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ATWATER KENT - EARLY RESISTIVE COMPONENTS AND TUBE UNITS

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Many readers will likely be surprised to find out that some of those valued Atwater Kent breadboards and components did not really carry factory nomenclature like "Model 4," but, instead, bore a mundane four-digit catalog number. This article continues the series on AK components and radios, and its primary purpose is to instruct collectors as to the authenticity of anything Atwater Kent that might be presented from time to time to add to his or her collection. In rare instances where certainty regarding component or part data cannot be reached, the authors will make that fact clear.

Introduction

IN our previous article we discussed the very first radio parts produced by the Atwater Kent factory, and how to identify them. Some can be recognized by the black Bakelite pieces used in them. But the black was soon replaced with all brown. Others can be identified because they were never used in AK factory-made radios, and soon disappeared from the component price lists.

In this article we'll look at rheostats and potentiometers which were used on the breadboards, or "Open Sets" as they were known in the AK literature. Then we'll discuss the single-tube components, including some rather rare items.

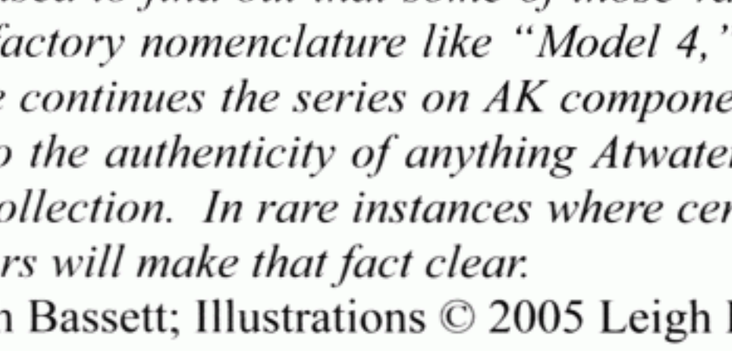

Figure 2-1. Table-mount rheostats, Cat. Nos. 3568 (4-Ω resistance) on left and 4122 (10-Ω resistance) on right.

We're putting strong emphasis on identification of parts by their proper catalog numbers. The AK staff was meticulous in assigning numbers to each and every part used or manufactured by the company. However, when the factory closed in 1936, most of the records were lost or destroyed. The best available information indicates that catalog numbers for radio parts began at about 3000. But some earlier generic parts were used in the radios, such as a staple with catalog number 1068 which was used on all the breadboards, and a

(Continued on page 3)

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catalog number 113 "fastening pin" which was used on early cabinet sets.

Tracing these numbers, and the usage of individual parts in different radio models and versions, is an awesome task. Little information is available to identify them. Many parts are identifiable only by comparing descriptions with electrical measurements or physical characteristics of actual samples. Except as noted in the description of specific parts, we're very confident of the accuracy of the part numbers presented. Our information may differ from that in other modern sources.

This is an on-going study. Readers are encouraged to contact the authors with additional information or corrections. See the "Links" section at the end of this article. We expect to include new information in Update sections of future installments as warranted.

Since we begin to discuss complete radio sets in this article, our treatment of model numbers deserves an explanation. The Atwater Kent Manufacturing Company did not assign model numbers to the early sets. The modern collecting community has created model numbers 1, 2, 3, 4, 6, and 7 to identify some of these sets, but not all. Some of these artificial numbers refer to more than one set.

In an effort to clarify the discussion, all sets will be identified by their catalog number. We will use the term Model, with a capital M, when a model number appeared in original AK literature, either advertising or price lists, associated with a catalog number. Modern artificial model numbers will be noted parenthetically. For example, the Model 12C #4910 identifies a factory-generated model number, while set #3925 (our model 1), identifies an artificial model number. In all cases the catalog number takes precedence for identification purposes.

Following this convention, the first identified model was the Model XV #4220 from May of 1923. The XV was the only set to use Roman Numerals for the model number. It was followed by the Model 8 #4325, then the Model 5 #4333, the Radiodyne #4340, the Model 10 #4340, Model 9 #4445, etc. Model numbers were not generated sequentially, and were occasionally duplicated. But except for the Radiodyne and Model 10 (both #4340), and the Models 10A and 10B (#4550 & #4560), catalog numbers were unique.

The Rheostats

Rheostats are low-value variable resistors that were used to control the tube filament voltage. This was the only means of controlling volume in the earliest sets. One rheostat might control one or more tubes, depending on the design of the radio and the particular tube(s) under discussion.

The early AK rheostats were available in two standard values: 4 ohms and 10 ohms. The lower value appeared first, for use with the early non-suffix 200- or 201-type tubes, having filaments which drew 1 amp at 5 volts. Since the common filament power supply was a rechargeable 6-volt battery, 4 ohms would vary the filament emission over a wide range. The 10-ohm parts were used in the same manner with the later A-suffix tubes, which drew ¼ amp at 5 volts.

