RADIO AGE

The Newsletter of the
Mid-Atlantic Antique Radio Club

Volume 30 **October 2005** **Number 10**

Atwater Kent
Tuning Components and Transformers

BY RAY THOMPSON AND LEIGH BASSETT

This article is part three of a series on Atwater Kent by Thompson and Bassett. Parts 1 and 2 appeared in the May and July 2005 issues of Radio Age, *respectively.—Editor*

Introduction

This section discusses the Atwater Kent audio and radio frequency transformers that were sold as components or incorporated into finished radios.

The first of these parts were made before the factory decided to enter the radio receiver market. As mentioned in part 2, part number information is incomplete, as most of this information was lost or destroyed. We are attempting to recreate as much detail as possible, so that the reader or researcher will be able to restore Atwater Kent parts and radios with a reasonable degree of accuracy.

With the ever-increasing interest in Atwater Kent radios, many are being restored with incorrect parts. To the historian, it is a growing concern that the authenticity of AK artifacts is being compromised.

(Continued on page 3)

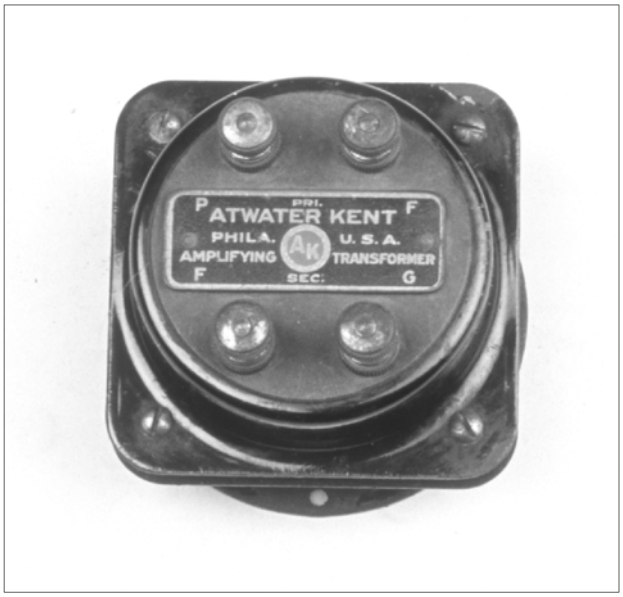

Figure 3-1. Type F audio transformer # 3509.

(Continued from page 1)

The Audio Transformers

The Type F audio transformer, part number 3509, shown on page 1, was the second radio part produced by Atwater Kent (variometer # 3488 was the first). It has a nominal 1:9 turns ratio (Pri:Sec) The DC resistance of the primary is 350 ohms, and the secondary is 4,500 ohms. The frequency range considerably exceeded the response of any reproducer being made at that time. This part was never used in any factory-produced receiver. It was offered as a part to be used in other brand receivers or for making experimental sets.

The Type L audio transformer, part number 3775, has a 1:3 turns ratio. DC primary resistance is 1,700 ohms; secondary is 3,250 ohms. It better matched the sound producing devices that were available on the market at the time than did the Type F p/n 3509. Although the 3775 is normally found with a brown Bakelite top, one example was found recently with a black Bakelite cover, apparently designed to match the color scheme of the earliest components as discussed in Part 1 of this series. This variant was unknown at the time Part 1 was written.

Figure 3-2. Type L audio transformer, # 3775.

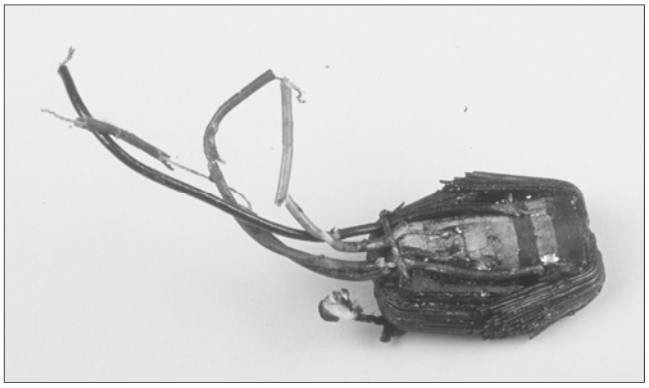

Figure 3-3. The uncased type L audio transformer # 3775.

