

# ATWATER KENT — MASTER OF MARKETING

Ralph O. Williams, N3VT

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## INTRODUCTION

Almost all of today's radio collectors are familiar with Atwater Kent radio receivers. Because some of the sets, particularly the later breadboards, are dramatic contributions to a collection they are held in especially high regard. The name Atwater Kent has come to signify something above and beyond ordinary, collectible receivers. But what are the reasons for the character of the breadboards? Or the style of the metal boxes of the 40 series? When Atwater Kent introduced these unique styles, was he only responding to the novelty of radio?

Beyond the radios is a much broader story. It tells of a man who was hugely successful in the automobile industry before entertainment radio was conceived. It tells about a developing young man who ultimately climbed to the highest reaches of American enterprise. This man was the very best kind of "do-it-yourselfer," building the largest radio manufacturing company without outside stockholders, without interlocking corporate structures and without the unethical practices that marked too many contemporaries.

Examining Atwater Kent the executive, and the functions that he implemented in his several businesses, cannot be done unless a trove of documents about him is uncovered. What can be done is to review his products and, by comparing their technical sophistication to the times in which they appeared, postulate something of the man who made them happen.

Other authors have done exemplary work in describing Kent's radios. To focus more directly on Kent, this article looks at the relationships he maintained between the users of his products and the means by which they were produced. The name of the relationship is "marketing."

Marketing, as the term is used in the last part of the twentieth century, has come to have two separate but related meanings. The first meaning concerns doing something in a place where commodities are bought and sold. A phrase with the first meaning might be, "I'm marketing radios," by which is meant "I'm selling radios in the market." The second meaning is used in industry and commerce. It refers to an analytical function that compares the requirements of customers to the capabilities of a supplier within the limits of his business goals. This is the meaning of the term, marketing, as it is used in this article.

How did Atwater Kent respond within the broader concept of market-

ing? Was Kent's customary approach one in which the demands of his customers were related to his manufacturing capability? Conversely, did he, as part of his business strategy, alter his manufacturing facilities to meet his customer's demands? How effective was his influence on customers and their choices? How successfully did he modify his factory to profitably fulfill their demands?

When we propose that Atwater Kent was a master marketer, we suggest that he used far-beyond-ordinary skills in discovering the wishes and intentions of his potential customers and altering his factory to supply those demands. At the same time, we observe that he met his business goal of profitable operation.

As we move through Atwater Kent's business life we review each product's effectiveness. Near the end of each section of this paper, we comment on his apparent marketing effectiveness for the products discussed. In the conclusion of the article we comment on some of the earlier analyses with the intent of extending them to a broader evaluation of Kent as an executive.

If it were possible, our method would include the classic technique: interviewing the subject and comparing his responses to contemporaneous facts and opinions. Instead, our primary method was to obtain pertinent material about his products and then to evaluate them in the light of their own times. A large part of the data that we used is 1920's production information that was given to us by his son Atwater Kent, Jr. who said that it was all that was left of the factory records.

To better perceive Atwater Kent himself, we looked briefly at the state of American technology shortly before and during Kent's active business life. This made it possible to project the influence of the environment on his growth to maturity. Then, to obtain a broader evaluation of Kent as an active entrepreneur, we reviewed published material about him and his products. We have tried to leaven the whole with information from interviews with those who knew him.

## INVENTION AND IMPROVEMENT

The evaluation of Atwater Kent's products requires a brief explanation of some terms as well as the context in which we use them. American technology throughout our history has been the result of two major creative activities: invention and improvement. While the results may seem greatly different, the processes by which both come about are largely the same. Only the bases upon which the processes work are different. For invention, the base is largely an idea, a mental concept. For improvement, the base is usually an existing device, an embodiment that can be touched or seen.

Creativity is the common element of invention and improvement. By creativity we mean that mental activity where concepts or ideas that do not have an initially obvious relationship are considered together, yielding a novel relationship which may or may not have an immediate practical application. Although some question or problem stimulates creativity which then generates an improvement or an invention ("Necessity is the mother of Invention"), the creative process can occur unbidden.

Both invention and improvement involve experimentation. The experimentation may be conceptual (as Einstein sometimes celebrated) or it may involve physical change to an embodiment. The form of the experiment differs between invention and improvement, but its function is the same in both cases; postulate novelty and consider effectiveness.

## THE SWEEP OF TECHNOLOGY

The main body of this article is an evaluation of Atwater Kent's several product lines: electrical, ignition, military and radio. Kent's first offerings were electric motors. They were sophisticated devices in their own time and would have been far beyond a person with no technical skills. His first motors might have been direct copies of earlier motors or they might have resulted directly from Kent's background, the results of his earlier experience in studying and experimenting as he grew to maturity.

What was his background? While we don't have records of Kent's life we can review the technical world into which Atwater Kent was born. We look at it from two perspectives: one is the state of its body of knowledge, both conceptual and implemented. The other is the potential it has for developing an ambitious young man.

Technical understanding has a relatively short history compared to art or the classics. It amounts to little more than four centuries. The history of art, religion, politics and language is more than ten times as long. The history of the replacement of animal power with mechanical power (engines of all sorts) spans only two centuries. The technology of radio, with which we associate Kent, is now only one hundred years old. We have selected three periods to describe: Today, Kent's time, and the beginning of the nineteenth century. This makes it possible to see how the sweep of technology might have formed the persona that we ascribe to him.

Looking back in time from the end of the twentieth century the pace of technological growth seems staggering and, to some people, even fearful. One part of the impression is generated by the breadth of our developments, ranging from the sub-microscopic alteration of DNA to reckoning the age of the universe by using data from observations of waves radiated across the cosmos. Another part of the impression comes from examining

the depth of knowledge that has resulted from the hypothesis, investigation, experiment and verification in our expanse of technology.

## TECHNOLOGY TODAY AND YESTERDAY

The successful technical person of today, at the end of the twentieth century, grows up in a moderately comfortable family, with strongly interested parents and good schooling. Early in life this person is encouraged to study math, science and computer technology. Although he may have worked on machinery or electronics, he has concentrated on concepts and theory. In the last half-century, the technologies that he might have learned-by-doing have matured to the place where only primitive experiments can be performed. He sees devices as things completed rather than challenges for improvement. The potential for growth of a young person at the end of the twentieth century is limitless. Achieved growth depends only on human capacity, no longer on material means.

Going back almost two hundred years, to the beginning of the nineteenth century, a very different picture of technology is seen. The first part of the nineteenth century was a period of great creativity but most of the implements, both large and small, were made primarily of wood. All sorts of improved tools and devices were conceived, produced and improved by mechanics, farmers and entrepreneurs. The era of invention was at hand. The reaper, the cotton gin and a multitude of agricultural machines reflected the growth of mechanical technology. Iron bridges and the steam locomotive were major inventions in related fields.

Electricity was known but was only emerging from its experimental stage. Near the middle of the nineteenth century, the telegraph was reduced to practice and it thereby established two other areas of increasing breadth: coded electricity and the transmission of data. Little more than a century later these became basic necessities of modern life. Underlying all these inventions and improvements was the rapidly deepening understanding of what they really were and how they worked. This growing theory clearly resulted from innovative successes but, to a much greater extent, the knowledge was gained from the many unsuccessful attempts that preceded each final, useful achievement.

At a time in this period, such as 1820, a young man of high technical initiative would have been sent to a local school where he would have learned to read and to do arithmetic. He would also have learned classics at home with his mother or father. Because of his inclination toward technology, he would have gained much experience with tools and agricultural implements and very possibly been apprenticed to learn a trade. He would have been very fortunate if his apprenticeship included working with metal, particularly iron.

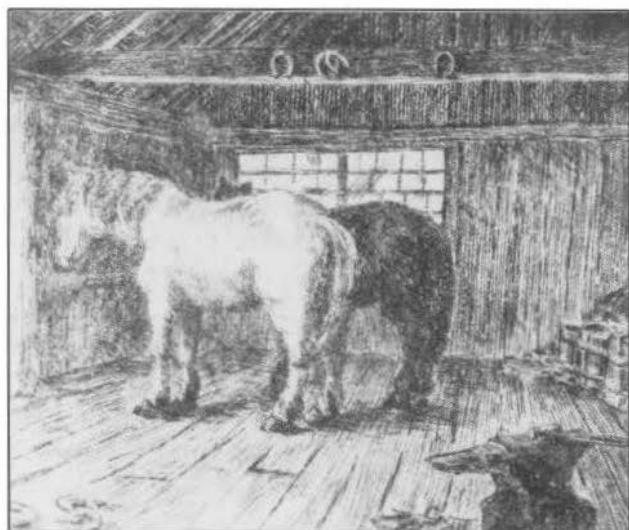


**Figure 1.** *The local blacksmith shop, the technology center of the 1800s.*

The local blacksmith shop, Figure 1, was the technology center of the early 1800s. Not only did the smith shoe horses and fashion simple tools but it was the place where the metal devices that were being developed for farms and small factories were invented and modified. An apprenticeship in the blacksmith shop would have exposed the young man to horses and oxen, since they were the main sources of portable power, but at the same time it would have offered him superior training in the most advanced technology in his area.

Had he been interested in medicine or teaching he might have gone to college. There he would have learned nearly no technology, because in the first part of the nineteenth century the inclusion of science and engineering in regular college curricula had not yet taken place. The potential for the young man of this time was dependent on both materials and theory but was nevertheless open to whatever growth his personal creative spirit could sustain.

## **TECHNOLOGY IN KENT'S TIME**

Between these two major periods in the history of technology, specifically the last quarter of the nineteenth century, innovation accelerated; power obtained from animals or humans was being rapidly replaced by mechanical power. Steam power became ubiquitous. The gasoline engine, invented by Otto in 1864 and perfected by Charter in 1884, was well on the way to supplementing steam, especially for small applications and for the automobile. Some other inventions that strongly advanced technology in the late nineteenth century and probably influenced the youth of that

period were; Brush's dynamo and arc lights in 1876, the practical typewriter brought out by Remington in 1874, and the mechanical typesetter, introduced by Mergenthaler in 1878 and upgraded to the Linotype in 1885. The pace in other fields was equally rapid. Bell filed for a telephone patent in 1874, only days before Gray. In 1877 Edison added carbon granules to the Bell transmitter thereby making it a practical instrument. With the further improvements made since then it is still in use. Isaacs invented a multiple camera system to make pictures of the motion of a running horse. Muybridge altered the system in 1882 to use a single camera. Eastman, in cooperation with Edison, produced a 50-foot roll of film which became a true motion picture after multiple exposures in Edison's camera. In 1887 the system became the Kinetoscope. Perhaps the most obvious sign of sweeping technology in the late nineteenth century was the perfection of the incandescent lamp and of the electrical generating and distribution systems that provided its power.

The body of technical knowledge grew so rapidly that new academic disciplines had to be introduced into the curricula of technical schools and universities. Only by extensive dissemination could students interested in innovation share in using and extending it. The pattern of scientific and engineering education that is in place today had its start in the last part of the nineteenth century. Although schools taught concepts and technical practice, learning from experiment and experience was still the significant part of the development process. A young man could become very proficient in improvement and invention without a formal education.

To understand the particular young man who started building and selling the first Kent products, we must add details about his immediate home and family and consider the time and situation of his youthful development.

### **ARTHUR ATWATER KENT**

Arthur Atwater Kent was born December 3, 1873, into a comfortable family of moderate means. His mother and father recognized the value of formal education, but when Arthur was small they had not become so modern as to preclude the value of learning by experiment. Kent's father, Prentiss J. Kent, born 1834, earned a living as a machinist and had taught school in the middle of the nineteenth century. Before the civil war he became a doctor and later was appointed a surgeon in the NY 174th Volunteers, staying in the service until 1864. Upon his return to Burlington, VT he married Elizabeth Atwater. The Kents moved to Worcester, MA in 1869 where he was involved in medicine, pharmacy and a vestige of his machinist days, invention.

The family returned to Burlington, where Arthur was born, and later moved back to Worcester. There is no clear record that says how strongly Prentiss Kent maintained his interest in machine work in Worcester but there is evidence that he had a machine shop there in 1889. From what we see of Atwater Kent's first motors, he must have been very strongly encouraged by his father to become proficient with machine tools. Kent's mother also encouraged him, in part because he was her only son, but in greater part because of his initiative and independence.

Later interest and effectiveness in the technical world suggest that young Arthur, as he was known at home, was strongly influenced by both the technology and the culture of the last quarter of the nineteenth century. His father's experience and his mother's teaching provided him with the opportunities he used to become an entrepreneur while still in his teens. At the same time Kent benefited greatly from the cultural influences of his home life. Our interviews with Atwater Kent, Jr., his son, who preferred to be called Atty, left strong impressions of the richness of his father's personality.

Atwater Kent's youth was the time when the steam engine, one of the very few complex machines of its time, had reached a stable level of perfection. Other examples are: the telegraph and the engine lathe. One story of Arthur's experimental bent and his family's "encouragement" was told by his son, Atty, nearly one hundred years later. It seems that Arthur had some serious thoughts about the steam engine in the family launch and how it could be improved. Figure 2 pictures such a launch. Out on the lake one day during a summer holiday, he put his ideas into action. The unanticipated result was disaster. The launch burned to the ground (water). As Atty told the story, Arthur's punishment had the flavor of restitution; perhaps it even enhanced Kent's further technological growth.

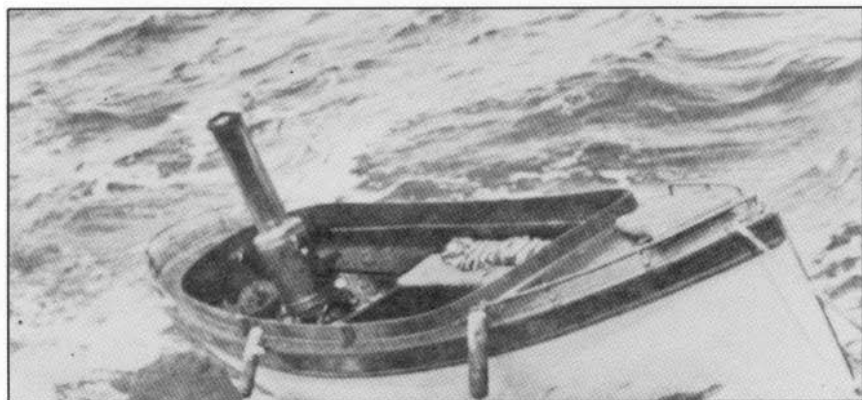


**Figure 2.** *An early steam launch, of the style that Kent worked with.*

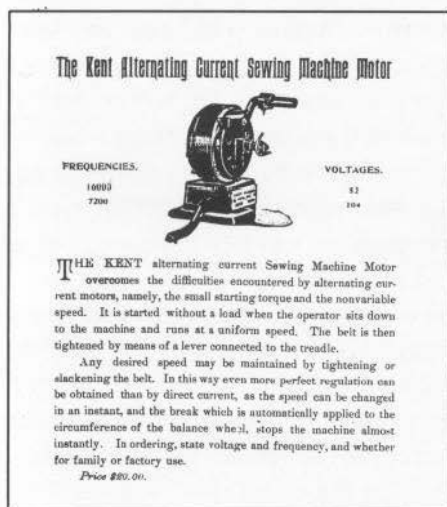


**Figure 3.** Data sheet from the Kent Electric Manufacturing Co., 1896.

## THE YOUNG MACHINIST

The few records that have come to light about young Atwater Kent let us look at him shortly after he turned twenty. One record shows that he entered Worcester Polytechnic Institute in 1895 as a member of the class of 1899. The other is a notice in an 1896 issue of the publication *Electrical Engineer* announcing a sewing machine motor made by the Kent Electric Manufacturing Company. Figure 3, reproduced from a data sheet issued at that time, describes the motor.