An aside regarding evaluation of vintage parts in the modern environment: We like to discuss parts in terms of their nominal or design values, since these match the published specifications. But 80 years later, the values that we measure may differ markedly from those norms. Parts age, suffer from corrosion, electrical overload, and survive the indignities of rodents and insects. And we don't know what the tolerances were for any of these parts. So if your rheostat measures 7 ohms, you must rely on other characteristics for positive identification. We will try to discuss those characteristics as we go along.

The table-mount rheostats shown on page 1 as Fig. 2-1 were sold to hobbyists and amateurs for experimental use. These parts were never used in AK factory-built radios. Note the heavier wire in the 4-ohm #3568 on the left, as compared with the finer wire on the right. This is the simple distinguishing

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In This Issue

(Continued from page 3)

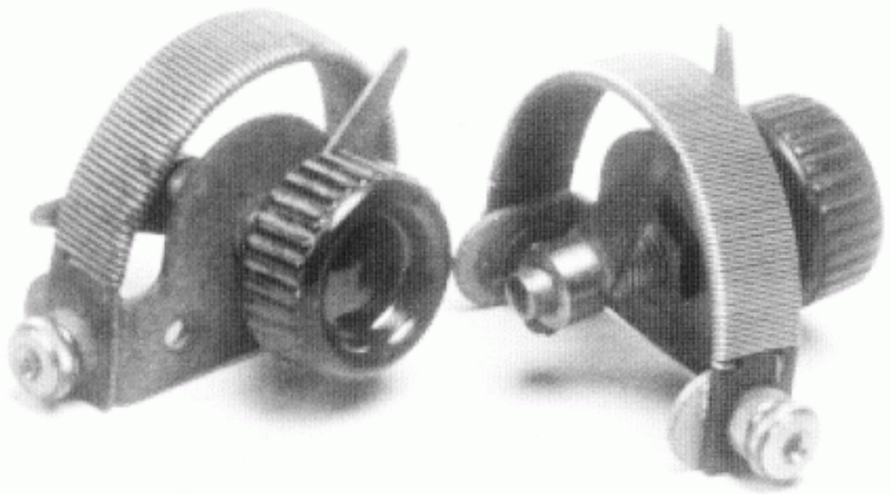


Figure 2-2. Panel-mount rheostats; catalog numbers 3530, 4-Ω resistance (left) and 4119, 10-Ω resistance (right). Like those in Fig. 2-1, these were never used on AK factory radios.

characteristic of all rheostats, as we will note on later parts, as well.

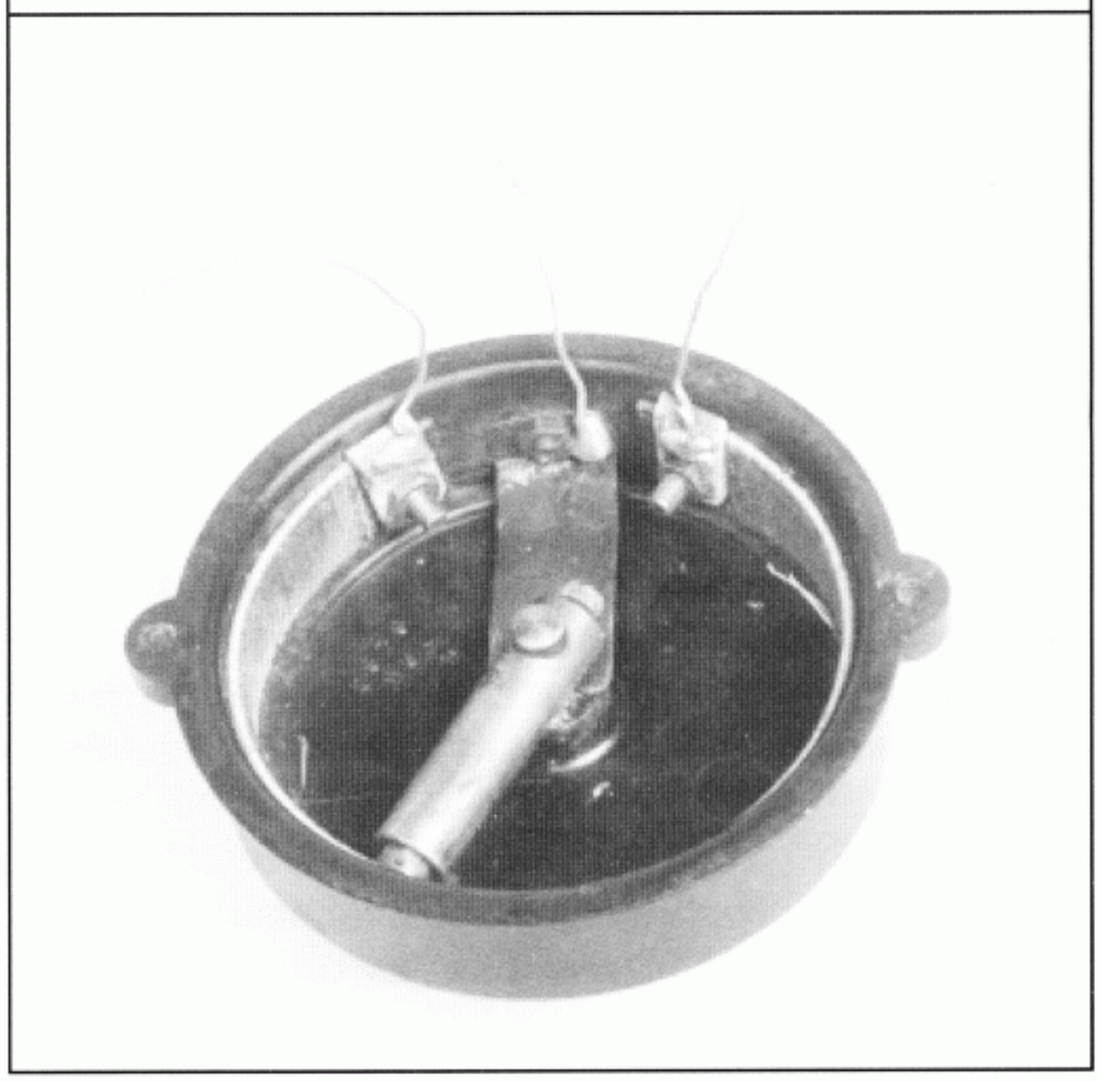
While it's easy to see the difference when you have both units side-by-side, determining the type of an isolated sample can be more of a challenge. A detailed drawing of 4-ohm rheostat #3849 is available at http://www.AtwaterKent.Info under Tech Data -> Modern Drawings. This drawing shows the exact wire gauge, size, and number of turns used on the part. More drawings will be available soon for individual parts as an aid to identification, and for fabrication of replacement components.

