerals or punctuation were included.

An instruction booklet "How To Become An Excellent Operator" was included with purchase of the device. Additional discs could be purchased for 5 cents each. The same device on a larger base was identified as "The Omnigraph #3" in a c. 1910 catalog.

The company offered a device similar to the simplest Omnigraph, but fitted with an inexpensive sounder and key identical to those in a J.H. Bunnell "Morse Learners' Outfit" advertised in the 1900 Bunnell Catalogue. These instruments were undoubtedly supplied to Omnigraph by Bunnell (Fig. 2).

There was no separate model number for this instrument device, and it was regarded as a version of "The Omnigraph Transmitter No. 1." A 1903 MESCO catalogue listed it as the "Omnigraph Learner's Set." A press release in the April 16, 1901 issue of *The Telegraph Age* described this set as simply "The Omnigraph" and suggested that it might have been the first instrument produced by the company.

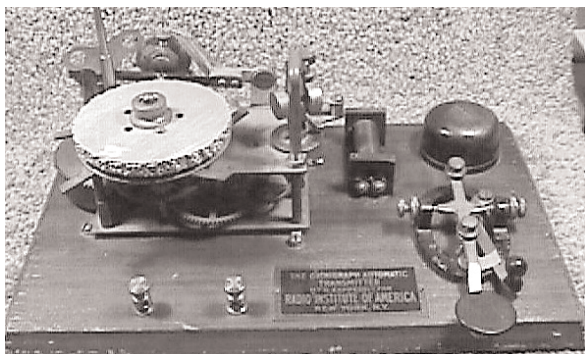


Fig. 4. Compact 5-disc Omnigraph with integral key and buzzer made for the New York Wireless Institute. (Photo courtesy of Mr. Lynn Burlingame N7CFO).

A 5-disc model was designated the "Omni-graph No. 2 Junior" in the 1924 J.H. Bunnell catalogue. This model (Fig. 3) was probably the most popular one (1), and incorporated the clock motor, a stack of 5 discs, and a cam mechanism to move the stylus from one disc to the next higher disc. When the stylus arrived at the highest disc, it would travel down the stack again from the highest disc to the lowest disc and then ascend again. An adjustable mechanism allowed the user to decide whether to play the entire disc before moving to the next disc in the stack, or to play a segment of the disc before moving to the adjacent disc.

The entire disc or 1/5, 2/5, 3/5, 4/5 segments could be played before moving on to the next disc. By allowing less than a full disc to play before moving to the next disc, the user could create non-repeating messages much longer than the sum of all of the characters on the 5 discs. This ingenious pseudo-random character generator design would allow continued playing of different 2/5 disc segments for many, many hundreds of characters before repeating the message.

The 1914 and 1919 U.S. Department of Commerce rulebooks stated that commercial and amateur radio license examinees undergo a code test and that it "will be conducted by means of the Omnigraph or other automatic instrument wherever possible"(1). Omnigraph produced a compact 5-disc model with a key and buzzer for the New York Wireless Institute, a correspondence school. (Fig. 4) Advertisements for the school also mention an on-site 'post graduate' course at 258 Broadway. Of note, the Vibroplex Company was located directly across the street at 253 Broadway during 1910-1920 making it convenient for students to purchase bugs. An Omnigraph catalogue c. 1930 listed Vibroplex bugs for sale including the models #4 "Blue Racer" for wire work and the #6 "Lightning Bug" for wireless work.

A fifteen-disc model was listed in company advertisements as "The No. 2 Omnigraph." It incorporated the same driver motor as the other models, but with a more elaborate cam mechanism for changing the discs. A version of this model advertised in 1909 as "The Omnigraph No. 2 Improved" used a battery-powered motor and rheostat in lieu of the wind-up motor. An elongated drive belt connected the drive shaft of the electric motor to the rotating platter.

A total of 60 discs was included with this model. At \$10.00, this amounted to nearly a week's wages for a typical worker in 1909. A slightly different version of this instrument with a different design cam mechanism also allowed

for hand cranking.

The demise of the company and its unique instruments was undoubtedly related in part to the superior capabilities of perforated tape devices such as the Instructograph. As dazzling as Omnigraphs were to watch in use, they were finicky and temperamental instruments. The multi-disc Omnigraph devices, although ingenious in design, allowed for, at best, pseudo-random code generation, limiting overall utility. Although company advertisements boasted a 45 minute running time on a single winding, a properly functioning and adjusted instrument would begin to slow noticeably after about 20 minutes(3). ☐

FOOTNOTES

- ¹ An Omnigraph catalogue c. 1930 listed the company as 'Established 1900'. The first Omnigraph advertisement the author could locate was from a J.H. Bunnell catalogue from 1900.
- ² No advertisements for Omnigraphs were found after 1931 suggesting this year for the demise of the company.
- ³ Numerous radio and electrical publications and equipment. Catalogues from 1900-1931 were employed as reference materials and are too numerous to mention individually.

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