Figure 4 illustrates a fan that used the same motor that was used for the sewing machine. The written copy on its data sheet states “putting our fans on the market for the season of ‘96.” Since in Massachusetts the fan season is summer, both the fan and the sewing machine motor must have been manufactured early in 1896. Considering the time that it would have taken to obtain materials and to make parts for the motor suggests that the motor was manufactured in late 1895 and early 1896. This work appears to have been going on at the same time as Kent’s attendance at WPI.

The coincidence of Kent going to college at the same time as his latest motor was introduced was an intriguing idea to the author. What inferences could be drawn from this idea in the light of other information that was available about Kent? First, the documents from which the sewing machine and fan motor illustrations in this article were made were given to us by Atty, Atwater Kent’s son, for historic preservation. We were ecstatic that he gave us the documents but more important, that he shared his pride in his father’s invention of the devices.

A second inference is built on several other motors. Figure 5 reproduces the data sheet issued by his Kent Electric Manufacturing Company for the No. 2 Motor. Its design and description suggest strongly that it was

**KENT A. C. FANS.**  
18,000 ALTERNATIONS.

Highest Efficiency.  
Greatest Breeze.  
Least Current.



No Commutator.  
No Brushes.  
Self-Oiling Bearing.



IN putting our Fans on the market for the season of '96 we feel confident that we can offer a machine that has no peer. In a test of various makes it was found that our fan consumed from 1 to 2 Amperes less, and ran at a higher speed than any other induction fan made. The motor complete with fan and guard weighs but 17 pounds.

It is of the induction type, and has neither commutator nor brushes, no insulation on the armature and nothing to burn out. It has but one, long, self-oiling bearing and is impossible to get out of alignment. It is of the simplest construction and requires no attention, carries a 12-inch, four-blade fan protected by a handsome guard, and is finished in Japan and polished brass.

Made for 104 and 52 volt currents. In ordering state voltage. SEND FOR PRICES.

MANUFACTURED BY  
**KENT ELECTRIC MANUFACTURING COMPANY,**  
27 HERMON STREET, - - - WORCESTER, MASS.

**Figure 4.** Kent alternating current fan, 1896.

similar to the sewing machine motor particularly in the design of its single rotor bearing. Figure 6 shows the No. 3 Dynamo Motor. Both of these motors are low-voltage direct-current machines that would have been produced before the sewing machine motor which had been upgraded to use line voltage alternating current.

Mention is made in the No. 2 data sheet of two more motors: "The No. 4 is the sewing machine size. The No. 5 is about 1-8 H.P." There were also direct-current fans produced in two configurations, one where the customer could buy the motor and the fan blade, the other where the fan was complete and contained its own pedestal. Figure 7 shows that fan.

Since all these direct current motors including the fan and their very mature, business-like data sheets predate the alternating current motor, there can be little doubt that Atwater Kent and his father, who would be nearing 60, were together in the Kent Electric Manufacturing Company. The design of the motors, their quality and their range of application show significant investment in time and money. The financial support would have come from Prentiss and the aggressive technical approach would have come from Arthur.

**THE Kent Drum Armature**  
Motors and Dynamos.

For Noiseless Running, High Grade Workmanship, High Efficiency.



For Running Electric Lights, Electric Motors, Sewing Machines, Fan Motors, Etc., Etc.

Our New No. 2 Motor.

Our Drum Armature Battery Motor.

The few years that we have been manufacturing and experimenting on Battery Motors, we have used to such advantage that we are now able to present to the public machines which possess great advantages over other makes. In the workmanship and general design alone they excel. But our Drum Armature gives them unparalleled supremacy in the Battery Motor Field.

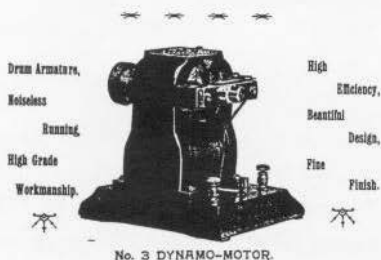
(CONTINUED ON 2D PAGE.)

MANUFACTURED BY  
**The Kent Electric Mfg. Company,**  
27 Hermon Street, Worcester, Mass.

At the time of Kent's entry into college, his line of motors was in production and being distributed. His father may very well have supervised their employees in the shop and done the billing while Arthur attended school. That work would have been a very light demand on Arthur's time. Our second inference is that Kent kept in touch with the factory while he went to college.

**Figure 5.** Kent No. 2 motor, 1896.

## THE KENT DYNAMO OR MOTOR



For Running Electric Lights, Electric Motors,

Sewing Machines, Fan Motors, Etc., Etc.

MANUFACTURED BY

The Kent Electric Manufacturing Co.,

27 Hermon St., Worcester, Mass.

## THE KENT "96" BATTERY FAN



THE ONLY DRUM ARMATURE BATTERY FAN MADE.

If you are going to buy a Battery Fan, why buy one with a three-pole armature, that you know will rattle and soon wear out, when you can have for the same price one with a Drum Armature with self-oiling bearings, rubber cushioned base, and finely nicked and jappanned? Uses the smallest current and gives the greatest breeze. Price \$10.00.

### FAN OUTFIT COMPLETE.

|                         |         |
|-------------------------|---------|
| MOTOR AND FAN,          | \$10.00 |
| 3 CELLS FULLER BATTERY, | 5.00    |
| 15 FEET FLEXIBLE CORD,  | .50     |
|                         | \$15.50 |

—SOLD BY—

ANCHOR ELECTRIC COMPANY,

71 Federal St., - - - Boston, Mass

Figure 6. Kent No. 3 dynamo or motor, about 1895.

Figure 7. Kent "96" battery fan data sheet.

## KENT TRIES COLLEGE

There is a third inference to be considered. It relates to Kent's age at this time, 22 years in December, 1895. He was older than most of the students with whom he enrolled and he had a very different background. Kent had completed the designs of the several electric motors well before he started college, and would certainly have experimented with everything that interested him, especially electric motors. He probably would have built many in an effort to produce an improvement over those that he would have seen. He had used the time before college to learn technical invention. When the factory reached the production state, he was able to apply his time to the new experience, learning concepts and theory. His analytical capabilities would have been keen.

At the end of the 19th century engineering was still the province of the technician. The experience of constructing and reconstructing pieces of machinery was more pertinent to creating improvements than was design from concepts, principles and handbook data. (At the time of the author's return to college after WWII he was embarrassed to have the head of the electrical engineering department tell him that he brought far more knowledge about radar to class than was known in the school. The author needed field theory so he quietly continued his studies.) Our third inference is that Kent



**Figure 8.** *Ken's electrical game, Amperia.*

used his time before college to create improvement and make inventions based on practice instead of theory.

The fourth inference concerns leaving college during the first year, reentering the next year and again leaving before finishing. While this might suggest that Kent was not a good student or that he couldn't meet academic requirements, such a characterization does not fit any of the qualities that typify Kent. Several years after this time he attacked and succeeded in solving ignition problems that required a great deal of hard head-scratching to overcome. Our inference is the more consistent view that he was so good a craftsman and inventor that he found the basic college courses divergent from his goals and that he chose to go his own way.

Kent was very familiar with small electric motors and he was also very familiar with the tools that were needed to manufacture small lots of electrical devices. He had grown up with the facilities and materials to devise improvements to any small machine on which he chose to experiment. No better way could have been found to create improvements and inventions than to couple teen-age curiosity with that kind of opportunity.

## AMPERIA

One more Kent motor is pictured in Figure 8. It is the basis of a game called Amperia. The motor tells much more than the simple fact that it has only two poles and is spun by connection to a single cell battery through a

key operated by the players in the game. The Amperia motor appears to be Kent's first product.

The data sheet for the No. 2 motor makes much of the improvement of its six-pole armature over the three-pole armatures used in competitive machines. Three-pole motors were significantly better than two-pole motor because, although they vibrated, they started. Sometimes when a two-pole motor is stopped its armature is in such a position that it won't restart unless moved a little by hand.

The Amperia motor must have been Kent's first try at a salable product. Although the finish work on the motor and its parts shows a reasonable level of quality, its operation does not. The motor was offered as a bonus for selling magazine subscriptions, indicating a novelty application. It was also used to demonstrate interesting optical phenomena such as color blending by spinning several primary hues and having the eye blend them. If a little magnetism was retained by the iron in the rotor or stator, the motor won't stop randomly so its value as a game was lost. Kent must have learned much from this foray into the business world.

Perhaps he brought too much experience and too little patience for the staff at WPI. Though his stay was limited his relationship with Worcester Polytech was always cordial. Nearly thirty years after this time he was awarded an honorary doctorate and, by way of his will, he endowed the Atwater Kent Laboratories at WPI. Taken together, the story so far indicates that young Atwater Kent was very bright, had gained much hands-on experience with machine tools, had very high initiative, was familiar with selling to customers, had chosen electrical applications as a way to go and was well on his way.

## THE IGNITER

By about the turn of the nineteenth century, internal combustion engines using gasoline for fuel had started to displace steam engines. One form was used as the motive power for automobiles. Another form was the stationary engine, used to drive pumps and generators, rigged in boats for propulsion, and mounted on wagons and platforms to provide portable shaft power. One continuing problem with early engines was carburetion, getting the fuel to mix with air so that it could be exploded in the cylinder of the engine. The other problem was igniting the fuel-air mixture.

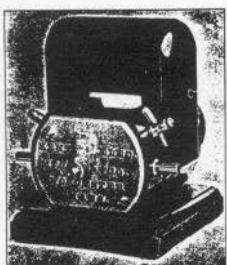
The present day method of igniting fuel in gasoline engines is to provide a high-voltage electric discharge across the points of a spark plug mounted somewhere on the walls or top of the cylinder. In the century since Atwater Kent first became interested in ignition the system has become so standard and so reliable that it is no longer a problem. In Kent's

. . . . Kent  
Gas Engine Igniter.



Low  
Speed.







Water  
Proof.



Maintenance  
of  
Batteries.

It has become to be acknowledged that electrical ignition is the most convenient form of ignition for gas engines. It is also becoming known that batteries are inadequate for this work. They become exhausted in a short time and their continued renewals foot up a large expense.

OVER.

MANUFACTURED BY ———

**Kent Electric Manufacturing Co.,**  
WORCESTER, MASS.

**Figure 9.** Kent's gas engine igniter, 1899.

time it was the most difficult problem with engines, even considering carburetion.

The means of generating a high voltage was known in laboratories. Ruhmkorff coils were used for experiments and demonstrations. Marconi was using the coils for his wireless development but they were not available to the ordinary users of gasoline engines. The systems used for ignition operated at low voltage by connecting a source to a pair of contacts inside the cylinder, and then mechanically separating the contacts.

With voltages higher than 12 volts the system would produce a feeble spark and could ignite the gasoline-air mixture in the cylinder under favorable conditions. If a battery was used to provide the electricity, the depletion rate was excessive since the points were closed more than they were open. By shaping the drive mechanism to modify the timing of the contact operator, the contacts could be left open for the larger part of the engine rotation. Then, near the end of the compression stroke, the contacts could be closed and opened, thereby conserving the battery energy.

With the invention and availability of small generators similar to those that were produced by The Kent Electric Manufacturing Company (described earlier) a higher voltage could be produced for the igniter to operate with. The generator was usually mounted on the engine with a belt to drive it, with its output wired directly to the igniter contacts. Because the points closed across the generator output, its windings had to tolerate the near-short circuit. Figure 9 shows the Atwater Kent's Igniter, a dynamo or generator built for stationary-engine service. An announcement in *Electrical World and Engineer* dates the availability of the Igniter to 1899.

**KENDRICK & DAVIS.**—Mr. A. Kent, of Worcester, Mass., who was the manager and owner of the Kent Electric Company, manufacturers of the Kent motors, has moved his business to Lebanon, N. H., and will hereafter be associated with Kendrick & Davis, the latter having absorbed the Kent Electric Company. Kendrick & Davis have for years manufactured the well known Porter motors, one of the pioneer battery motors. The firm has extensive manufacturing facilities and operate their factory, the year around, by water power, being located on the Nashua River, at Lebanon, N. H., where water is abundant. This company, besides manufacturing battery fan motors of all kinds: as well as small motors for various other purposes, manufacture voltmeters, am meters, medical batteries, coils and many other electrical novelties. They are also soon to place on the market an entirely new gas engine igniter, which will embody many new features from any of those on the market at the present time. Mr. Kendrick states that they are shipping large quantities of goods to China, London, Paris and Cuba.

**Figure 10.** *Kent joins K&D, from Electrical World and Engineer, 1900.*

Although the illustration does not permit accurate analysis of the Igniter's construction, it appears to be very much like the No. 3 Dynamo mounted upside down. The field coil seems to be the topmost part of the Igniter in the illustration instead of being near the bottom as in the No. 3 Dynamo. The nameplate on the Igniter hid (and protected) the brush structure. The drive pulleys on both machines were on the side opposite the brushes.

The presence of the Igniter in the Kent Electric Manufacturing Company line of machines shows the expanding interests that Atwater Kent brought to his chosen field. With an expanding business based on customer acceptance of his products, his marketing analysis would have directed an increase in production capability. The foregoing review seems to indicate that The Kent Electric Manufacturing Company was an in-family business that would have required total restructuring to expand further.

## **KENDRICK and DAVIS**

Figure 10 is a copy of an announcement in the *Electrical World and Engineer* for May 5, 1900. The announcement says several things of great interest to our look at Atwater Kent as a master-marketer. It says that Kent moved his business to Lebanon, NH. and that he will be associated with Kendrick and Davis. It further says that they absorbed Kent's business.

Kendrick and Davis were in the small electric motor business and no doubt benefited by getting Kent's designs, customers and, best of all, Kent himself. They announced that they made Porter motors and did not mention Kent's motors. The most startling part of the announcement is near the end when it says "They are also soon to place on the market an entirely new gas engine igniter, which will embody many new features from [sic] any of those on the market at the present time."

The result of Kent's marketing analysis was to involve another company. Whether this was the best outcome for his business is hard to



Figure 11. Prentiss Kent writes to his son, Atwater.

ascertain with as little data as is available. Some personal feelings shared by Arthur and his family must have been part of the decision to change, because less than two years later Kent moved again. To provide a basis for evaluating Kent's home life Figure 11 reproduces a letter sent to him in Lebanon by his father in 1900. Each reader will make his own judgment of the closeness of the family. The fact that Arthur's father, Prentiss Kent, was saving and restoring one of their first motors is a strong indication of the Kent family values.

When Kent went to work for K&D, he brought his motor designs and his ideas. One of the motors was Amperia which Kent had not patented. As a result of being at K&D a patent was applied for and when issued was shared equally by Kent and the Company. The motor was altered slightly to eliminate the binding posts and marketed under a new name, the Electric Top (Figure 12).



Figure 12. The K&D Electric Top, 1900.

## PHILADELPHIA

Kendrick and Davis and Lebanon could not have held Atwater Kent's interest for long. He had sold his designs to them as a part of the expansion process and had joined the company to assure continued growth. They didn't appear to have his initiative or ambition so after getting the Igniter and the motors into production he moved on to customer cultivation and sales. Inside the bright ambitious young man there was also a budding executive who needed more challenge.

Kent looked at places where he could start another business. He had realized that the medium-size cities in New England did not suit his purpose. Boston, New York and Philadelphia were good choices for locating his new business, and of these Philadelphia was the best choice. It had a pool of technical skill, excellent educational facilities, competent labor, good transportation and easy access to materials, markets and manufacturing. In 1902 Kent started his new company, The Atwater Kent Manufacturing Works, in Philadelphia to continue making electrical products.



**Figure 13.** *The Monoplex telephone, illustrated on an AK Co. envelope, with dealer discount.*

The first product produced by the new company was a telephone for use in residences and businesses. One model is shown in Figure 13. Kent was ever mindful of the need to meet his customers' expectations, so for this product he coined the name "Monoplex." At its introduction the Monoplex was a basic telephone in an oak wall box, with a watchcase earphone, a carbon granule transmitter, a ringer, and a button to signal another similar instrument. In the initial system they were used in pairs to talk between two locations in a house, much like an inter-com is used today. Sales must have been satisfactory because extensions of the service using additional instruments were made available shortly after the Monoplex was introduced.