As in the case of the table-mount rheostats mentioned above, the panel-mount parts in Fig. 2-2 were sold as individual components and never used on AK factory radios. Many of the panel-mount rheostat piece parts are identical to those in the table-mount units. This is a good example of component re-use, which is one mark of a mature engineering and manufacturing organization. AK was well-versed in the principle of economy of scale.

The Potentiometers

Potentiometers, or pots, were used to control signal voltages and balance within amplifier circuits, usually in the RF stages. These components were sold separately and also used in the breadboard radios. All of the pots identified so far have a resistance of 200 ohms. Various modern references give values from

Figure 2-3 (above). Catalog number 3987 (second version) potentiometer.
Figure 2-4 (below). Same number, but later version, rear view.



175 to 500 ohms. These erroneous values probably result from measurements of deteriorated parts.

In all there were five different versions produced. We introduced two of them in our first article. The #3978 board-mount unit was used in several sets, notably the #4052 (our model 6), #4066 (our model 7), Model 9 #4445, Radiodyne #4340, and the early Model 10 #4340. The #4095 pot was a panel mount style, electrically identical, but never used in any factory radios. Both of these styles had external connections using knurled nuts.

(Continued on page 5)

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A second version of #3978 was recently discovered on an early Model 9 #4445. It has the raised word POTENTIOMETER and the metal tag just like the later versions, but has the knurled nuts on the outside. So far this is the only example of this part known to the authors.

A third version of the #3978, actual part number unknown but probably unchanged, is shown in Fig. 2-3. The screws are turned around with the heads outside, and hex nuts are used rather than the knurled style. Wires were soldered to the device inside the housing and routed down through holes in the breadboard. This part is found on the Models 9 #4445, 10 #4340, and 12 #4620. Other identifying characteristics are the raised word POTENTIOMETER and the metal tag.

The fourth version of #3978, part number unknown but probably unchanged, is shown in Fig. 2-4. This variant was produced from a new mold with the word POTENTIOMETER removed. However, the part number of the Bakelite housing was still 3979, as used for the earlier versions. The metal tag is still present. The attachment of the wires which went through the mounting board is clearly visible. This version is found on the Models 9A #4445A, 10 #4340, and 12 #4620.

The fifth and last version, part number unknown, has neither the molded wording nor the metal tag. In fact, there is nothing to identify this as an AK part. This version was used on the Models 9A #4445A, 10A #4550 & #4560, 10B #4550 & #4560, and 12 #4620.

The Tube Units

Virtually all of the assemblies which had tubes can be included under this description. Our focus in this article is the simple assemblies which supported a single tube, having a filament rheostat and possibly a few other components. The Tube Assembly (TA) units, characterized by multiple tubes on a Bakelite base supported by a metal can, will be discussed at length in future installments of this series. And we begin the discussion with a rather rare piece.