In the pictured configuration the Type L was never incorporated in a factory manufactured radio. But the transformer itself, inside the can, was physically and electrically identical to the transformers used in all of the TA units, including those used in the breadboard sets, battery models 19, 20 Big Box, 20 Deluxe, 20 Compact, 21, 30, 32, 33, 35, 48, 49, and the AC sets 36, 37, 38, 40, 42, 44, 45, 52, 56, and 57. The part number of the uncased transformer used in the TAs is unknown.

The metal can of the Type L was reworked to create the transformer used in Models 19 # 4880, 20 # 4640 (the "Big Box"), and 24 # 4920 (the "Model 20 Deluxe" aka Model 24). The changes were: The Bakelite cover was eliminated and the can was inverted; a narrow flange with three screw holes was mounted around the open end; the wires were lengthened as needed. A later version having a wider flange with only two screw holes was used on all of the other models mentioned above.

In This Issue

Table 1. Part numbers and specifications for Atwater Kent transformers.
(All have primary resistance 1700 ohms and secondary resistance 3250 ohms.)

Part Number	Type of Radio	Function	Used in Models
Component (uncased 3775)	Breadboard	1st and 2nd AFT	TAs #3634, #3676, #3812, #4030, #4330, #4520
4748	Battery	1st AFT	20 #4640, 19 #4880, 24 #4920
4779		2nd AFT	20 #4640, 19 #4880, 24 #4920
7660		1st AFT	20C #7570, 21 #7780 30 #7950, 8000 before s/n 517,000
7661		2nd AFT	20C #7570, 21 #7780, 30 #7950, 8000 30-A #8000A, 32 #8270, 33 #8930, 33 Panel #8970, 35 #8100, 35A #8100A (?), 48 #9640, 49 #9860
7661	AC Models	2nd AFT	36 #9390, 37 #9500, 37C #9700, 37F #9740, 37FC #9830, 38 #9400, 40 #9800, 40 F #9960, 42 #9850, 42F #9970, 44 #9900, 44F #9980, 45 #9880, 52 #9930, 56 #13900, 57 #14000

Part numbers of these internal transformers changed with minor design variations, such as paint and wire color, as shown in Table 1.

The RF Transformers

The RF transformers, part numbers 3802 (Stage 1) and 3972 (Stage 2), shown in Fig. 3-4, first appear in an AK factory flyer supplement, Form 19A, dated January 1923. Complete radio sets # 4052 (our Model 6) and # 4066, (our Model 7) which use these transformers, appear on the same flyer, which introduced them to the market.

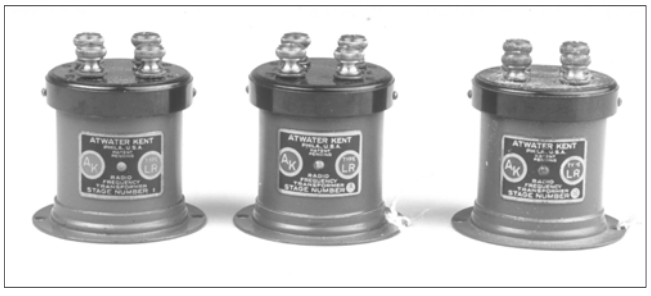

Figure 3-4. RF transformers: (Left to right) Stage 1 # 3802 late, Stage 1 # 3802 late, and Stage 2 # 3972.

There are two styles of the RF transformers known. The first (shown in the Jan. 1923 flyer) has metal ID tags with an exposed brass dot in the bottom right corner. The stage number (1 or 2) was stamped in that circle. The second style has the stage number etched along with the other text on the label. Stage 1 transformer, part number 3972, was used alone on radio sets # 4052 and # 4120, while both were used on # 4066, # 4205, and # 4275. One of each style transformer, without the can, was used in the five-tube TA, part number 4330, which was used in the Model 5 # 4333 and Model 8 # 4325 open sets. Fig. 3-5 shows a disassembled transformer # 3802.