## Monoplex Intercommunicating Telephones.

The Atwater-Kent Manufacturing Works, of Philadelphia, are bringing out intercommunicating instruments similar to their two-communicating system that would give equal satisfaction, led the concern soon after these instruments came out to give the matter their attention, with the present result. They made a careful study of the requirements of systems for various uses and developed then by installing them in a large number of places that have given a severe test of their reliability and convenience. The "monoplex" instruments used on these systems are as simple as it is possible to make them.

The systems are designed so that they are simple to install, and the diagrams, as shown here, are plain and complete.

Their No. 2 system is an all-around intercommunicating an selective ringing system. The instruments are of the switchless type so that they are perfectly automatic and need no adjustment in any way when the receiver is hung up. This instrument has many advantages, it is asserted, over the switch type. It saves consulting key to find the number of the station that one wishes to call, the

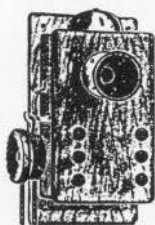


FIG. 1.—MONOPLEX TELEPHONE.

turning the switch to that point and pressing the button. Pressing the button beside the name of the station to be called is all that is necessary with the switchless type.

Another prominent feature is that it can be used for a finder to find a man immediately, no matter where he is in the building. This is done by a code of signals, which are rung on all of the bells

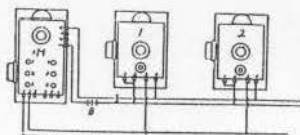


FIG. 2.—DIAGRAM OF CIRCUITS.

one time. The person then, on hearing his signal, goes to the nearest telephone. The number of wires required on this system are the plus the number of instruments. Hence, a system of say five stations would require three plus five, or eight wires.

Only one central battery is needed for both ringing and talk circuit, and for the ordinary system, three dry cells or four wet cells

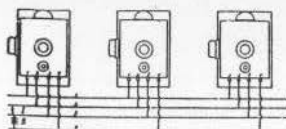


FIG. 3.—DIAGRAM OF CIRCUITS.

are sufficient. The impedance coil necessary with this system

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Figure 14. Trade literature description of the monoplex telephone.

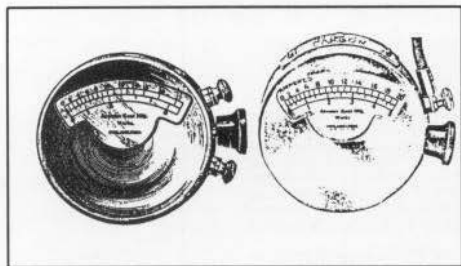


**Figure 15.** *Atwater Kent pocket volt-ammeters, 1903.*

System Number 2 introduced another form of the Monoplex, this instrument having not one but six signaling or calling buttons. Figure 14 shows the selective signaling Monoplex. Kent went on to offer further extended circuits to use his Monoplex telephones. They were announced and advertised in early 1903. Kent recognized the value of advertising, but he directed his messages to the trade rather than to the end user. He had not yet become aware of marketing (not selling) as a way of expanding his business. The apparent reason was that he was struggling to just establish a product line. He had left the small motor business with Kendrick and Davis. He tried the inter-phone line but it did not have great potential. He needed a new line and he found it in the automobile business.

### **KENT STRIKES A SPARK**

Radio collectors may find it difficult to keep in mind (especially when the Monoplex telephone is considered) the fact that Atwater Kent was as interested in internal combustion engines as he was in electrical motors, and had been from his early teens. In 1898 he saw an opportunity to combine both interests and produced his Igniter, a fundamental internal-combustion engine auxiliary. In 1901 he acquired his first automobile and found out for himself the difficulties that came from discarding horses. After Kent established himself in Philadelphia he went to work on auto/electric devices in an effort to establish a new line.

In 1903 Atwater Kent introduced a voltmeter-ammeter for testing the batteries used with internal combustion engines in automobiles. Two of these instruments are shown in Figure 15. The push button on the side of the instrument switched the internal coils, to provide a voltmeter function with the button out and an ammeter function when the button was depressed. The movement of the voltmeter-ammeter was a simple moving vane whose deflection aligned with the resultant field generated by a fixed horseshoe magnet and the electromagnet produced by the current to be measured flowing through its coil. Several versions of the instrument were offered between 1903 and 1906. The left instrument in the figure came first. The two binding posts were for positive (marked C) and for return or ground

(marked Z). The later version used a single binding post for ground and a serrated plate on the side of the instrument marked CARBON for the positive terminal.

This instrument could not be said to be an invention since there was prior art, but it could be classed as a patentable improvement. The advantages that it had over many other similar instruments was portability and ease of use. They must have been good sellers because their survival rate is moderate to high. Again no evidence of marketing analysis attaches to this product. Rather, it seems to repeat the story of the Monoplex telephone, a means of establishing a stable business, perhaps even a means of survival.

## ELECTRICAL IGNITION

Igniting the fuel-air mixture in the cylinder of an internal combustion engine had been a problem for engine makers and users from the beginning of practical engines in the last quarter of the nineteenth century. On very early engines a hot tube that had a port directly into the cylinder was used but a direct electric spark was found to work much more effectively. The ignition took place by the simple opening of a contact located inside the cylinder and connected across a battery. Because the spark had to expend significant energy to assure igniting the compressed fuel mixture, reliable ignition could not be achieved by the low voltage spark. This difficulty led to the igniter, a higher voltage source that provided more energy in the spark discharge. Although the igniter was better, it was still limited in spark energy.

By 1903 one solution that was satisfactory (and with maintenance was reliable) was the vibrator-excited spark coil. This was a transformer whose primary was connected through a set of timer points and a vibrating contact to a battery. The points were operated by the cam shaft of the engine so that as the piston neared top-dead-center on the compression stroke the points closed. The vibrator then chopped the battery current through the primary of the coil and induced a high voltage in the secondary. The high voltage was connected directly to a spark plug and produced a series of sparks when the points closed and the vibrator buzzed.

The usual system had one spark coil for each cylinder. Distributing the low tension energy from several sets of points in a shaft-connected timer was much more reliable than distributing the high tension from one coil. But two problems were characteristic of the vibrator-coil system. At low engine speeds the multiple sparks produced by the vibrator wasted valuable battery energy. At high engine speeds the time lag of generating a spark resulted in late firing and reduced available power. The advantage of using a single coil with high-tension distribution was known but that

### Mechanical Sparker for Gas Engines.

The accompanying illustrations show a new type of spark generators for gas engines, which does away with the usual commutator and magnetic vibrator. In the mechanical vibrator:

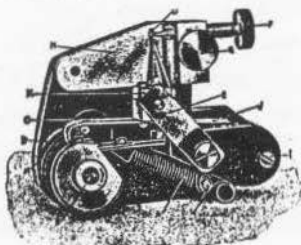


FIG. 1.—MECHANICAL VIBRATOR.

(Fig. 1), which is the principal feature of the generator, there are two platinum contacts, one at *D* and the other on the end of the screw *F*.

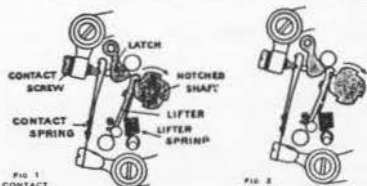


FIG. 1  
CONTACT  
OPEN

FIG. 2  
CONTACT  
STILL OPEN



FIG. 3  
CONTACT  
MADE



FIG. 4  
CONTACT  
BROKEN

**Figure 16.** *The patented Kent Electrical Contact Device for gasoline engines.*

**Figure 17.** *Operation of the electrical contact device.*

method had not been reduced to reliable practice in 1905. Operating the coil by using the points in the timer to break the current was neither practical nor reliable.

## THE UNISPARKER

Atwater Kent understood the single coil method of spark ignition. He set about solving the problems of the multiple sparks and the variable time of ignition. His work resulted in the Electric Contact Device shown in Figure 16. The sketch in Figure 17 shows the critical elements of the device. The action is based on the lifter which is pulled away from its rest position by the projections or teeth on the notched shaft. When a tooth on the shaft rotates far enough, the lifter is released and is pulled back toward its rest position by the lifter spring (second sketch). As the lifter travels back it is lifted up onto the tooth and away from its rest position (third sketch). The moving lifter pushes on the latch, which pushes the contact spring, which moves the contact on its upper side and closes the circuit. Further motion of the lifter separates it from the latch, which through the contact spring lets the contact open. The cycle ends when the last motion of the lifter and a few more degrees of rotation of the shaft permit the hooked tip of the lifter to drop into the space behind the tooth on the shaft, with the lifter returned to its rest position (fourth sketch). The lifter remains quiet until the next tooth engages its tip, at which time the cycle repeats.

Kent's contact device was connected between the battery and the primary of a transformer (ignition coil). The contact mechanism was mounted

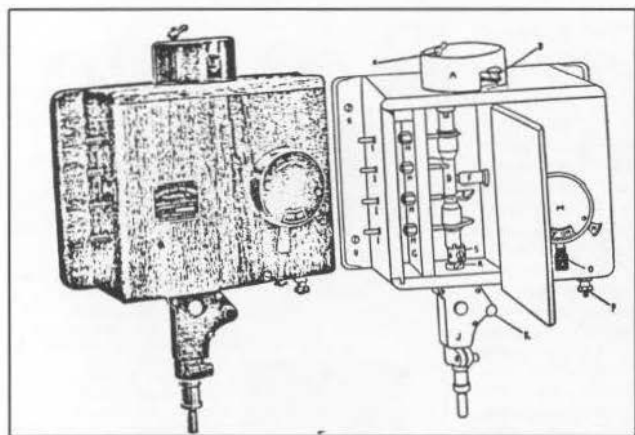


**Figure 18.** *The Kent Unisparker automobile ignition system, 1906.*

on an engine so as to engage the cam shaft and to be adjustable in angular position. Internal adjustments on the device controlled the contacts so that the time of closing and duration of current flow were adjusted to precisely what the engine required. The duration of contact closure was controlled by the rate of motion of the lifter actuated by the spring, and was not a function of the engine speed. That meant that the spark energy was delivered in single pulses that were not influenced by the sparking rate.

The contact device was a true invention. Kent applied for a patent in 1905 and was granted his patent in 1915. Because of the importance of the device in the automobile industry, there must have been many difficulties in establishing its claims. The patent was the basis of Kent's participation as a major factor in the automobile business and was the source of his first fortune.

As with the success of the name Monoplex for his telephone, Kent coined a name for the ignition system that incorporated his contact device. It was UNISPARKER. The first embodiment of the whole system was produced in 1906. It is pictured in Figure 18. The door covers the high-tension distributor. The contact device is shown on top. The entire unit was fastened to the dashboard of an automobile with the wires for the spark plugs fed forward through holes in the dash. The angle drive was used to connect the Unisparker to the cam shaft of the engine.

Atwater Kent built his ignition business over the period that his patent ran. He supplied equipment to original manufacturers listed in Figure 19 and made his systems available to retrofit automobiles like the Packard as well. Some examples of his products are shown in Figure 20. Several coils mounted in oak boxes along with a Unisparker distributor and a switch that was used with them are shown. In Figure 21, a Ford retrofit with its original box and its later distributor are shown.

**Atwater Kent Type K-2 Ignition System  
is used as Standard Equipment  
on the Cars Listed Below**

| NAME<br>OF CAR       | YEAR         | MODEL         | TYPE OF ATWATER KENT<br>IGNITION USED |
|----------------------|--------------|---------------|---------------------------------------|
| Arbent.....          | 1915.....    | 25.....       | 4 cyl. K-2 standard coupling          |
| Chalmers.....        | 1914-15-16   | 26-30-32 B    | 6 cyl. K-2 standard coupling          |
| Enger.....           | 1915-16..... | Six.....      | 6 cyl. K-2 standard coupling          |
| Enger.....           | 1916.....    | Twelve.....   | 12 cyl. K-2 standard coupling         |
| Fischer.....         | 1914.....    | .....         | 4 cyl. K-2 standard coupling          |
| Flagler.....         | 1914.....    | Four.....     | 4 cyl. K-2 standard coupling          |
| Franklin.....        | 1916-17-18   | Series 9..... | 6 cyl. K-2 male shaft                 |
| Grant.....           | 1914.....    | Four.....     | 4 cyl. K-2 on magneto base            |
| Grant.....           | 1914.....    | Four.....     | 4 cyl. K-2 standard coupling          |
| Grant.....           | 1915-16..... | Six.....      | 6 cyl. K-2 standard coupling          |
| Hall Motor.....      | 1914.....    | .....         | 4 cyl. K-2 standard coupling          |
| Harvard.....         | 1917-18..... | Four.....     | 4 cyl. K-2 standard coupling          |
| Hollier.....         | 1916-17-18   | Eight.....    | 8 cyl. K-2 standard coupling          |
| Homer Laughlin.....  | 1918.....    | Eight.....    | 8 cyl. K-2 standard coupling          |
| Howard.....          | Late 1915    | Six.....      | 6 cyl. K-2 standard coupling          |
| Hupmobile.....       | 1915-16..... | Four.....     | 4 cyl. K-2 standard coupling          |
| Imperial.....        | 1914-15..... | Four & Six    | 4 & 6 cyl. K-2 standard coupling      |
| King.....            | 1914.....    | Four.....     | 4 cyl. K-2 on magneto base            |
| King.....            | 1915.....    | Four.....     | 4 cyl. K-2 male shaft                 |
| King.....            | 1915.....    | Eight.....    | 8 cyl. K-2 male shaft                 |
| King.....            | 1916-17..... | Eight.....    | 8 cyl. K-2 standard coupling          |
| Lexington.....       | 1914-15-16   | Four.....     | 4 cyl. K-2 on magneto base            |
| Los Angeles.....     | 1914.....    | Four.....     | 4 cyl. K-2 standard coupling          |
| Majestic.....        | 1917.....    | Six.....      | 6 cyl. K-2 standard coupling          |
| Meteor.....          | 1916.....    | Six.....      | 6 cyl. K-2 standard coupling          |
| Monarch.....         | 1914-15-16   | Six.....      | 6 cyl. K-2 long male shaft            |
| New Era (Elgin)..... | 1916-17..... | .....         | 4 cyl. K-2 standard coupling          |
| Norwalk.....         | 1916-17..... | Six.....      | 6 cyl. K-2 standard coupling          |
| Paige.....           | 1914-15..... | .....         | 4 cyl. K-2 standard coupling          |
| Peerless.....        | 1915.....    | Four.....     | 4 cyl. K-2 standard coupling          |
| Peerless.....        | 1916.....    | Six.....      | 6 cyl. K-2 standard coupling          |
| Peerless.....        | 1917.....    | Eight.....    | 8 cyl. K-2 standard coupling          |
| Pratt.....           | 1915.....    | 6-50.....     | 6 cyl. K-2 standard coupling          |
| Regal.....           | 1914-15..... | Four.....     | 4 cyl. K-2 long male shaft            |
| Regal.....           | 1916-17..... | Eight.....    | 8 cyl. K-2 long male shaft            |
| Remington.....       | 1916.....    | Four.....     | 4 cyl. K-2 standard coupling          |
| Ross.....            | 1915-16-17   | A-B-C.....    | 8 cyl. K-2 standard coupling          |
| Saxon.....           | 1914-15..... | A-B-C.....    | 4 cyl. K-2 standard coupling          |
| Saxon.....           | 1915-16..... | Six.....      | 6 cyl. K-2 standard coupling          |
| Saxon.....           | 1916.....    | Four.....     | 4 cyl. K-2 standard coupling          |
| Scripps-Booth.....   | 1915.....    | Four.....     | 4 cyl. K-2 standard coupling          |
| Thomas.....          | 1915.....    | Six.....      | 6 cyl. K-2 standard coupling          |
| Vison.....           | 1915.....    | Four.....     | 4 cyl. K-2 standard coupling          |
| Westcott.....        | 1914.....    | Four.....     | 4 cyl. K-2 standard coupling          |
| Woods.....           | 1915.....    | Four.....     | 4 cyl. K-2 standard coupling          |
| Woods.....           | 1916-17-18   | Four.....     | 4 cyl. K-2 on magneto base            |



# ATWATER KENT

## Coil

The Atwater Kent coil is furnished in three different forms, any of which can be used with either Type "H" or "K-2" Unispartner. Plate Switch coil is made only for 6 volt circuit. Kick Switch coil and Underhood type are made for either 6 or 12 volt circuits. The designed voltage is marked on the bottom edge of each coil.