Fig. 2-5 shows this tube assembly, designed for the WD11 tube. It contains a standard detector circuit, including a 2-Megohm grid leak resistor, 250-μμF grid condenser, and a 4-ohm filament rheostat. This was the first appearance of the round ring style

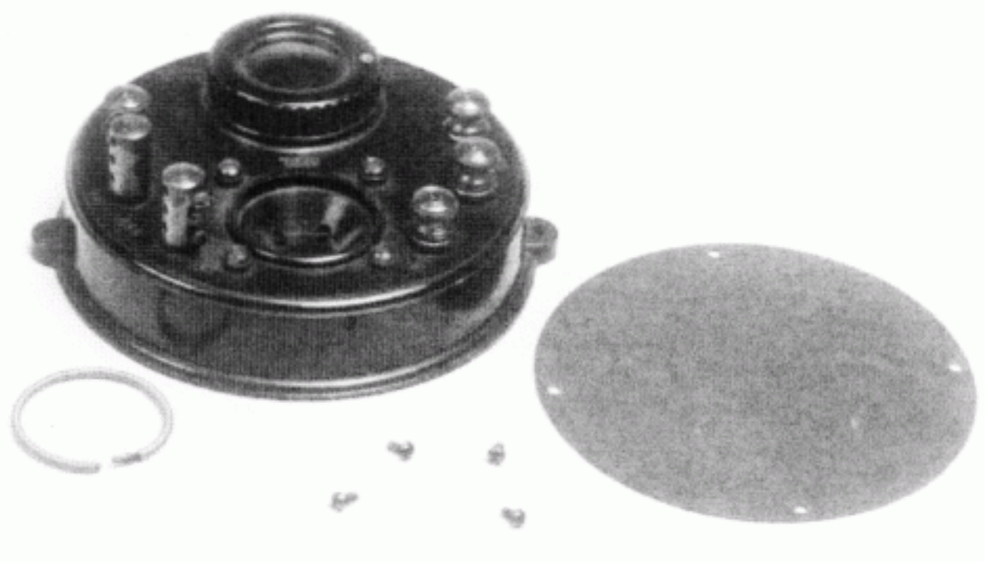
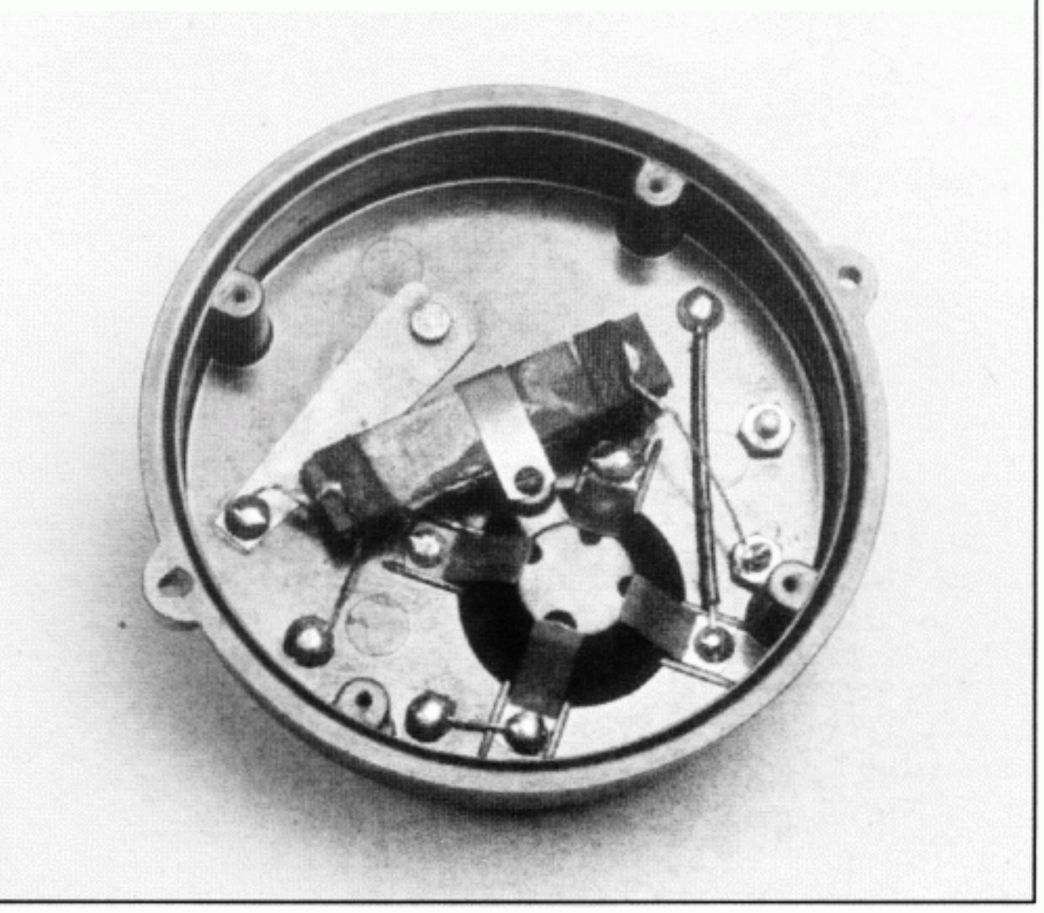


Figure 2-5, Catalog number 4053 detector unit, 1.5-volt rated, for the Westinghouse WD-11 vacuum tube. Note ring-type rheostat element.