DC Resistance of Windings:

3802 - Primary: 960 ohms, Secondary: 27 ohms

3972 - Primary: 1820 ohms, Secondary: 60 ohms

In September 1923, about the time the Model 5 (#4333), Model 8 (# 4325), and Radiodyne (# 4340) were introduced, the factory released several individual parts for homebrew builders. One was the # 4326 RF transformer. It had no holes on top to feed wires through from underneath to connect to the

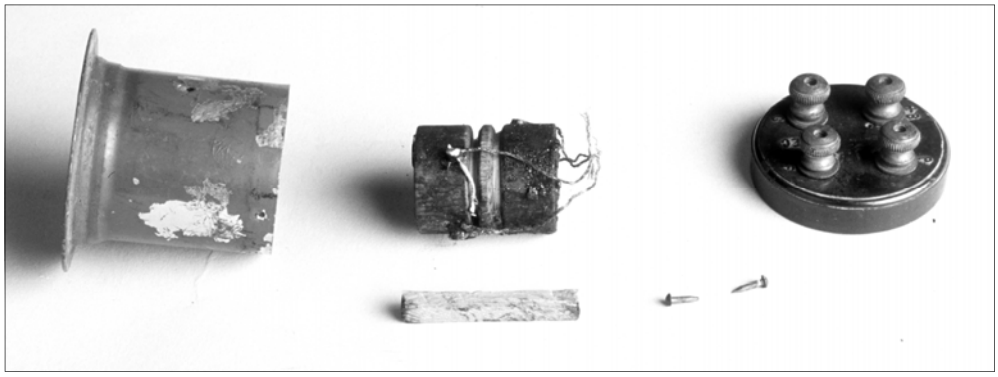

Figure 3-5. RF transformer # 3802 disassembled.

terminals on top. We refer to this as the Type 1 transformer (Figs. 3-6 through 3-8). In the Type 1 transformer, the primary is wound on a Bakelite insert that has holes for through wiring even though the outer housing does not.

The Type 1 # 4326 was changed to a Type 2 (Figs. 3-9 and 3-10) by replacing the Bakelite coil form for the primary with one made of fiber, probably phenolic, as can be seen in the accompanying photos. This is a good example of the factory cutting production costs while maintaining the high quality of the sets. The two materials would function equally well in this application, but the phenolic part was less expensive. The disassembled primary is the same as used in the Type 3 transformer, as shown in Figure 3-11.

The Type 2 transformer had four holes drilled through the top, near the thumbscrews, for wires coming up from the mounting board, as shown in Figure 3-8. Both types have a 15-turn primary and a 55-turn secondary.

The author (Thompson) has examined quite a few early Radiodynes and Model 10 sets with terminals, and found no evidence that the Type 1 transformer was originally used in their manufacture. The Type 1 transformer with the primary winding form made of Bakelite was originally intended for individual sale only, and indicates that the factory was already designing for cost effectiveness of factory-made sets. This will be seen when examining RF Transformer Type 2.

Figure 3-6. # 4326 RF transformer Type 1.

Figure 3-7. # 4326 RF transformer Type 1 disassembled, primary on the left. Note the un-drilled bosses on top near the terminals.

Figure 3-8. # 4326 RF transformer Type 1, bottom view, primary on the left.

Figure 3-9. # 4326 RF transformer Type 2, as used on the Radiodyne # 4340 and Model 10.

The Type 1 RF transformers were made at the same time as the Type 2, as the bosses for drilling the wire holes appear on all of the Type 1 coils. None have ever been found without the bosses.

At this point, how do we justify the quantity of Type 1 transformers found on so many breadboards? One reason is the distributor and repair shops had a quantity of both types in stock, and used them as replacement parts by simply drilling out the holes. Collectors have done the same with Type 1 parts. The AK factory used

Figure 3-10. # 4326 RF transformer Type 2, underside view. Note wires soldered to screw terminals.

Figure 3-11. # 4326 RF transformer Type 3 disassembled, primary on the left.

up its remaining stock on Model 10s that no longer had terminals on the condensers, tube sockets, and potentiometers.