Fig. 13  
Plate Switch Coil  
Price \$10.75

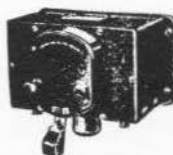


Fig. 14  
Kick Switch Coil  
Price \$12.75



Fig. 15  
Underhood Coil  
Price \$9.50



Fig. 16  
Contact Reversing Ignition  
Switch  
Price \$3.25

Fig. 13 shows the coil with simple Plate Switch, Fig. 14 the same coil with the addition of a more elaborate and heavier Kick Switch, Fig. 15 Underhood coil with separate switch. Both Plate and Kick Switches are provided with push button for producing extra hot starting sparks.

The Underhood coil is the one commonly used by manufacturers as regular equipment. It is intended to be mounted under the hood of the car, and while it is built to stand the high temperatures incidental to this location, it should be placed in as cool a position as possible.

## Switch

The Atwater Kent Ignition Switch is arranged to reverse the direction of the current flowing through the contact points each time it is turned "on," thus minimizing any tendency of the contact points to pit or build up unevenly.

The Atwater Kent Switch is installed by cutting a hole 3 1/2" in diameter in the dash and setting in switch flush, fastening it with the three flat-headed screws furnished with the switch.

**Figure 19.** Users of the K-2 ignition system.

**Figure 20.** Kent automotive ignition coils and switch.

In doing the research and the reviews to elicit findings that paint a picture of Atwater Kent, one pauses because so much of the information is favorable. Perhaps the author's bias outweighs the facts. One important event removes much subjectivity and permits open admiration for the man. That event was the Award by the City of Philadelphia, on the recommendation of the Franklin Institute, of the John Scott Medal - "to the Most Deserving" - to Arthur Atwater Kent in 1914 for the Unispartner, Figure 22.



**Figure 21.** A retrofit ignition system for a Ford.

## EXPANSION

One other product which reinforces the idea that Kent looked over a wide range of automotive products to find a profitable line is the horn shown in Figure 23, and the first sheet of the patent for it, Figure 24. Until experience had proven the superiority of his precisely-timed ignition system, he had to devote a lot of his attention to devising products that would keep him in business. After the ignition-product line was established and the licensing of his patent was accepted as a resource by the automobile manufacturers, he could spend his time improving his business efficiency and his customer relations.



**Figure 22.** The Philadelphia John Scott Legacy Medal given to Atwater Kent, 1914.

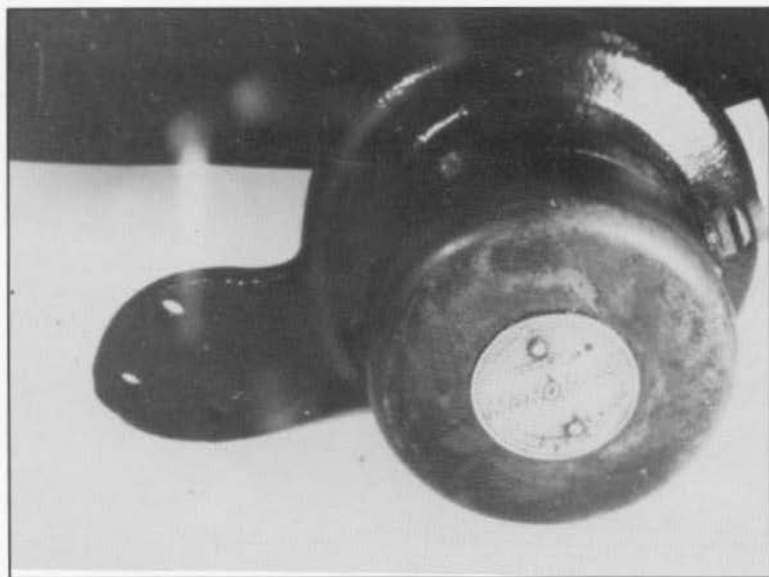


**Figure 23.** *The Kent Company Monoplex horn.*

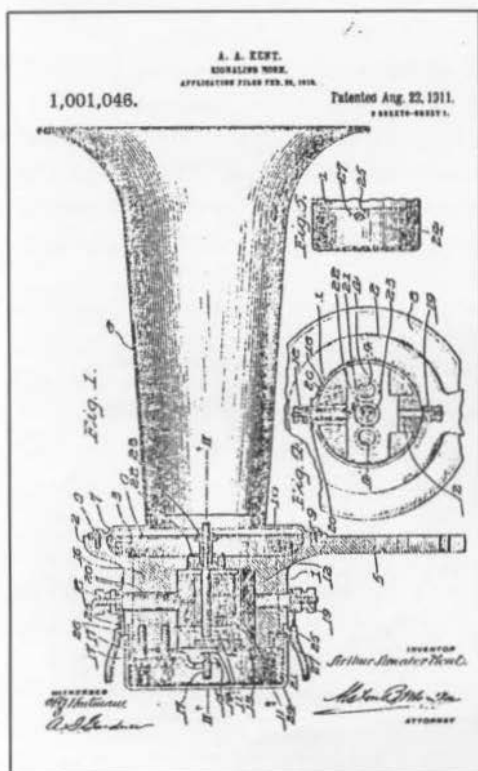


**Figure 24.** *The Patent for the Monoplex horn, issued 1911.*

Not all automobiles were equipped with full electrical systems. Kent realized that he could expand his ignition business into lighting, battery charging and starting. He was familiar with the concepts involved so the expansion was to add manufacturing capability and where necessary, licensing. By World War I he had established a full auto-electrical capability for supply and service. His customers were predominantly end-users instead of other manufacturers.

One important way Kent enhanced his company reputation was by assuring satisfactory operation of his products by the end-users. He established Atwater Kent Official Repair Stations across the United States and Canada. In 1919, there were 117 stations in the US and six more in Canada. Kent issued descriptive brochures for his products and made sure that they appealed to his customers by their appearance and by their quality of explanation. The experience that was to serve so well when he produced radios was initiated in this phase of his automobile business. Kent's marketing ability is demonstrated by his recognition of end-users as his customer base and by the modification of his factory to produce what they wanted to buy. To identify him at this point in his business career as a master-marketer is premature. To suggest that he had the potential to earn that title is perhaps an underestimation.

## WORLD WAR I

When World War I drew the United States into the conflict, Atwater Kent had an active factory making electrical equipment for automobiles. The equipment was adapted to trucks for the military but more production for the war effort was needed. Kent was asked to design and manufacture some support equipment for gun-control.

One product that he made was the clinometer, pictured in Figure 25. It was similar in principle to a sextant but was simpler and less difficult to use. It was used for two functions. One was setting the elevation of a rifle using the bubble level and the elevation scale of the instrument. The other was determining the elevation angle of a distant hill by aiming the cross-hair in the barrel at the hill and adjusting the bubble to level. The elevation was then read off the scale.

Another product that Kent produced was the theodolite, shown in Figure 26. It was used by gunners to determine both elevation and azimuth angles and to train weapons. The instrument was clamped to a platform and leveled. The pertinent readings could be made directly from scales in the instrument. Another device called the fuse-setter was produced for the military. It was a set of movable rings that engaged adjusters on the nose of a shell thereby permitting the gunner to set the time-to-go or altitude of detonation immediately prior to loading the shell.

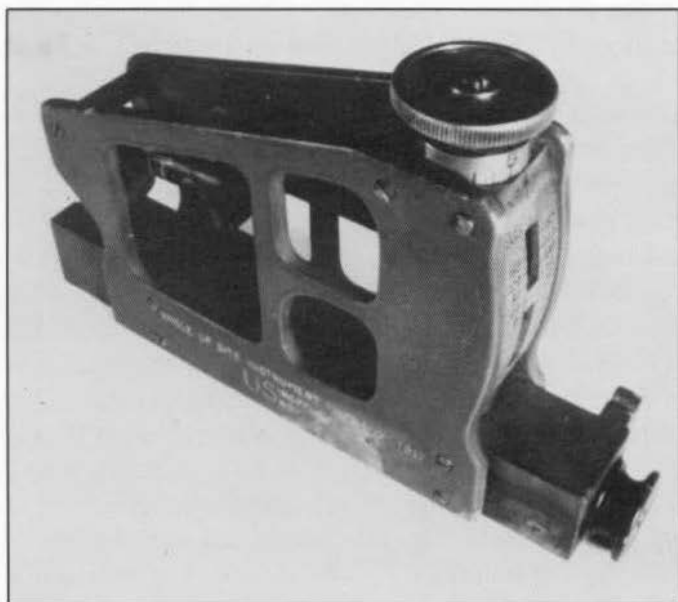


**Figure 25.** *The AK clinometer used by the military during WWI.*

With the end of WW 1, Atwater Kent's military support terminated. He had expanded his factory to accommodate the production of military instruments and he had continued production of auxiliary electrical equipment for use in military vehicles. Kent returned to the civilian automobile market with complete electrical systems for many makes of cars. His capacity was greater than his reduced market could absorb, and worse, the market was not subject to major expansion. Many of the earlier marques had disappeared and others were consolidating. Kent needed new products and cast about for effective use of his facilities. He needed a new direction for his factory.



**Figure 26.** *The AK theodolite used by the military.*

## THE BEGINNING OF RADIO PRODUCTION

The year 1919 saw the opening of a new field of national interest. Wireless had provided the knowledge and interest in a means of transferring knowledge beyond the imaginations of ordinary folks. Amateurs and returned military operators stirred the interest of the public in those invisible, inaudible disturbances of the ether. 1920 saw that interest turn into a new concept, public entertainment. In 1921 Kent joined this new excitement called Radio. It looked like the near-ideal market for his kind of product.

A marketing review might have gone like this: A new electrical market seems to be developing. Marine and military uses of radio have established a number of communications stations and an unofficial but interested body of listeners. Some experimenters and amateurs are showing that radio can serve a bigger purpose, informing and entertaining the general public. If the experimenters are right, a large market for general use radios could develop.

The second part of the Kent's marketing review might have considered his capability to enter such a market. He had the production facilities for electrical devices. His factory had experience in winding condensers and coils, his engineering staff was skilled with high-voltage devices and were very familiar with insulation suitable for making motors and ignition apparatus. His mechanical facility included the capabilities of forming small, high-quality, sheet metal containers, of casting superb phenolic (Bakelite) structural and appearance shapes, and of making and finishing the small boxes used for ignition equipment.

By 1920 several radio manufacturers had entered the developing market. Examples are Grebe, Kennedy and Westinghouse. Their initial offerings were reapplied military production. Then, after the Radio Corporation and its owners, General Electric, Westinghouse and American Tel. & Tel. entered the domestic market, the new opportunity became very apparent to potential manufacturers all over the country.

Kent would have put aside all doubts.

More importantly, Kent had a nationwide network of auto-electric dealers and a reputation for producing very fine equipment. Because some of his electrical systems were retrofitted to the automobiles of individual owners, his service organization was experienced in satisfying his direct users, who would become his radio set buyers. Altogether, he was in an optimum position to sample the new market without having to invest heavily in new facilities and without having to start at the beginning in merchandising a new product line.

To follow what seems to be the trail of new radio parts offered to potential Kent customers, we are going to assume that Kent's factory, particularly his engineering record-keeping function, followed standard practice. This means that Drawing Numbers were assigned as new parts and pieces were committed for design, specification, and manufacture or purchase. Each new part received a unique number which was abandoned if the part was not to be added to the production process. Using the part numbers the order of the appearance of different parts can be determined quite accurately, and even more pointedly, the time of introduction and initial use of the part can be established.

When Atwater Kent introduced the Open Sets (breadboards), what was he doing? Interested collectors have come up with several explanations, some of which are: "He was simply following a standard experimental practice," and "He had earlier produced table instruments and had to use them up," or "He liked that style of radio construction and pushed it onto the market." These explanations are valid but they are incomplete. For example, consider the first one, experimental use.

Up to the time of micro-electronic implementation of radio circuitry (almost today), engineers have used breadboards to build and try their first circuit configurations. Now the computer has become the breadboard and on-screen graphics have replaced the physical attachment of parts. But, Atwater Kent's engineers would have used the breadboard technique to evaluate his initial line of instruments in actual circuits.

Evidence of the use of breadboards to support product evaluation may be found in several ways. Figure 27 shows the earliest tuning condenser, No. 4117, which was built with a circular base for mounting on a horizontal, flat, circuit board. The first mounting board has a much earlier number. It was No. 3601, and was 18 1/2" by 8 1/2". Almost all the other early instruments have similar base-mounting arrangements. With so many clues pointing toward production using the horizontal board style, the simple explanation of experimental use doesn't explain the breadth of its application.

The second explanation of having the instruments in the table-mounting configuration and pushing them off to the public, is more an effect than a cause. Why did he have so many instruments of this style? Perhaps the reason is to be found in a standard style of construction used at the beginning of entertainment radio. There, the tuning instruments and rheostats were mounted on a vertical panel and the transformers and tube sockets were mounted on a horizontal shelf that was fastened to the bottom edge of the panel. Kent produced the instruments for horizontal mounting because that was the early standard and he made a lot of them because they were popular and sold well.

# ATWATER KENT

## *Variable Condensers*



No. 4117. TABLE MOUNTING, TOP CONTROL . . \$8.00

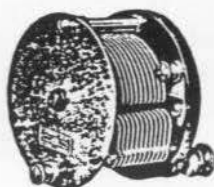
THE ATWATER KENT VARIABLE CONDENSER has been designed for the purpose of obtaining the greatest possible degree of accuracy in tuning, which is of vital importance in broadcast reception.

The remarkable degree of precision in adjustment of this condenser is obtained through the extreme smoothness of operation together with a friction type of Vernier. An accurately ground steel shaft and self-aligning bronze cone bearings are used.

The workmanship and material throughout is of the highest possible grade. It is ruggedly built to give permanent satisfaction. Electrical losses have been reduced to a minimum.



No. 4270  
TABLE MOUNTING, FRONT CONTROL, \$8.00



No. 4165  
PANEL MOUNTING, \$7.00

**Figure 27.** Data sheet showing the earliest AK radio tuning condenser, the No. 4117.

## THE OPEN SETS

Ascribing to Kent the perception that the Open Sets were the style of the future in 1921, when he first started designing radio instruments for production, seems inconsistent with his being a manufacturer of great marketing skill. The first approaches to the new market do not show a great burst of creativity. The table-mount variable condenser does not differ enough from the Murdock condenser to justify describing it as an innovation. The Type F low-boy audio transformer No. 3509 was similar to others, differing only in the orientation of the core, horizontal instead of vertical. He also produced some early instruments that were used only for panel mounting. These are the panel-mount tuning condenser No. 4164, the rheostat No. 3530 and the potentiometer No. 4095.

A better explanation would be that he initiated manufacture of instruments of both styles so as to capture shares of both markets. The early inductive instruments tell an interesting story of aiming at both styles. The first variometer was No. 3488. It was described as "unmounted," meaning no dress panel. The mounted variometer was No. 3822 brown or No. 3824, black. The more than three-hundred number difference in the part numbers indicates an early application to panel construction and a later use on breadboards where the dress panel provided the background for the dial. This is another indication that Kent looked at both styles.

Less than a year later the first assembled radio device was produced. It was a panel and box assembly containing a detector and two stages of audio amplification. It was No. 3590, introduced on May 26, 1922. Note that its number, and that of the panel-mounted rheostat and the two audio transformers are in the earliest radio part number series. Since there were no more assemblies of that style and no more panel instruments, it appears that Kent had chosen the Open Set style as being his best market opportunity. The indicated approach to both construction styles is a strong reason to believe that Atwater Kent showed the sensitivity to his market that is a characteristic of an expert.