Figures 2-6 (above) and 2-7 (below), top and bottom views, respectively, of 4053 detector unit.



rheostat, seen in the foreground of Fig. 2-5. This rheostat, in different values, was used in numerous

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AK radios through the 1927 models. It was also used in the #4333 five-tube TA unit in the Model 5 and Model 8 open sets. The #4053 was sold as a component but never used in an AK factory radio.

Figs. 2-6 and 2-7 are detail views of the #4053 detector unit. The filament rheostat is mounted inside the large knob. The electrical connection can be seen in the underside view (Fig. 2-7) toward the top of the picture. The cigar-shaped component at the center in the underside view contains both the grid resistor and grid condenser.

One diagnostic point is shown in Fig.2-7, and holds true for all AK Bakelite housings: The electrical connections are made by soldering wires directly to the bottoms of short screws. This technique will not be found in many modern reproductions, since the plastic used might not withstand the heat of soldering. When you see this type of soldered connection, you're almost assured that the housing is really Bakelite, and if you see that melting or scorching of the housing HAS occurred at the soldered connections, you can be sure that the part is NOT Bakelite.

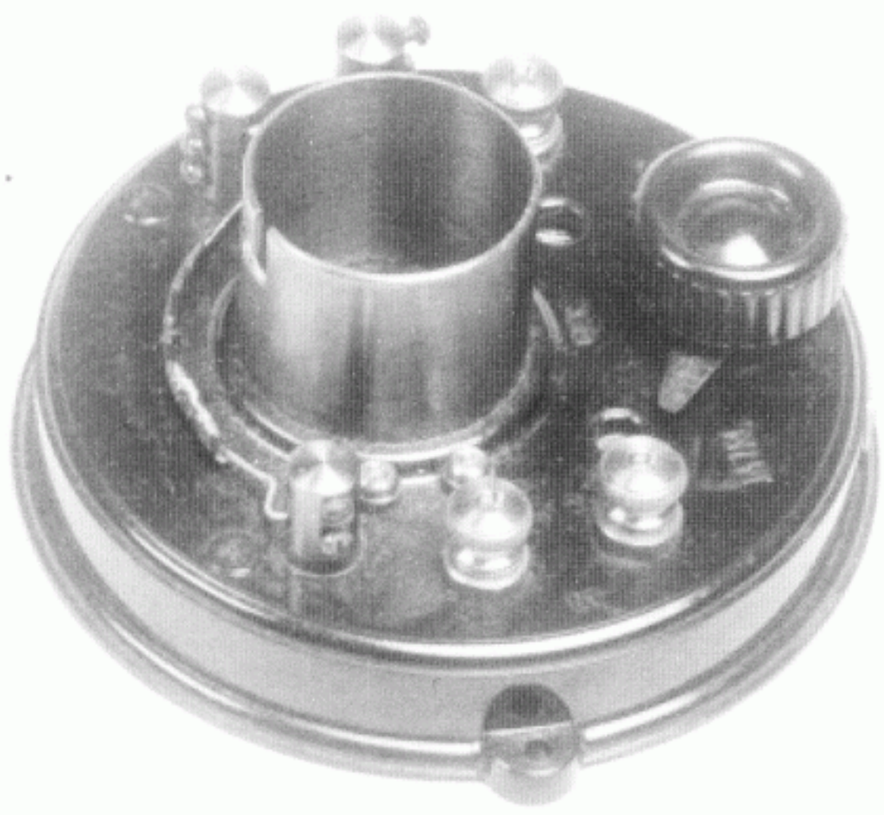

Figure 2-8. Side view of No. 3902 or 4332 detector unit. No. 3902 was for type 200 tube and No. 4332 was for the 200A.

Another TA detector unit, shown in Fig. 2-8, is #3902, made for 1-amp tubes or #4332, for the newer ¼-amp tubes. These two parts are identical except for the value of the filament rheostat. The #3902 was designed to work with the type 200 detector, with a 1-amp filament. When the ¼-amp 200A became available, the rheostat was changed to 10 ohms and the Detector Unit catalog number changed to 4332. When using the 200-type tubes, the B+ was 22½ volts nominal. The 200A tube, when used, could employ a B+ of up to 45 volts.

The two rearmost posts, at the left of the picture, are identified as P1 and P2. These were connected by a factory-installed jumper wire as shown. However, the user could remove the jumper and connect these posts to a variometer to create a regenerative detector. This rather convoluted arrangement was used to circumvent a patent held by Armstrong for the regenerative detector. AK had not bought a license for this patent, and thus could not legally manufacture regenerative detectors.