The author (Thompson) owns one such set, with serial number 7426. This is well past the last of the parts with terminals as used on Model 10s, as they end somewhere around s/n 6000. The wires used on this set to connect to the top terminal screws on this set appear to be factory done. There is no evidence that any of the wire staples have been removed to add the extra wire lengths required.

In the fall of 1923, the AK factory found itself unable to keep up with the overwhelming demand for their products. Accordingly, any suitable parts in stock. were used. The company at that time was not sufficiently geared up for high volume radio production.

The Type 2 transformer was used in the manufacture of all 4000 Radiodynes, and those Model 10s with all parts having thumbscrew terminals (about 2000 sets). Examination of several Radiodynes and Model 10s covering a broad range of serial numbers finds no counterexamples.

The next step in reducing the production costs of the "open sets," or breadboards as we now call them, was to eliminate as many connection screw terminals from the parts as possible. This included the RF transformers. Instead of running the wire connections through the transformer top, the lead wires from the windings were extended to protrude through the holes in the board. The result was the Type 3 transformer, as shown in Figures 3-11 through 3-13.

Figure 3-12. #4326 RF transformer Type 3 disassembled, underside view.

Figure 3-13. #4326 RF transformer Type 3 with raised ring.

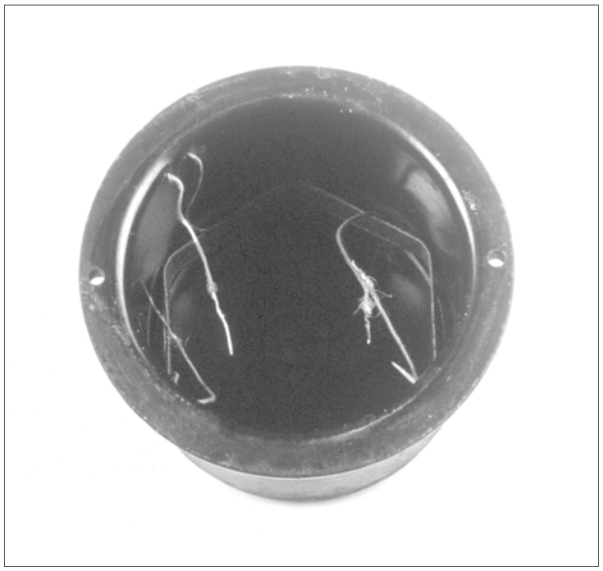

Figure 3-14. Detail of the primary coil in the Type 4 transformer.

Two different Bakelite outer forms were used: The first type was based on the Type 2 transformer, but with the terminal bosses un-drilled. A second variant used a new mold that had a raised ring around the top, but no bosses at all. This is shown in Figure 3-13. The primary was still wound on a fiber form.

Type 4 of the # 4326 is the same as Type 3 except that the primary wound on a fiber tube has been replaced with an air-wound primary of hexagonal shape glued to the inside of the outer Bakelite housing (see Figure 3-14). Both the early style housing, with the bosses, and the newer style with the raised ring, were made with the hexagonal primary. We assume that the Type 4 transformer still carried part number 4326, since it is identical electrically to its predecessors. It is found on Models 10 # 4600, and 10A # 4550 and # 4560.