Even if the discussion above points to Kent's decision to go with the Open Sets, the larger question is: Why did Kent continue producing breadboards for three years? During an interview with Atwater Kent, Jr. the subject of his father's preferences came up, and we learned that the Open Sets were definitely Kent's favorite. Possibly, the reason was prescience, but another explanation is that they were very profitable and therefore allowed him to move away from the ignition and auto-electrical business. This was necessary because his 1907 ignition system patent would run out in 1924.

## THE "THREE-DIALERS"

When the entire line of Open Sets is analyzed for circuit development and mechanical configuration, some findings stand out as important marketing decisions. At the time that Kent started assembling complete radios (the 3900 series in late 1922), he might have arranged to get a license for regeneration but he didn't. One of the reasons might have been that Kent had some kind of self-image that kept him from accepting someone else's work. This is not likely since he knew the value of the ignition patents and had benefited greatly from them. Another reason might have been that he couldn't obtain a license from Armstrong. This may well be true, but if he had another way to go the reason is moot. Still another and perhaps very likely reason might have been that he had to see a pay-back for the investment in license fees and that was unlikely unless he wanted to make regenerators his main radio product.

The radios in the 3900 series were detector-amplifier receivers, not regenerators. They were not good home companions because their audio output was too small to properly drive a loud speaker. The benefit of regeneration was that it would increase the overall amplification enough for speaker operation, but that feature was accompanied by an unwelcome characteristic in the receiver. Unless it was very carefully controlled by the user, the regenerator spilled over and became an oscillator. Interference in the neighborhood was not a good sales feature.

Kent's market analysis made it clear that the overall amplification of his receivers had to increase. Even though his customers wanted loud-speaker operation, he would not go to regeneration. However, he did make the variometer available for those who wanted more overall amplification and were willing to accept the liability of spillover with sets in the 3900 series.

Kent's way around the limited output problem was to increase the number of tubes and to use radio-frequency amplifiers to build up the signal level at the detector. In this approach, we see the picture of a marketing person controlling manufacturing so as to secure an overall increase in business growth. Looking back and noting how the radio field expanded, we see that Kent was right in going to five-tube receivers, and he was also right in avoiding regenerators. Whether this choice came because of his marketing acumen or from bending in the face of the inevitable must remain undetermined until more factual evidence is uncovered by radio historians. Taken with the other situations discussed in this article, the suggestion is strong that Atwater Kent was an acute marketing man.

When Atwater Kent produced his first five-tube receiver, No. 4066, tuned-radio-frequency amplification had not yet come into general use. He had his engineering staff devise fix-tuned radio-frequency transformers,

Part Nos. 3802 & 3972, to be used in the 4000 series. The fix-tuned r-f transformers of the 4000 series did nearly nothing to discriminate against an adjacent channel. They were designed to be quite broad (low Q) and were tuned to make the radio-frequency amplification of the receiver relatively non-selective. The set, when it was introduced in January of 1923, was satisfactory because there were only two frequencies in use and they were nearly 100 kilocycles apart.

The Department of Commerce changed the situation later in the same year when it redefined the broadcast band and assigned channels ten kilocycles per second (kHz) apart. Because of the 10-kHz channel spacing, the capability to discriminate became more important than sensitivity or enough power for the loud speaker. The single tuner of the 3900 and 4000 series did little to eliminate interference from adjacent stations because its purpose was to adjust the antenna impedance to the input amplifier. The radios in Atwater Kent's first two series became obsolete.

However, they were still usable in some situations. For a listener in a small city there was usually only one station and consequently interference didn't exist. Stations in big cities were assigned with five-channel spacing (50 kHz) so local interference was tolerable.

But in the winter time, when stations from great distances came in almost as well as local stations, the problem with adjacent channels grew severe.

The solution for the adjacent channel discrimination problem was the "three-dialer." Atwater Kent produced his first three-dialer, No. 4340, in September of 1923. In keeping with Kent's awareness of the value of a name, it was initially identified as the RADIODYNE and shortly afterward as the Model 10. The rate at which the Kent factory updated its production is staggering, especially when the parts ordering and assembly modifications are considered. From the release of the Model 1, No. 3925 to the release of the Model 10, No. 4340, less than eleven months had elapsed. This sequence shows how strongly the market drove production. The production rate of the Model 10 is another significant indicator of the demand Kent's customers made on the factory. It exceeded three thousand sets per month, more than 150 breadboards per day. All of Kent's experience was necessary to reach that rate. Not only did he have to be a market analyst, but he had to be a production planner, a factory manager, a dealer negotiator, a transportation specialist and a banker. The experience of the ignition days and the demands of the military in WW 1 served him well. He did not hesitate to put the best talent on his staff, whether they were technical, commercial, production or sales. Among other qualities, he was an excellent executive. The increasing growth of his business, its customer base and its manufacturing capability is another cogent reason to recognize Atwater Kent as a master marketer.

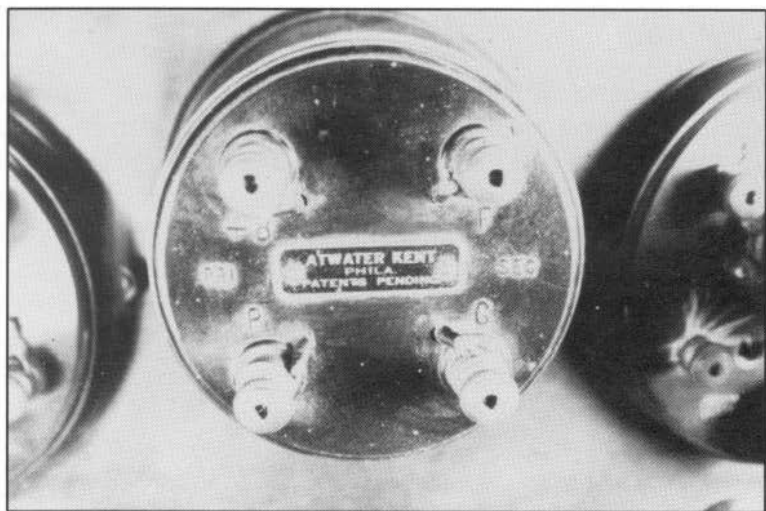


**Figure 28.** *The interim nameplate on the Radiodyne coil.*

## RADIODYNE

When Western Coil Company of Racine, Wisconsin, notified Atwater Kent about their priority of the name Radiodyne, Atwater Kent immediately stopped shipping radios with that name on the coil (r-f transformer) nameplates. It is interesting to contemplate how long it was before he shipped the first set with new nameplates. The date of the change is not known but it might have been in November of 1923. This would have been the time when the dealers were getting ready for the holiday season with a radio set that was a best seller. To cut off the supply would have been almost unthinkable, certainly intolerable.

Kent's action was very direct. Neither circuit nor assembly had to be changed. All that the new set needed was a new nameplate for the coils on which "Model 10" was substituted for "Radiodyne". To do his, the original artwork had to be cut, pasted and re-photographed for new etching masks. The new plates had to be etched, polished and painted and then attached to the coils. It is interesting to guess how long all of this would have taken: A week? Two days? One shift? The way Kent ran his factory suggests the last estimate.

But what happened meanwhile? Kent had someone go back into the stockroom where the surplus nameplates that had been used on tube sockets, potentiometers and tuners were kept. Enough of those old nameplates were retrieved to complete all the coils that were no longer to be part of the Radiodyne. Those nameplates made it possible to continue uninterrupted production until the first Model 10 was assembled. Figure 28 shows one of the coils on the interim set.

## THE BOX SETS

Atwater Kent would have liked to continue production of the Open Sets but his marketing awareness signaled a change. Customer response to the open sets was less enthusiastic than it had been. Why? One reason was that their style, a very esoteric look, was no longer greatly appealing. Another reason was that, in many homes, radio sets had become part of the general furniture and the Open Set did not conform to the more traditional styles that were familiar to Kent's potential customers. A third reason was the impracticality of dusting and cleaning the exposed instruments on the Open Set and the attendant risk of damaging the tubes. Kent realized that he had to go to enclosed (box) sets. Here again, the marketing function ties the customer to the producer, this time affecting parts of the factory.

The differences, from the manufacturing standpoint, between the Model 20 (the first box set, No. 4640) and the Model 10C (the last Open Set, No. 4700) were extensive. First, there was the box with its hinged cover, which substantially expanded the wood-fabrication part of the factory from what was necessary to build boards for the Open Sets. Then there was a new function, the stamping, welding and painting of the front panel and its attached chassis. This expanded the metal processing shop but did not require any new fabrication techniques. Finally, there was a necessary repackaging of all the components. While the functions and internal materials of the piece-parts did not change, components like the tuning condensers and the audio transformers were given new external forms.

For the new sets, the electrical circuits did not change. However, the mechanical repackaging did alter the electrical performance of the radio. The different couplings between coils and the new, unshielded tuning condensers required some electrical engineering to assure the dependable performance that characterized the Open Sets. The pressure to get ready to release the Model 20 in April of 1924 must have been very high, especially with the factory still in full production on Model 10C.

The first few Model 20 radios were not the same as subsequent sets. They looked the same, and to the listener, performed the same. The differences were two: One was that the coils were larger than the standard coils of the 20 series. The other was that the nameplate on the inside of the lid was the one that had been used on the Model 5. An explanation for the larger coils is that Kent foresaw the next model series as smaller in physical size and, in the not-too-distant future, the single-dial receiver. To meet those future needs, new coils had to be designed, coils that were smaller in physical size and more uniform in their electrical characteristics.

The redesign of the coils did not get done in time to meet the release date for Model 20, so special coils were fabricated in the model-shop and installed in the first sets. The coils were the same size as the ones used on



**Figure 29.** *The obsolete Model 5 nameplate on the transition Model 20.*

the Model 10, but were different because they used treated cardboard forms instead of the bakelite castings used on the breadboards.

Kent felt that the sets with the non-production coils had to be identified separately. Therefore, instead of etching a nameplate different from those already in hand, he used the obsolete Model 5 plate shown in Figure 29. The customer would not have been bothered by the substitution. The normal business functions such as shipping, billing and warranty service functions were able to properly handle the set because it was adequately identified.

## THE COMPACT MODEL 20

Kent's continuing analysis of the radio business in 1924, and the expected market of 1925, indicated that table model sets had to get smaller. This finding was in accord with his own views even though his reasons were different from those of his customers. The customers no longer wanted large, showy table models because the novelty and status of having a radio had diminished. A radio had become a customary part of American life. Now the old-fashioned large table-model receiver was taking space away from the decorative household items preferred by the homemaker.

Kent's response was the Model 20 Compact, No. 7570. From the factory's standpoint the changes to produce it were small. The set was only the big Model 20 reduced in physical volume by removing the unused, empty space inside the cabinet. The parts and the circuit were identical in the two sets. Later the bias scheme in the Compact was changed to enable higher loud-speaker output. From the customers' viewpoint the set was very popular,

and Kent had hit the market correctly again. Production of the Compact Model 20 exceeded 750 sets a day and continued for two years.

Consoles had come on the scene to fill the need for big showy receivers, but Atwater Kent did not want to get into the furniture business. He resisted making consoles, or even having them made for him. But he knew there was a customer base for the larger sets. To meet the demand for consoles, he arranged with furniture manufacturers to provide the receiver that would be sold as part of the console radio by the furniture company.

Two examples of the arrangement are Pooley and Red Lion, both Philadelphia companies.

During an early interview with Atwater Kent Jr., he told us that his father liked the solid mahogany woodwork of the Open Sets and the cabinets that characterized the 20 and the 30 series. He said, further, that Kent rejected the use of plywood and veneer as cabinet materials.

In the arrangement Kent made with these furniture makers to sell his radios in their cabinets, we see the marketing function of relating the customer requirements to the production capability fulfilled in another way. Here the production part of the requirement is not met by altering the factory but by supplementing it with a contracted, not capitalized, service. It should be noted that even when a console was made by a different company, the Atwater Kent identification was retained. This was especially apparent in the advertising. The furniture supplier benefited greatly by the use of the Atwater Kent name.

## THE R & S POWER SUPPLIES

Until about 1926 most home radios were powered from batteries. The energy to heat the filaments on sets like those three-dialers that Atwater Kent sold came from a 6-volt wet cell called the "A" battery. Providing the plate voltages required with 201A tubes was the function of the "B" battery. This was usually a block of 1½ volt cells connected in series to supply output voltages from 22½ volts to 135 volts. Batteries were not big favorites with the homemakers of the time.

The wet cells of the A-battery were dirty, exuded acid fumes, and had to be recharged as often as weekly. Their operating cost was between one and two cents per hour. B-batteries were cleaner but the cost of their use (replacement after depletion) was high. The B battery cost more than five times as much as the A-battery; as much as ten cents per hour to operate a three-dialer with the speaker at moderate volume.

In homes where electric power was available for lighting and utilities the set user could recharge his A-battery conveniently and cheaply with a simple charger. The dry-cell B-batteries remained the big expense of radio operation because they could not be recharged. This resulted in a big

market for "B Eliminators." These were devices that converted line power, usually supplied as 110V. A.C., into the voltages and currents usually obtained from the B-batteries.

Atwater Kent produced two B-battery eliminators, Type R, No. 8800 for 60 -cycle A.C. and Type S, No. 9000 for 25-cycle A.C. service. The part numbers indicate they were designed about the same time as the Model 30 radio, possibly as early as the end of 1925. In terms of the potential market for B-eliminators they were late. Both the 10- and the 20 series needed them. Why were they late? Were there some marketing considerations that explain the late introduction or was there a technical problem?

One very interesting early technical limitation concerns the rectifier that had to be incorporated in a B-eliminator. The hot-filament rectifier designed for receiver service, the Type 213, was made available by RCA in 1925. Before then, cold-gas rectifiers such as the Raytheon B were tried. Kent did extensive experimental work on his own tube, an argon-discharge rectifier, and therefore did not use the Type 213 or the Type B.

Kent preferred to use his rectifier, No.607. Looking back at the introduction of the Atwater Kent B-eliminator suggests that the development of this tube delayed the production of the eliminator and resulted in a missed market. (In trying the tube and the eliminator fifty years later, the author concluded that the product was not up to Kent's quality.)

Another consideration is that Kent's marketing evaluation for the B-eliminator found a strong market but a weak factory capability. He may have decided that the eliminator was not profitable as a product, or perhaps the Type R and Type S power supplies were not in the mainstream of his planned products. It appears that little or no emphasis was given to development of the B-eliminator. When they were finally introduced, the Types R and S were late and did not have a high sales potential.

The story does not end on this note, however. One analysis of the Types R and S eliminators indicates that they were really fall-outs from the development of the power supplies to be used in the A.C. sets. Development work done on Types R & S was part of the work on the whole line of A.C. power supplies. More is said about this in looking at the Model 36.

## THE SINGLE DIAL – MODEL 30 AND 30-A

Three-dial receivers, compared to their predecessors, were much more docile and useful in the family. They might be described as house-broken. They made it possible for ordinary folk to listen to programs without having to cope with a technology that took the fun out of entertainment and the pleasure out of culture. They were suitably sensitive, offered loud-speaker volume, presented a good appearance in the home and were stable. Still they had one characteristic which made them not friendly. They were

not easy to tune. If you knew the individual dial settings for your favorite station, you could bring it in without much trouble. If, however, you wanted to change stations, perhaps to hear another program, you had to remember the new settings for each of the three dials, tune them and then tweak the set for the volume level you wanted. As listeners became familiar with their three-dialers, the preference for an easier way to tune, such as using only one dial, resulted in an increasingly high demand from radio listeners.

Kent was aware of this when he went from the Open Sets to the 20 series (both three-dial sets). He didn't have the technology to go directly to a single dial because the production controls on the components and on the amplifier tubes were not tight enough to assure the proper resonance for a common dial setting on all three tuners. Much progress toward that end was made in going to the Model 20 Compact receivers. Manufacturing tolerances tightened enough so that the dial settings for two of the stages were the same over the broadcast band. The remaining problem was with the first stage tuner, caused by the antenna effects.