The #3902 detector was used on the factory-built #3955 radio (our model 3), on the #3960, and on the #3975 (our model 4). The #4332 (¼-amp variant) was probably not used on the #3955 and #3975 sets. These sets were only on the market for a few weeks before the #4052 and #4120 sets were introduced, making the earlier radios obsolete. The #4332 was probably sold as a component for experimentation.

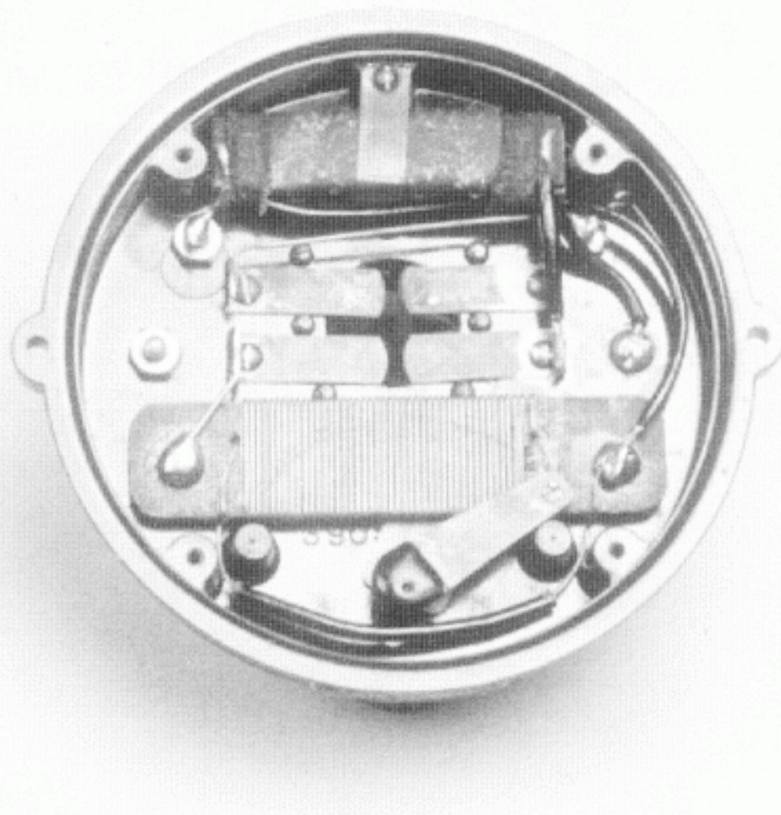

Figure 2-9. Bottom view of Detector Unit 3902, showing the flat card-type rheostat element (below tube socket) and grid leak/condenser (top).

Fig. 2-9 shows the #3902 Detector Unit from the bottom side. This view shows the detector circuitry to be the same as that used with the WD11 detector described above. The grid leak resistor and condenser assembly is identical, but is here mounted along the upper edge of the housing. The 4-ohm filament

(Continued on page 7)

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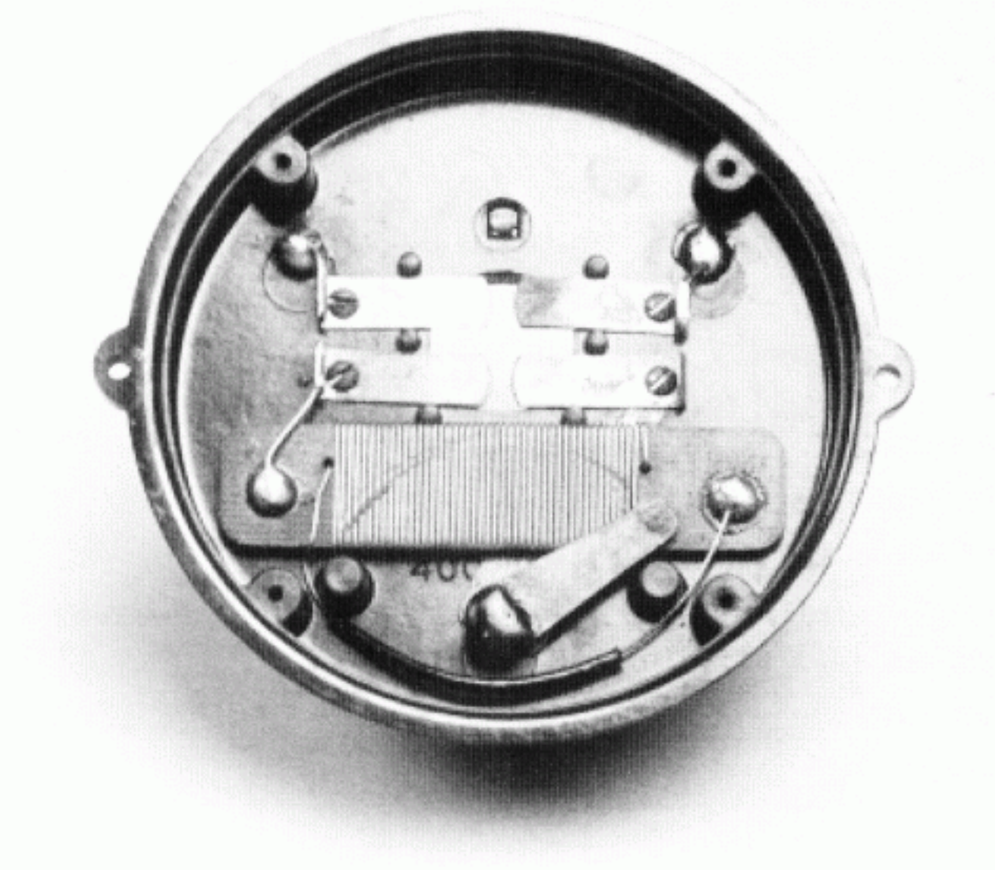
rheostat is p/n 3849. The #4332 Detector looks identical except for the rheostat. The 10-ohm rheostat was used on many different assemblies, and is shown in a later picture. A complete schematic of the detector, and a detailed drawing of the #3849 rheostat, are available on the AK site under Tech Data -> Modern Drawings.