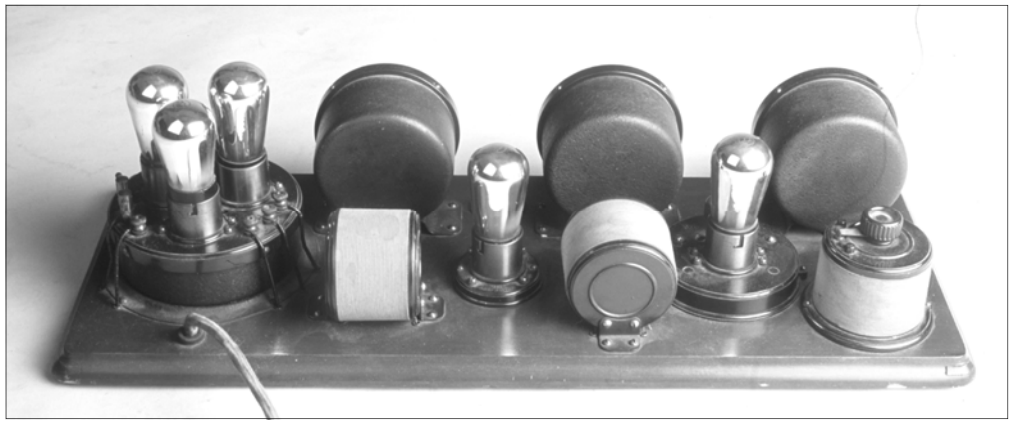

Figure 3-15. Model 10C #4700, rear view showing orthogonal transformers.

The Type 5 RF transformer represents a radical departure, both mechanically and electrically, from the earlier versions. All earlier types were mounted vertically on the board. With the Type 5, the mounting was orthogonal, with the antenna transformer vertical, the second transformer horizontal with its axis front to back, and the third transformer hori-

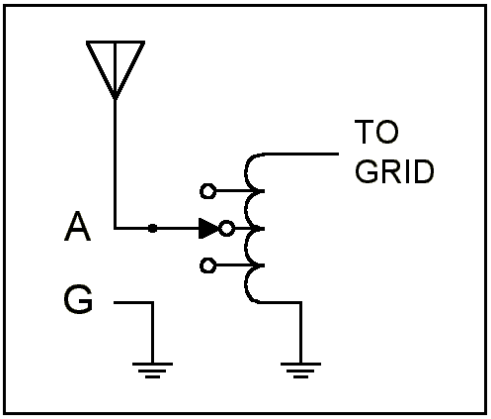

Figure 3-16. Schematic of antenna autotransformer connections for Types 5 and 6 transformers.

zontal with its axis side to side. (Fig. 3-15 is a rear view of a Model 10C # 4700.) The 2nd and 3rd transformers are mounted with a bracket at the closed end, and a clip at the open end.

The orthogonal arrangement reduced the coupling between stages and greatly enhanced the stability of the set, reducing its tendency to oscillate.

Major changes were made at this time in the antenna transformer. The circuit was changed from a true two-winding transformer to a single-winding auto-transformer, and a switch was added to select one of three input taps, to accommodate different antenna configurations. The part number of this Type 5 transformer is not known. This style antenna transformer was used on Models 10B # 4550 and # 4560, 12B # 4620, and

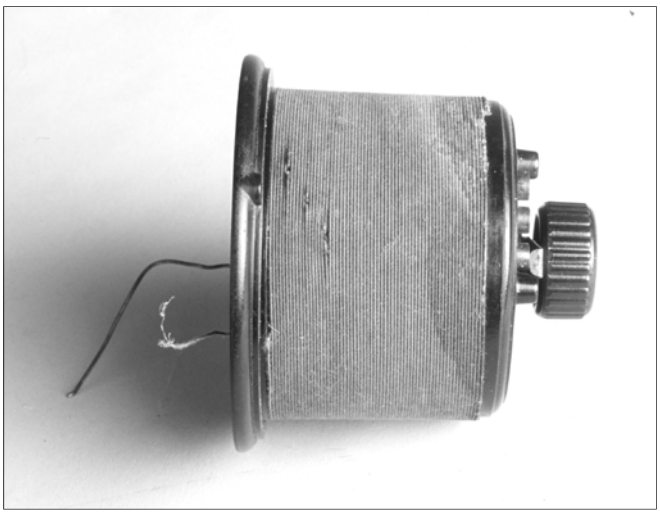

Figure 3-17. Type 6 RF transformer, #4633, showing the taps on the lower portion of the winding.