An antenna has some of the properties of a tuned circuit and it therefore affected the tuning of the first amplifier stage of an uncompensated receiver. If every listener had the same antenna as the others, the first amplifier of a receiver on a multi-stage radio like the ordinary three-dialer could be compensated by the manufacturer to make its dial setting track the other dials. In the middle 1920s most radio listeners had long-wire antennas of as many different sizes and locations as there were listeners, and the first stage of their receivers usually needed different dial settings.

Kent's engineers developed ways to get around the problem and consequently produced a single-dial set that significantly improved the ease of operating the radio. One way was by using an untuned amplifier before the first tuner. This additional stage isolated the antenna from the tuning system. Model 30, No. 8000, was the first of the series to get the isolator stage. It was a big step forward in the progress of the Atwater Kent product line.

The extra stage added only moderate cost to the radio. When Type 201A tubes were first used in Atwater Kent radios they were priced at six dollars each. The extra cost of the isolator stage would have been a doubtful trade for the convenience of single-dial tuning, but when the price of tubes dropped to half of that, the overall price of the tubes in the six tube set was less than it had been with five expensive tubes and the three-dialer became obsolete.

Model 30 was, in many ways, identical to the Model 20 Compact. It used the same mahogany box so it looked very similar. It used the same power and operated the same speaker. There were some differences; most important, it was user-friendly.

The other major difference was condenser ganging. The tuning condensers and coils in the first Model 30 were the same as those in the Model 20 Compact, but they could not be supported by the front panel for esthetic reasons. Their mounting screws would not have been hidden by dials as on the Model 20. A sub-panel, in itself a separate chassis, was installed to mount the condensers and the bakelite panels that contained the tube sockets.

The improved receiver was identified as Model 30-A, No. 8000-A. It differed from the earlier set in the mechanical details of the tuning condensers and their supporting chassis. Up to the time of the Model 30-A the tuning condenser used bakelite end-plates to support the rotor, to insulate the stator and to mount the condenser to a panel. With the Model 30-A the factory went to a metal end-plate for the condenser. It carried the rotor bearing, incorporated insulating plates for the stator and was fastened directly to a newly designed chassis. This new design was used later on the Model 33 and the Model 35.

In operating a single-dial receiver, the listener is not at all interested in how the motion of the dial causes the condensers to rotate as long as they track (stay in tune). However, the factory was strongly interested in this mechanism. Atwater Kent devised a method of connecting a pulley on each condenser to the others by means of a flexible, phosphor-bronze belt. Turning the middle condenser shaft with the dial resulted in moving all the tuning condensers exactly the same angular amount.

Another way to accomplish the same function was to fasten all of the condensers onto a single shaft, under the patent of J.V.L. Hogan. Atwater Kent did not license the patent, preferring his way until several years later when the complexity of the radios he was building precluded use of the pulley-and-belt system. This occurred in the 60 series. (Sometimes the author wishes he had worked for Kent and could have learned the background reasons, not just the results).

Almost 100,000 of the first configuration of the Model 30 were sold in 1926. Before the end of the run in 1927 another 20,000 sets of the improved version of this single-dialer were sold.

### **THE FOUR -TUNERS – MODEL 33**

The standard broadcast receiver of the early tuned r-f amplifier days had five stages; two radio frequency, two audio frequency and a detector. The Atwater Kent line had been established with that line-up in the days of the Open Set Model 7, No. 4066. Its difference with subsequent five-tube sets was the lack of tuning in the r-f stages. All the versions of Model 10 were five-tube sets of the two r-f, two a-f, detector configuration. Because they used three tuning circuits in the r-f stages they were called

three-dialers. Atwater Kent understood that variations had to be made available to those who wanted something more or something less. For the something-else customers he brought out Model 9, an abridged Model 10. Later he brought out the Model 19, an abridged Model 20.

For the something-more people of the breadboard days he brought out Model 12. It had three a-f stages and was also a three-dialer. Collectors don't usually identify it as a three dialer even though its r-f-stages are identical to those on the corresponding Model 10. When the 20 series was introduced, Kent made Model 22, No. 4930 available. (The author has not seen a Model 22 but believes it to be the big Model 20 with an extra audio tube located in the empty space behind the regular audio tubes.)

When the series 30 was introduced, the something-more customers wanted a radio that was better than the ordinary Model 30. It had to have more than the five tubes that was the earlier standard. But the sixth tube in the Model 30 didn't fulfill their expectations for two reasons. First, the extra tube didn't count since it was an isolater and not a tuned amplifier. The other reason was that the set did not offer to the something-mores an appearance that was up-scale enough. The set had to look bigger and more important than the Model 20 Compact and the Model 30.

To satisfy these customers Kent brought out Model 32, No. 8270. He incorporated the isolater tube to make the set friendly but he also built in another radio amplifier for a total of seven tubes. With four tuners instead of the standard three, the set sold very well. Model 32 had the same construction as the first Model 30s. It used the bakelite end-plates on its tuning condensers and individual tube sockets for the radio amplifiers.

When the Model 30 was upgraded to Model 30-A another variation of the 30 series was produced, Model 33, No. 8930. This was a six-tube set but like Model 32 had four tuning condensers. The circuitry that had been used with the isolator in Model 30 was combined with the first tuned r-f amplifier to reduce the tube count from seven in Model 32 to six in Model 33.

The variation in antennas that was still a problem for listeners when Model 33 was introduced was solved by adding two conveniences; separate connections for a long antenna, or for a short antenna, and a trimmer to provide finer compensation. Model 33 used the same design for the internal chassis that characterized Model 30-A but it was longer because of the extra tuner. The style of condensers used on Model 30-A was repeated on Model 33 but there were four instead of three. Its cabinet was very nearly the same as that used for the Model 32. The eye appeal of the Model 32 was maintained even though the circuit had been simplified.

Model 33 is an interesting set from a marketing standpoint. The customer analysis part of marketing said there would be good sales and that analysis was correct. Model 33 was one of the big selling receivers. The

factory analysis part of the marketing evaluation was much more complex. The new-style chassis construction was available from Model 30-A and from Model 35 with only a small change to accommodate the greater length. The circuit changes were minimal. The factor that may have obscured all of the factory availability analysis was the on-coming requirement to manufacture an A.C. receiver, and to do it immediately. Model 33 was to become Model 36.

### A.C. FILAMENTS – MODEL 36

The marketing analysis suggesting that the B-eliminators were not substantial product investments may well have indicated several other important considerations. The B-battery eliminator only solved half of the problem of using direct current tubes in circuits powered with alternating current. It took care of making plate current available but did nothing to solve the tube-heating current problem. A-Battery eliminators were available to solve the filament heating problem but they were not well received because they were expensive, and with their wet-cell rectifiers, were as messy as wet-cell batteries. What was needed to advance the radio art were new vacuum tubes with filaments that could be operated directly by alternating current.

The Radio Corporation, together with Westinghouse and General Electric, had been working on the redesign of battery-powered vacuum tubes almost from the time that Atwater Kent had started radio production. It was able to release replacements for the Type 201-A in 1926 and 1927. They were the Types 226, 227 and 171. As soon as samples were available, Atwater Kent's engineers started redesign work to get a set on the market without delay.

Kent's market analysis also would have directed the redesign of a radio that assured immediate customer acceptance, the use of an existing set to reduce factory changes, and doing everything that was needed to maintain the Atwater Kent reputation. This would not have been the time for sweeping change. Getting the A.C. set into the customer's hands was more important than creating a new image. The new radio was Model 36, No. 9390

For easy redesign, the best radio was Model 33, No. 8930. It had good customer acceptance as a full-function, high-end set with all the operating features that the A.C. receiver needed. It was the best choice for conversion to Model 36 for another reason. The Model 33 chassis had the latest technical features and projected the longest manufacturing run. It had binocular coils, four tuning condensers, an antenna peaker and the metal sub-chassis.

Converting Model 33 to A.C. operation did not involve extensive re-work. The only requirements were a new bakelite sub-panel for the new detector and audio-frequency amplifier tubes (the Type 227 detector had five pins instead of the four pins used for the Model 33 detector), a new cable to connect the chassis to the power supply, a new volume control unit, substitution of Type 226 tubes for amplifiers, substituting a Type 171 tube for the power output tube, and minor bypassing.

Model 36 required a full A.C. power supply. Here the work on the Type R and the Type S power supplies paid dividends. With a simple change to add filament windings on the power transformer, a change to the output terminal board, and the substitution of the Type 280 vacuum rectifier for the Type 607 gas rectifier, the new power supply, Type Y, was ready.

Production numbers for the Model 36, No. 9390, show that it was a success. It came out in late 1927 and more than 36,000 were sold. The marketing analysis had paid off handsomely.

### THE METAL BOXES – MODEL 35

In the middle 1920s a very important change took place in the use of steel for the fabrication of sheet metal stampings. By the addition of manganese to a smelter batch of iron containing a small amount of carbon, the ductility of the resulting steel was remarkably extended. Shapes hitherto beyond forming with presses because of wrinkles and tears became standard production. The pressure on the steel companies to improve their iron metallurgy came from automobile manufacturers who wanted to produce major body components and other large sheet-metal parts in single units, instead of having to limit their sizes or fabricate them by assembling smaller pieces.

One result of the availability of this new steel was its use in another industry, the manufacture of major household appliances. An example was the manufacture of domestic-service refrigerators to replace ice-boxes. General Motors produced the first Frigidaire in 1926 and General Electric made its first Monitor Top in 1927. Atwater Kent, through his continuing friendships in the automobile industry, was able to follow the progress of metal forming, not only for automobiles but in the other industries where it expanded the product applications.

Kent could easily conceive of a metal container that might be used to enclose a radio. He didn't lack interest or experience. His ignition coils were assembled in deep-drawn steel cups, and the TA amplifiers were contained in shallow steel pots. The Model 5 had extended this concept, and the Model 20 panel-and-shelf utilized larger but simpler stampings. Kent's marketing sense also indicated a very strong change in his customer's interests. America would fall in love with stamped steel. The automobile

companies were ready to advertise their new steel vehicles, the appliance companies had new products (electric servants) to be introduced and the novelty of steel appliances was in the air. Atwater Kent could see that his radios should be in the wave.

This time the marketing analysis not only indicated the new and potentially very large customer demand, but it also indicated a major expansion in the capital equipment of the factory. He had to replace his wood shops and minor metal-fabricating facilities with a major metal-forming capability. Kent knew that he had get a new radio on the market in the least possible time.

He could not make all the design improvements that would be desirable in a single model change, so he wrapped the upgraded Model 30-A, No. 8000-A, in a decorated metal enclosure and created Model 35, No. 8100. He did not use Model 33 for the upgrade and he did not include the A.C. power supply even though it was available from Model 36. He was right again; Model 35 was the next record seller for Atwater Kent.

### MODEL 37

The success of Atwater Kent's first metal box receiver, the Model 35, confirmed his evaluation of the market. He had found a very strong customer interest in a new style. His problem was how to combine several vital forces that could result in a stable product line. One of the forces was based on production, the use of stamped steel for the container. Kent knew that by increasing the production rate and reducing the cost of the materials, an improved radio in a shaped metal case was not only possible but the way he wanted to go.

Another force came from the market. Home makers wanted and were willing to buy a radio with a new style. The new receiver had to have a modern look but, at the same time, it could not depart very far from the traditional look of radios. Several characteristic elements could be carried over from the box-and-panel sets of the previous period. The table model continued to be popular and its size had been well accepted. The width and height of the new style did not have to be substantially larger or smaller than the 30-series battery receivers. The depth had to grow to accommodate the internal power unit but on a living room table the depth would go unnoticed.

The new radio did not have to present a new tuning dial. The general public had not yet come to relate favorite stations with frequency or wavelength. A dial number or position was satisfactory. The new style did not require its container to incorporate a loud speaker. Listeners were comfortable with separate speakers, especially those that could be moved away from the radio to the easy chair.

Still another market force was the use of A.C. filaments and the incorporation of the B eliminator. The use of batteries was no longer acceptable except where house power was not yet available. All the electrical parts except the antenna and the loud speaker had to be put into the cabinet of the radio.

Combining the best elements of the radios and power units that he had produced and sold was the way Kent maximized the appeal of his new line while minimizing his investment in its production. He used the chassis of Model 35 (almost without change), the power unit from Model 36 (Model Y redesigned), and a new stamped steel container to make the new set, Model 37. However, part of the new factory had to be equipped with large punch presses if the new line was to be produced economically.

## THE FACTORY STORY

When Atwater Kent started his new business, The Atwater Kent Manufacturing Works, in Philadelphia, he located his offices at 112 N. Sixth Street in the old Franklin Institute building. His manufacturing operations were done in nearby rental facilities. Kent was very creative, as evidenced by his many patents, but his capability to innovate was not limited to the products he put on the market.

He showed a strong interest in the means by which his production took place. He was actively concerned with the manufacturing process and its facility. As his business grew Kent found that downtown Philadelphia was not as good for expansion as a place on the outskirts of the city. One of the communities he looked at was Germantown, a suburb only about six miles from the center of Philadelphia.

Germantown was founded by settlers who came to Pennsylvania in the seventeenth century, not long after William Penn. It became a part of Philadelphia in 1854 and, like other districts in the city, was the home of a hard-working, skilled labor force, ideal for the production of the ignition equipment that earned Atwater Kent his public recognition.

In about 1912 Kent opened a small factory on Stenton Avenue in Germantown, not far from the railroad. He gathered his scattered manufacturing operations and consolidated them in that plant. The ignition business continued to grow because Kent's system, using the precise Unisparker, had shown its superiority over the trembler and the fixed-magneto systems. He was able to expand his operations and fill the Stenton Avenue factory. With the advent of World War I, and Kent's manufacture of precision equipment for the military, he further expanded his factory on Stenton Avenue by moving into a new, larger building at the end of the street.

The end of the war saw Kent with more factory capability than his business needed. His tools included small presses, screw machinery, Bakelite

casting equipment, wire and coil winding machines and a competent wood-working shop. He needed another product line. Making instruments for the new fad, radio, was a possibility.

In 1919, the radio business was a combination of recovering communications companies and a new breed of radio amateurs, some licensed, some not, many of whom had been military operators. These new fans were fascinated by what they heard listening to ships, commercial stations and experimenters. All of this interest led to a new use of radio waves, entertainment. This new idea caught the public fancy (like today's Internet) and resulted in an almost uncontrolled growth of listeners, amateurs and commercial experimenters who were trying to establish the viability of making broadcasts. Constructing and showing a receiver, however simple, became a popular activity for technically interested hobbyists.

In 1920 Kent decided to enter the radio business. In many ways he was well equipped for the new venture. He had the factory, and his nationwide service organization. Most important was his native ability to recognize the marketing potential. During the next year Kent started making radio instruments in the facilities at Stenton Avenue. Based on the enthusiastic response of the radio market to his instruments he added the assembly of Open Sets. In 1922 he was manufacturing Bakelite castings and metal stampings for the radio instruments that home-built set constructors wanted, and he was making similar instruments for the factory assembly of the first Open Sets. At the same time he continued the production of auto-electrical systems.

By the time the Radiodyne was introduced in 1923 Kent again needed more factory space. But this time he was severely limited by the lack of suitable property on Stenton Avenue. The direction that the radio business had gone, and was going, convinced Kent that a very much larger plant than the entire Stenton Avenue factory would be required. It was because of this need to expand and the limitation of Stenton Avenue that we get a chance to see another side of Kent's interests. He had to select another location, build a new plant and, in effect, start a new business. To do this he felt strongly that he had to conceive and define the new plant and all its elements, i.e., function, location, appearance, design, and operation. Kent wanted a factory that not only built his radios but also enhanced his image as a major entrepreneur in the American business scene.