There is one interesting point regarding the rheostat: the pigtail connecting the left-hand end of the resistor with the battery post is made from the same resistance wire as the element itself. This provides a fixed minimum resistance on the order of 0.25 ohms when the control is set full ON.

Figures 2-10 (above) and 2-11 (below). Cat. No. 4024 Tube Unit, as seen from the side, and from the bottom, respectively.



Figs 2-10 and 2-11 show the #4024 Tube Unit, probably the minimum configuration that can be called an electrical circuit. It has a 4-ohm rheostat. That's its only claim to technological complexity. The #4175, with a 10-ohm rheostat, looks quite similar. The side view clearly shows the wiring holes, just to the left of the knurled nuts, which appeared in later versions of these units. Earlier versions were produced without the holes, requiring the wires to be routed around the outside of the base.

The bottom view clearly shows the mounting bosses for the metal bottom plate which was used on the early version without the wire holes. Generally, metal bottom plates were used on parts that were sold separately to consumers. Parts which were used on AK factory-built radios might or might not have metal plates, and variants used in later radios did not.

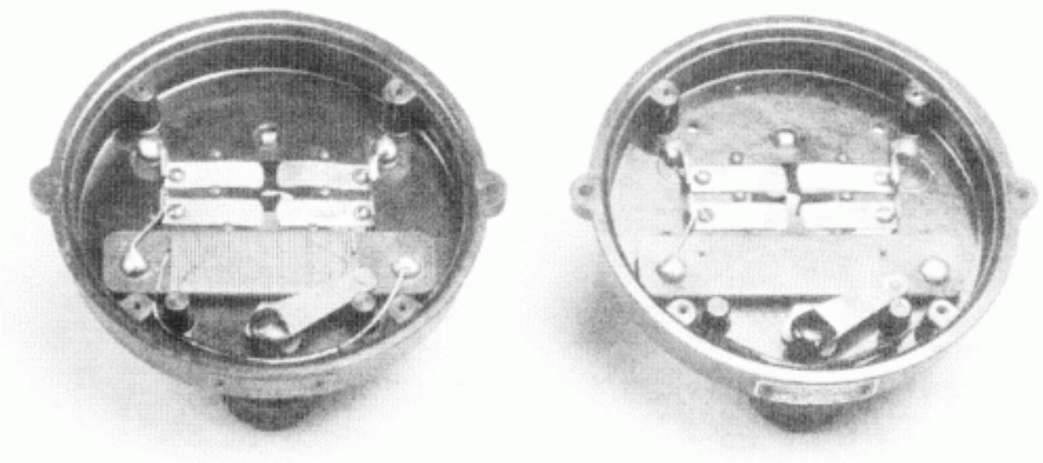
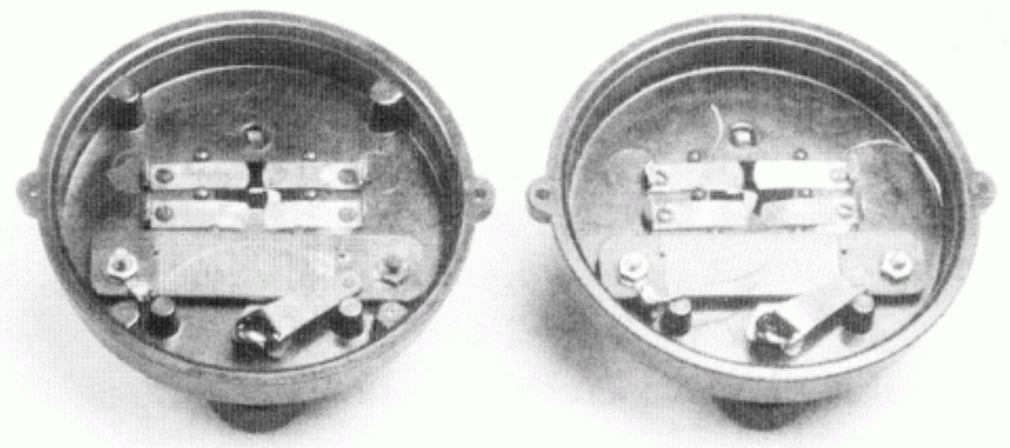


Figure 2-12 (above). Tube Units 4024 (left) and 4175 (right) for 1-amp and ¼-amp tubes, resp. Figure 2-13 (below). Later Tube Unit variants.