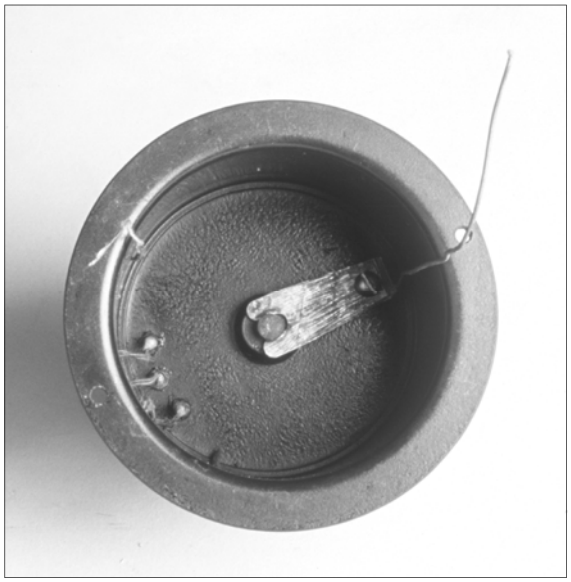

Figure 3-18. Type 6 RF transformer, #4633, internal view of switch configuration.

Pooley 10B # 4590. The circuit arrangement is shown in Figure 3-16.

The Type 6 transformer is very similar, differing only in the number of turns and the attachment method (Figs. 3-17 through 3-23). The Type 5 has 8 turns on the primary and 55 turns on the secondary, with taps at turns 4, 9, and 15. The Type 6 has a seven-turn primary

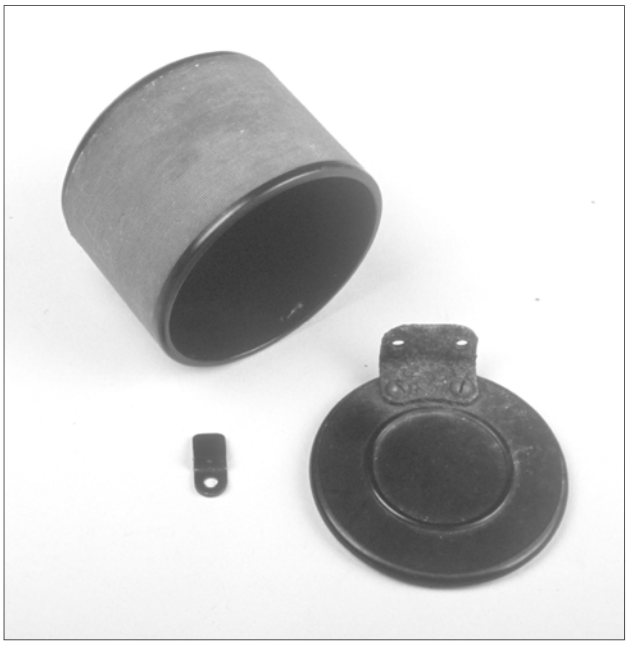

Figure 3-19. Typical 2nd or 3rd stage transformer with the mounting clip used on the B-suffix radios and the end cap used on the C-suffix radios.

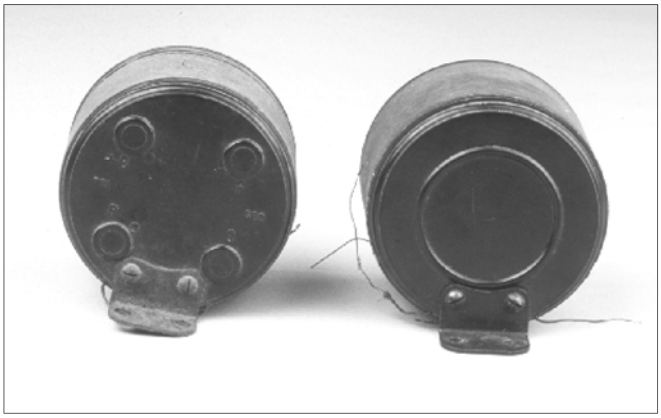

Figure 3-20. Type 6 RF transformers, 2nd and 3rd stages. Left: # 4636, 3rd RF in 10C and 12C, and # 4663, 2nd RF in 9C. Right: # 4946, 2nd RF in 10C and 12C.

and a 47-turn secondary with taps at 6, 12, and 18 turns. The Type 6 transformer was used only on Models 9C # 4660, 10C # 4700, 12C # 4910, and Pooley 10C # 4950.