## WISSAHICKON AVENUE

Based on the production rates of the Open Sets, the continuing automobile-electrical system business, and the limitations of Stenton Avenue, Kent decided that a new plant of about half-a-million square feet in total area, located in the same general part of Philadelphia, would

accommodate all his needs. He bought a 20+ acre plot on Wissahickon Avenue and engaged the Ballinger Company, architects and engineers, to design and supervise the construction of what turned out to be one of the most advanced radio-manufacturing plants of its time.

The new facility included his engineering development staff with its laboratories, the commercial offices and most important, his headquarters. Kent felt that the building had to reflect his views of technical progress and architectural excellence. The first part of the new plant construction was triangular in shape and enclosed about one tenth of the fifteen acres that would finally comprise the factory building. Its dominant feature was the entrance. It was faced in limestone colored terra-cotta to match the brick facing of the rest of the building and its echoed Renaissance design with heavy columns setting off both sides of the arched doorway. It presented a fine appearance for Atwater Kent's new factory and continued to enhance Philadelphia's industrial image long after the property was sold.

The initial, triangular part of the building was completed in 1923. It was immediately tooled up to make Model 10 Open Sets and roughly doubled Kent's manufacturing capability. Because casting Bakelite was a limiting process in producing the instruments for the Open Sets, a new casting department was installed at the new plant. One evidence of the duplicate casting departments may be seen in the radio transformer coil forms. The older ones had bosses on top, a vestige of the days when binding posts were used. The newer forms, made at Wissahickon Avenue, had a decorative ring on the top of the form instead of the bosses. Both the Stenton Avenue and the Wissahickon Avenue production lines continued to make Model 10 Open Sets until they were replaced by Model 20.

Work on enlarging the Wissahickon Avenue plant continued at such a pace that in 1924 the second section, which enclosed more than half of that building's floor area, was ready for service. Since this was the time of the 20 series there must have been a greatly enlarged wood working department put into operation in the new section. The next year the third section, which filled out the main body of the building, was completed. In 1926 the last part, a two-story extension, was added to the corner of the first building, diagonally opposite the entrance.

Atwater Kent had much to be proud of in this bright new factory. One of the most important features was the skylight roof. The saw-toothed panels faced north providing light for the operators that was almost free of glare and never cast shadows. The entire roof, nearly fifteen acres, was the light source. The roof construction took advantage of the saw-tooth nature of the skylights by adding strength members at the top of the saws to form trusses.

Another feature was the arrangement of the vertical columns that supported the roof. Because of the design of the trussed roof these columns

were located 40 feet apart in both directions, leaving very large areas on the floor (1600 sq. ft.) that were free of all encumbrances. The open floor space was ideal for shifting operations as the need to add new functions or to abandon old ones had to be met. The Superintendent of Plants, Harold Ashworth, in writing about Kent's modern factory said in part:

"—it is no uncommon thing for a whole department to be removed to a new location between a Saturday closing hour and Monday morning, while another department expands with equal speed to occupy the space thus vacated."

The picture of Atwater Kent clears a little more. He had emphatically influenced the design of the new factory and continued active in defining what and where the many operations were performed. Perhaps it is not inaccurate to say that the Wissahickon Avenue factory was his image as well as his invention.

When the third section of the plant was put into service it might have been planned and set up for the assembly of Model 30. This would have been good manufacturing practice since any disturbance of the very profitable Model 20 lines would have been out of character with Kent's direct concern with his manufacturing efficiency. In 1925 a few more than 350,000 radios were produced, almost all in the 20 series. There were also about 25,000 from the 10 series but a large part of those were probably made at Stenton Avenue.

The next year saw the full change-over to the 30 series. The whole plant produced about 450,000 sets of which about 80,000 were in the 20 series. In the first part of 1926 the wooden-box 30 series were predominant, but by the end of the year almost 200,000 Model 35, metal-box sets had been manufactured. When the big presses that were to be used for drawing the Model 35 steel enclosures were delivered, they were probably installed in the fourth section of the plant. By putting them in that area, only minor alterations in the assembly area traffic patterns would have been made. Handling the raw stock for stamping and finishing would not have conflicted with circuit assembly.

The floor space and the assembly lines in the factory were sufficient for planned production rates for the entire 30 series based on the battery sets in wooden boxes. Substitution of the metal enclosures for the earlier wooden boxes did not result in extra demands for factory space, beyond that planned for the new punch press area in the fourth section of the building. But the demand for the sets with the metal enclosure, Model 35, was far higher than had been projected by Kent's earlier marketing estimates. Another factor that had to be considered was that the required fabrication floor space for Model 35 production was somewhat more than that given by sets that were no longer being made. It was poor factory practice to replace the wood shop with the big hydraulic presses while some wooden-box sets



**Figure 30.** *The 16½ acre addition to the Wissahickon Avenue plant, 1929.*

were still in production. Together, these factors made it clear that the factory would be pressed to meet the increased customer response.

### **MODEL 37 AND THE SECOND BUILDING**

The problem was even more serious because the next set to be released was Model 37. It required greatly enlarged floor space to stamp, punch, draw and bend the new cabinets and to assemble the internal power supplies. Moreover, the demand for Model 35 was based on appearance, not convenience (it was a battery set) so the conversion to socket power for the new radio, the 37, would have forced still higher demand estimates. To meet the demand a new building was started on the western edge of the Wissahickon Avenue site. It would double the factory size to about 32 acres (Figure 30).

The production of Model 37 was started in 1927 using the first factory building, which had just been enlarged. In that year only 12,000 sets were produced but they served to confirm Kent's upgraded estimates of what floor space was required in the immediate future. The 40 series was the next group of receivers to be produced. They did not require any revision in the layout and equipment of the factory but they were a substantial load for the first building because they were popular. By the time the second building was up and running, the next series, the 55s, was ready for production. The second building was tooled up for them.

Some of the statistics about the Wissahickon Avenue facility are interesting. Together, the east and west buildings extended nearly half-a-mile along Wissahickon Avenue. To walk around the entire plant was a trip of about 1 1/2 miles, but to go from one building to the other the bridge over Abbottsford road was used. Inside the factory assembly and material movement used about six miles of conveyors — belt, chain and roller, Figure 31. But for radio collectors, the most interesting feature of the new building was (and still is) its cornerstone.

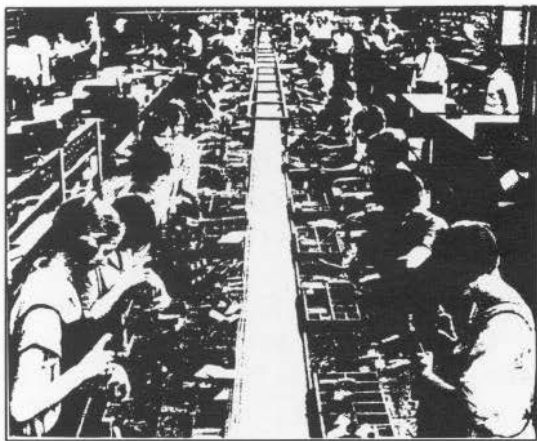


**Figure 31.** *Conveyor belt for assembling sets, inside the factory.*

When the building was dedicated in 1929, a current model radio was sealed in the cornerstone. Figure 32 shows the ceremony on May 21 with Atwater Kent standing behind the Model 55. (It could be a 60 but May 1929 is very early for that Model, and Kent would not have used an engineering sample.) In his dedication speech Kent told much of himself and his view of the future of radio. In part he said:

“My own feeling about the present and future of radio is presented to you in the form of this big new factory. Great as the success of radio has been in the past, I feel more confident than ever today that the greatest development still lies in the future and I have shown that confidence by the construction of the plant which we have met here to dedicate.—”

“—the radio business is something which is constantly changing and constantly moving forward. To me this is inspiring and stimulating. I could not be happy doing the same thing every day in the same way; cut and dried to order. I like a game which puts me on my mettle, which makes me keep my wits about me, which forces me to meet and beat new problems.”



**Figure 32.** *Sealing a Model 55 set inside the cornerstone at the dedication, May 21, 1929.*

## MODEL 55 AND THE CHASSIS PRESSES

The receivers in the 55 group continued Kent's enthusiastic customer response. They were available as table models in several colors and highlights. To meet the demand of families that wanted their radio to be furniture, they were made available as consoles. All the sets were of the same basic design, the difference between the table model and the console being only the metal-box enclosure.

The earlier metal-box sets, the 40 series, and Models 37 and 38 used a sub-chassis to carry the radio parts and a separate enclosure for the power supply. In all those sets, the radio sub-chassis was fastened to the enclosure by means of two brackets, one on each end of the sub-chassis. The power-supply enclosure was bolted to the flat bottom of the metal box. To supply these sets as consoles, the entire metal box was simply placed on an internal shelf in the body of the console. The dial, volume control, switches and monogram were made available through trimmed cut-outs in a decorative panel which hid the metal box from the listener.

The mechanical design of the Model 55 and subsequent sets was different. All the parts, both radio and power supply, were mounted on a full-sized metal chassis. This change in design permitted a consolidation of the manufacturing processes. With the full chassis only one manufacturing sequence was required because the power supply components were no longer assembled in a separate unit. The sequence was duplicated on as many production lines as the volume of sales justified.

The Model 55 set was cased either in the metal-box enclosure that was Kent's image or in a console without the metal-box. For the console sets the full chassis was built with a small front panel exposed by an opening in the face of the cabinet. For the metal-box sets the chassis was fastened to the bottom edges of the enclosure. Both styles used a flat metal cover fastened to the bottom of the chassis to protect against dust and interference.

Model 55 (and all of Model 60s except the last design) used a vertical panel fastened to the main chassis to mount the tuning condensers. Kent retained the band-and-drum system for ganging the condensers, and on all but the very first Model 55s mounted a vernier tuning mechanism panel and windowed the front of the enclosure to reveal the dial. The first 55 did not have the window but used the same dial as the 40 series, Figure 33.

The change to a single large chassis was a savings in so far as assembly was concerned, but it also incurred an expense. New presses were required to stamp out the new chassis. The factory had to be equipped with larger presses than those that shaped the metal box enclosures used for the 55 and the earlier receivers. The reason for the bigger presses was the size of the 55 chassis. It was a 10" by 21" medium-draw stamping with turned

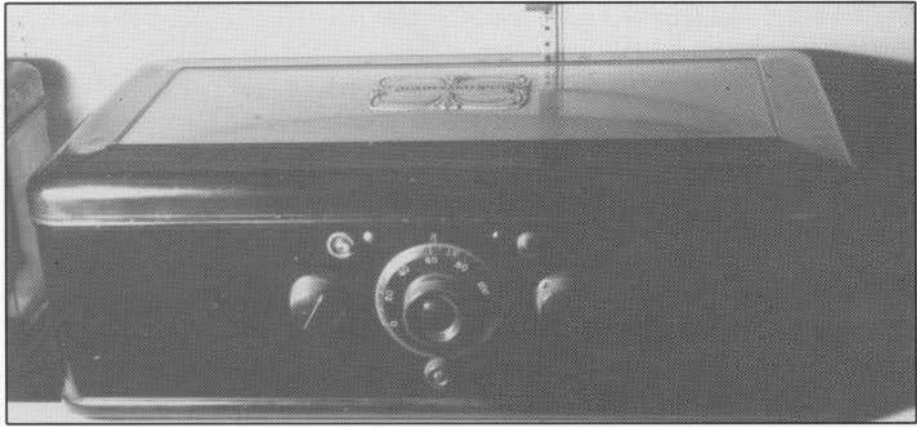


**Figure 33.** *An unusual AK Model 55 without the dial window.*

edges. With the big presses Kent did not have to reinvest to stamp out all the rest of the console sets that he produced. Figure 34 shows what the big presses looked like.

Sometime between the start of production of the Model 55s and the end of production of the Model 70s, Kent's production rate peaked. This was probably late in 1930 or early in 1931. At the same time three very significant changes took place in the business of manufacturing radios. One of these was a change caused by the ever-present cycle of styles. The metal box radio no longer spoke to the public of technological progress. High style had to reflect an exotic influence and it had to be done in wood.

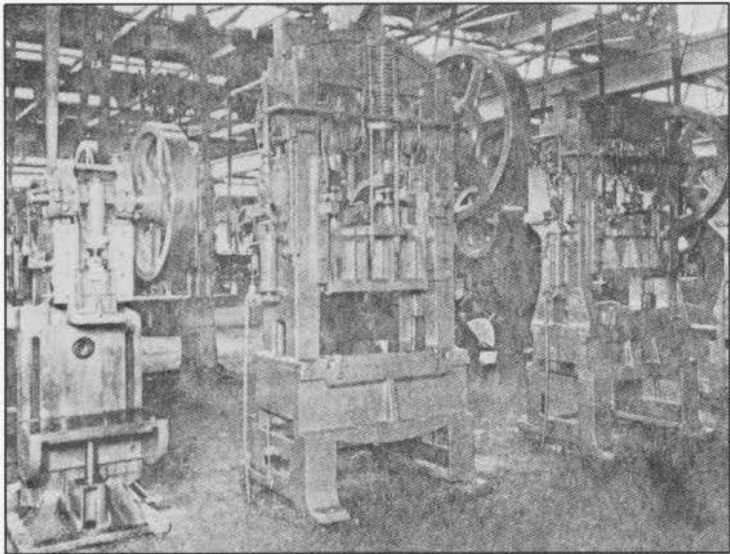


**Figure 34.** *One of the large flywheel presses for forming chassis.*

Another change was generated by the licensing of the superheterodyne patent to all comers. The day of the large tuned-radio-frequency set and a separate loud speaker was done. Although Kent's first superhet, Model 72 with its H circuit, was assembled on the big chassis, the compact style exemplified by the 80 series with their small chassis and incorporated speakers took over. The third change was in the pocketbook of the nation. No longer was the middle of the market able to afford the prices attached to the big chassis sets even if they were enclosed in economical metal boxes.

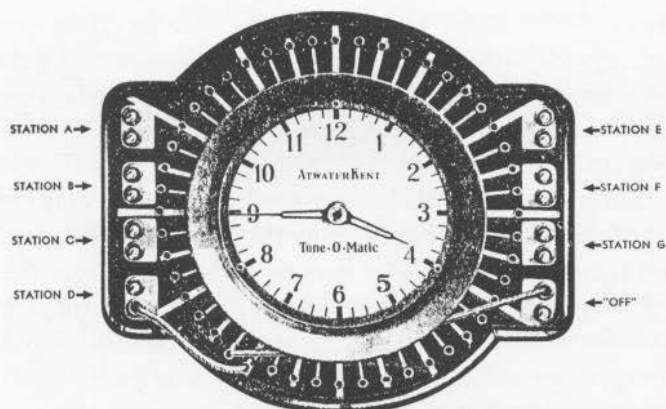
The winning combination was exemplified by a six-tube superhet with an 8" speaker in an art-nouveau-inspired, veneered, round-topped box for less than \$50.00 complete. Kent recognized this new market. His marketing analysis indicated that expanded factory performance was no longer the key factor. The capability of finishing big chassis had to be replaced by reductions in size, complexity and cost. Continuing business efficiency meant expanded customer contact, but the market had changed. Reaching the customer called for a new sales approach; discount stores were displacing department store merchandising. Kent tried to bridge the chasm.

Kent produced a line of compact radios that appealed to the new customer demands. He also continued to develop and modify his line of consoles. He made some very good receivers such as the Model 812 and the Model 511 (Figure 35), but he also produced a line of less expensive consoles. They used the same chassis as one of the table models, e.g., Models 286 and 356.

To maintain the business positive changes had to be made on the customer side, and more particularly in influencing the potential customer to buy a new Atwater Kent Receiver. This was no novelty for Kent; he had effectively pursued his automotive and radio customers for more than three decades.

## KENT INFLUENCES HIS CUSTOMERS

In any business that maintains a stable performance over several cycles of product replacement, the marketing function continually relates two aspects of the on-going business processes, Making and Using. "Making" is a way of referring to manufacturing and all its elements, such as the factory with its machines and its people. "Using" is a way of referring to all the customer activities up to and including the actual operation of the product itself by the end user. Our marketing analysis of Kent's business has been based on a major assumption: that there was a durable product. The product had to be capable of being produced and it also had to be useful. Its cost and price had to be contained within the standards set by customer acceptance and business practice. All of Kent's products, with the possible exception of Amperia, met that test.