Figs. 2-12 and 2-13 show the evolution of the tube unit over time. The #4024 and #4175 in Fig. 2-12 are identical except for the rheostat. These Tube Units had metal base plates, as indicated by the tapped bosses for the plate mounting screws. The AK factory used the #4024 on the #4052 (our model 6) and #4066 (our model 7) radios which used 1-amp tubes. These were the first sets to be modified by having the wiring concealed and routed through holes in the Bakelite housings. With this modification, the metal bottom plates were eliminated.

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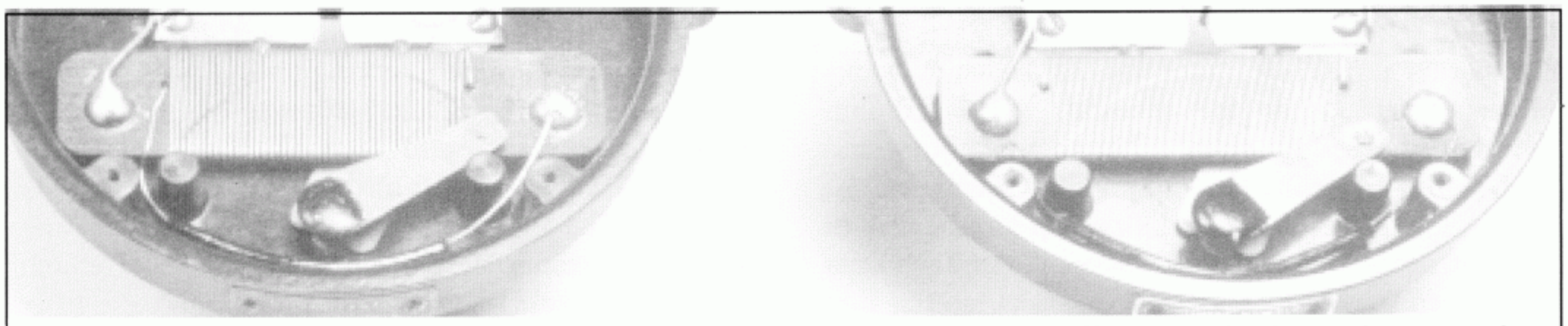

Figure 2-14. Blowup of part of Fig. 2-12, making it possible to see the differences in the resistance wire wound on the two filament rheostat cards.

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The #4175 was used on many sets, including #4205 (our model 7), #4207 (our model 7), #4275 (our model 6), the early Models 9 #4445, Radiodyne #4340, and the early Model 10 #4340 with terminals. The bottom plate was not used in these sets.

Note the different appearance of the rheostats, emphasized in Fig. 2-14. The 10-ohm rheostat on the right uses finer wire and more turns. This is the same difference as was noted for the individual rheostats earlier in this article.

The second variety of the #4175 is shown on the left of Fig. 2-13. Obviously the same mold was used for the Bakelite housing, but the mounting holes for the bottom plate screws are not drilled or tapped. Wiring was soldered to the underside of the unit and routed through holes in the breadboard base. This is the first version of the Tube Unit to use this style of wiring, which would become commonplace in later open sets. Service shops had to unsolder the wiring below the breadboard in order to remove the unit for repair. This part was put into use in December of 1923, and was used in the Models 9A #4445A, 10 #4340, 10A #4550, 10A #4560, and 12 #4620.

The last style of the Tube Unit is shown on the right side of Fig. 2-13. A new mold was used which eliminated the G, P, A+ and A- terminal labels on top, and removed the mounting bosses underneath. It seems that this same part, under different part numbers, was used on many different radios. It was used in the Models 9A #4445A, 10A #4550, 10A #4560, 10B #4550, and 10B #4560.

We know from factory lists that this Tube Unit was also used in Models 9C #4660, 10C #4700, and 12C #4910. In the 9C it's listed as #4661 with a #4662 rheostat (20 ohms). On the 10C and 12C it's listed as Tube Unit #4500 and it is equipped with a #4497 rheostat (10 ohms).

Conclusion

In these first two parts, we've examined passive components and simple assembles. We'll continue this discussion in our next installment with coverage of RF parts and related items.

Links

Email Ray at AKRadio@aol.com or Leigh at Leigh@AtwaterKent.Info
Online copies of this series after their publication in *Radio Age*, additional drawings, photos, and schematics, are available at http://www.AtwaterKent.Info and click on Articles.