The C-suffix breadboards have different part numbers for the 2nd and 3rd RF transformers even though the two parts look identical. This is due to the fact that some of the 2nd RF coils have a 600Ω grid resistor installed inside the coil. These transformers are used in the 2nd RF stage of the 10C and 12C, but not on the 9C. The grid resistor was not used in the 3rd stage transformer

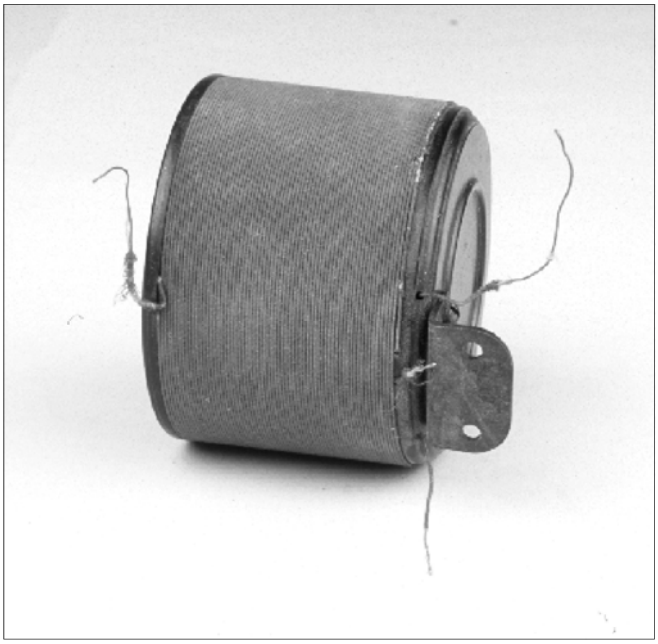

Figure 3-21. Type 6 RF transformer, bottom view.

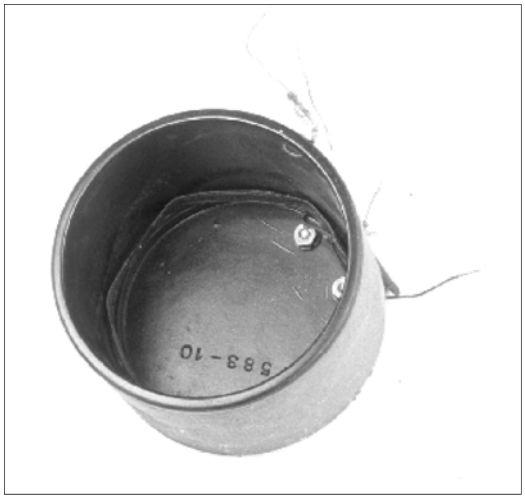

Figure 3-22. Type 6 RF transformer, interior view showing the hexagonal primary coil.

that feeds the detector circuit. These transformers have a seven-turn primary and a 64-turn secondary. Due to this internal component, an end cap was designed that fully closed the end of the transformer that was open on the B-suffix breadboards. The mounting clip and end cap can be seen in Figure 3-19.

The last transformer in this family was the duplex transformer, part number 4380, used in the Model 8 (# 4325) open set. To date no examples of this transformer, nor of the Model 8 radio, have been found, and no technical information is available.

Links

Email Ray at AKRadio@aol.com or Leigh at Leigh@AtwaterKent.Info■

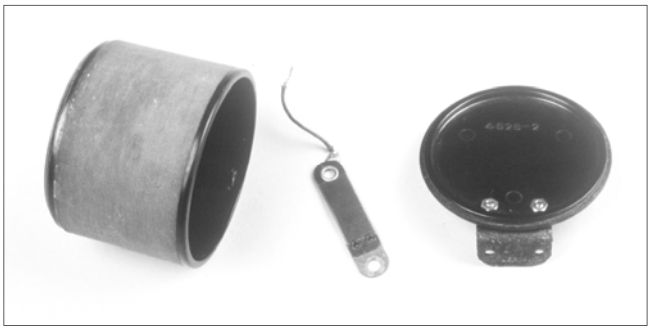

Figure 3-23. Type 6 RF transformer # 4946 disassembled, showing the grid resistor and end cap.