Illustrating the simplest case of automatic tuning: Station "D" will be tuned in automatically at 7 o'clock and automatically shut off at 7:15. If the "off" lead is inserted in some other jack, say for 10 o'clock, station "D" will continue in operation until 10 o'clock.

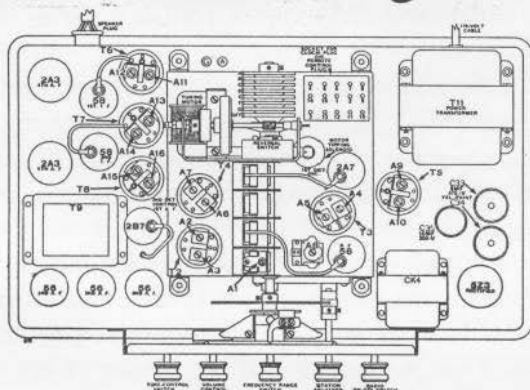


Figure 35. The Model 511 remote receiver and tuner

Up to this point our analysis of Atwater Kent as a master of marketing has looked predominantly at the Making function. Four decades of his products and the effects they had on his production facilities were reviewed. We have observed, without analysis, that his success was a direct reflection of his perception of his customers' potential needs, coupled to his management of technical and production operations.

Now we try to analyze how well Kent applied his marketing capabilities to the Using process of his business, which has two major factors. The first factor of the Using process is how the customer utilizes the product. The second factor is how the user may be influenced about the product or about an improved product. Because Kent's customers ranged from automobile manufacturers to homemakers and his products ranged from little motors to expensive radios, his customer relations included all the ways a producer communicates with his audience.

Customer relations range from a minimum of just supplying a distribution agent with product information to a maximum of doing business directly with the end user. Included in customer relations are all the activities related to:

- informing potential purchasers (advertising the product)
- informing the general public (institutional advertising)
- backing the product (warranty and factory service)
- providing maintenance service (dealers and factory service)
- agency sales (salesmen, distributors, dealers)
- providing product data (descriptions, service procedures)
- customer enticements (discounts, turn-ins, prizes, agreements).

At the end of the nineteenth century, when Kent started making electric motors, he seemed to be following his own interest (and skill) in the choice of products to make. There were customers for his motors but Kent seemed more inclined to make what he could than to alter his Making process to fit customer needs. His products were not the kind that were sold directly to the final user. The motors and the ignitor were sold inside the trade so his customers were the next-level manufacturers of end products. An example is the maker of a stationary engine such as Fairbanks Morse, to whom Kent wanted to sell his ignitor. Kent had to make his products known to that customer so he used the accepted method of that day, the trade journal, Figure 36. He also produced descriptive literature in the form of flyers and pamphlets that were sent to potential customers or passed out by sales agents.

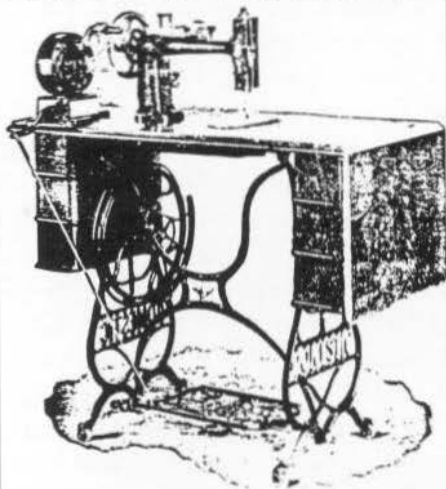
Although Kent did not advertise directly to the end user of his motors, he was interested in their satisfactory use. This is evidenced by the treatise that he wrote while he was employed by Kendrick and Davis. It is shown in Figure 37. In this 32-page booklet Kent takes a student through enough

December 9, 1896]

## THE KENT ALTERNATING SEWING MACHINE MOTOR.

THE extended use of the alternating system of electric lighting has created a large demand for small power specialties for such circuits. The Kent Electric Manufacturing Company, of Worcester, Mass., have lately been bending their energies in this direction, and one of their results is a sewing machine motor illustrated in the accompanying engraving.

The great difficulties encountered in this work are the small starting torque, and the non-variable speed of these motors. Both of these obstacles are overcome in the device shown. The motor, which is of the induction type, is mounted on a base, to move with a lever, connected to the treadle of the machine, and the speed regulation is obtained by tightening and slackening the belt. By this method, any desired speed may



THE KENT ALTERNATING SEWING MACHINE MOTOR.

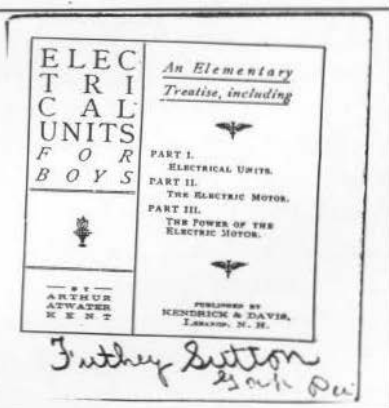
be maintained. In this way even more perfect regulation can be obtained than by direct current, as the speed can be changed in an instant, and the brake which touches on the circumference of the balance wheel stops the machine instantly.

A switch located on the base is turned on when the operator sits down to the machine. The motor is thus started without a load, and is running constantly while the machine is in use. It is compact, and neat in appearance.

The company also manufacture a variety of other apparatus such as battery fan outfits, alternating current fans, and small machines which can be run either as a dynamo or a motor, capable of lighting from one to four 8 candle-power lamps, or of running a 6-inch fan. The voltage motor

Figure 36. The Kent sewing machine motor, as depicted in a trade journal.

Figure 37. An elementary treatise on electricity, written by Kent around 1900.



basic electricity to enable him to calculate the input current required by a small electric motor. This publication and the instruction pamphlet that he wrote for the Amperia game were Kent's first direct contacts with his end users. They appear to have been good first steps in his marketing experience, but they were not as effective as the influences of other manufacturers or even of Kent himself in subsequent product lines.

The impression that Kent was more interested in Making than in Using is borne out by the transfer of himself and his business to Kendrick and Davis in 1900. There he could take advantage of their marketing process, even though it was little better than Kent's. He stayed with K&D for only a short time before he wanted to strike out again. The author feels that he was searching for the customer interface and he did not find it at K&D. He chose Philadelphia because its population included many craftsmen with high levels of technical skill. This says indirectly that Kent was still looking at the Making process. Nowhere does any available history of this phase of his career suggest that he went to Philadelphia because of its markets. He was not yet skilled in the Using process of marketing.

Kent's products in the beginning of his Philadelphia activity were indications of his looking for customers different from those of his pre K&D employment. The telephone and the Voltmeter were new products for him. They involved electricity but were not made by techniques that Kent had used in making his little motors. Here we see the beginning of the analytical marketing function: The Making process for these two instruments being directly controlled by the Using process, in this case the actual end-users.

The telephone and another early product, the horn, further reveal Kent's growing awareness of the need to influence his customers. He chose a catchy name for the instruments: Monoplex. The first half of the name means one or single. The second means part or piece. The name comes out as one-part, or unitary, a very good way to suggest cohesiveness. For the telephone installed in a business or in an extensive home the idea was effective. The customer was trying to enhance his cohesiveness by the use of the new communication capability offered by the Monoplex. He chose well. For the horn the idea of oneness accorded directly with the purpose of the horn, to warn with a single-tone, a loud signal.

Kent's next product, the contact maker, seems to tell a different story. It is with this product that Kent's marketing capability starts to show. The device was a major technical improvement over previous current interrupters. Kent had taken his experience, from all the way back to the burned launch of his teens, and added his technical ability at problem definition and mechanical design to invent the contact maker. Here he showed that he understood one factor of Using; the application of the device.

The customers in the ignition business were a far more complex problem than the product users Kent had experienced with his earlier devices.

Of particular difficulty were the relations with the end-user, the automobile or stationary engine owner. Internal engines in the period before World War I were at best balky and, more often than not, unreliable. One of the common difficulties was ignition, the function on which Kent had done his best technical work. (The Ignitor did nothing to remove the difficulties with unreliable ignition.)

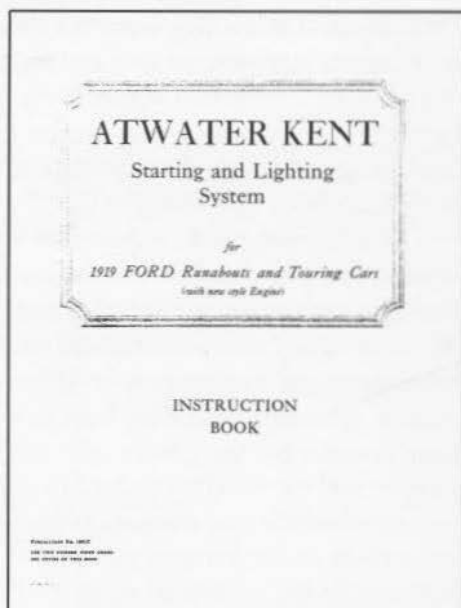
Kent's system was capable of providing reliable, trouble-free performance but it had mechanical adjustments to accurately set initial performance and to compensate for its wear and aging. Adjustments were a mixed blessing. They compensated for the minor but cumulative manufacturing tolerances and customer special conditions that were exorbitantly expensive to eliminate, and they kept down the cost of using the complex ignition system, but they were also an open invitation to the tinkerer whose experimenting usually resulted in undesired (faulty) ignition performance.

Any supplier of equipment as complicated as an ignition system had to provide a user-support service to keep his system in working order after delivery to the customer. Kent did this by appointing and training service stations throughout the country. They, in turn, trained local servicemen who worked directly on the customers' automobiles. From the beginning of Kent's national service capability through the 1920s, auto-electrical work on cars tended to be done by specialists who operated their own shops and garages. These service businesses were not exclusively tied to Atwater Kent systems. They handled all the current electrical systems and in many cases made and sold storage batteries. Their work ranged from turning commutators to burning the lead that inter-connected plates and cells in lead-acid storage batteries.

Kent put out instruction books and pamphlets for the use of those who installed or worked on his equipment. The Atwater Kent Instruction Book for the 1919 Ford Runabout is shown in Figure 38. The last page lists the Official Service Stations then in operation, 117 stations in 40 states plus six in Canada. Kent had learned the vital nature of customer service for his business reputation. For the detailed procedures that were necessary to assure effective automobile engine performance, the need for adequate service had become a mandatory part of Kent's business. To support his products he had to provide a factory technical group whose purpose was customer satisfaction and whose backing was all of Kent's engineering, sales and manufacturing organization.

The era of direct advertising to his final customers had not yet become a part of the Kent's necessary business practice about the kind of equipment that he made. Car manufacturers themselves had become very skillful at appealing directly to buyers through extensive advertising. Tire manufacturers, who sold replacement tires directly to end-users, had also learned how to use advertising in magazines and other periodicals. Kent, through

**Figure 38.** *The instruction book for the AK Starting and Lighting System, 1919.*



his close association with the automobile industry, had become very cognizant of the power of direct advertising.

Because of the nature of his offerings, direct advertising was of limited use to him in the auto-electrical business. However, he was very aware of the continuing need to evaluate his customers' interests and was quick to find ways that he could modify their demands, especially through his service stations. The lessons of customer evaluation and direct advertising would pay off handsomely later when he went into radio.

## THE RADIO CUSTOMERS

In 1920 Atwater Kent started in the radio business. His marketing analysis might have gone like this: There is a new product appearing on the scene. It comes from the possibility of receiving programs of value through the air. To receive these programs, a customer must have a receiver, a device made up of electrical parts (the product) that are related to the ignition equipment that we have manufactured for more than a decade. These parts can be sold through the same dealer network that sells our electrical systems.

The factory can manufacture these parts with only minor changes in its equipment. We will need some engineering for design of the parts and for changes to the factory, but they are only a small expense. Our reputation has been built over the years and is now associated with outstanding equipment. We will have to produce the same quality in this new field of radio (Making).

We can stay in contact with our customers using the same methods we have used in the past. We can easily produce instruction booklets, specifications and attractive packages for our products. Through our service stations and their clients, the direct servicemen, we can reach the experimenters, amateurs and radio fans who should become profitable customers (Using).

This analysis was very positive. On the basis of it, Kent started the engineering that was required for the new radio parts and the procedural changes that would be needed in the factory so that by the middle of 1921 he had parts to ship to his dealers, repair stations and servicemen. In effect Kent was expanding his product line without changing his approach to his customers.

The enthusiasm for radio was so strong in the country that a supplier could successfully put out a line of parts without announcing and extensively advertising them. Kent was able to benefit especially well from the intense customer interest because in every town that had an auto-electrical serviceman he had a radio parts salesman. He made his parts available through the servicemen and built an excellent reputation for high-quality instruments.

## **PARTS OR RECEIVERS ?**

It is interesting to conjecture about how the next step in Kent's expansion in the radio business came about. Did he foresee the need to build radios and plan to do that immediately after he introduced his line of parts? Or, was there a strong customer response to the sales agencies telling them that many of their customers would prefer to buy a complete radio than to assemble one from parts? The first two Atwater Kent receiver models suggest the latter question to be closer to the way things went. Since Kent considered the boards as parts and sold them along with the instruments, the only sign of factory engineering in those first sets was in the instruction sheets packed with the parts, Figure 39.

In either case, before the end of 1922 Kent had recognized his customer and started to meet end-user instead of dealer demands. As an example he sold Model 3 in two configurations, one with only the detector, No. 3960, and the other, No. 3955, with the detector and another instrument, the two-tube amplifier. At about this time, Kent started directly contacting his customers about radio receivers. He used catalogs put out by appliance sales companies and electrical supply houses and he included extensive data folders in the radio parts packages, but he did not yet employ direct advertising. The Using process of the marketing function had so far only considered the customer's use of Kent's products. The factor of influencing the customer about the products was an extensive and interesting part of Kent's business, but he had not yet started to use it.

# ATWATER KENT Radio Equipment

The Mounted Vacuum carrier through the standard quality of Atwater Kent products. For an open air it supplies a finished instrument accompanied in appearance and

No. 3714 Mounted Vacuum  
(Screen Panel and Dial) . . . \$18.00  
No. 3038 Mounted Vacuum  
(Black Panel and Dial) . . . \$18.00

Atwater Kent Vacuum carriers are constructed in accordance with safety and efficiency. They are suitable for either table or port mounting. From the molding of the vacuum carrier to the final test they are manufactured at one plant.

No. 2448 Vacuum . . . \$4.00

The Vacuum carrier has its application in equipment where greatest selectivity is desirable.

The Atwater Kent Vacuum carrier is constructed in accordance with safety and efficiency. They are suitable for either table or port mounting. From the molding of the vacuum carrier to the final test they are manufactured at one plant.

No. 3559 Vacuum carrier, standard  
64-turn rotor winding . . . \$4.00

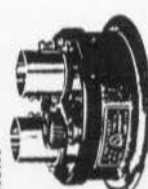
The Type L Transformer is similar in that and is our high grade Amplifier and is constructed in a steel metal container with a shielded top which encloses the primary and secondary windings in a desirable shape when it is known.

No. 3775 Type L Transformer . . . \$4.00

The Atwater Kent Audio Frequency Amplifying Transformer is an excellent example of perfect design and high quality workmanship.

Discussion of the signal has been eliminated by careful attention to the proportion and impedance balance of the coil windings. The transformer is a standard type.

No. 3509 Transformer . . . \$3.50



This carrier has been designed to take the popular type of 1 1/2 inch tube. The substandard model contains two sockets an excellent type carrier.  
No. 3041 1 1/2 inch Tube Carrier . . . \$8.00

The Standard Kent Parameterizer is designed so as to obtain the utmost in close adjustment. The amount of compression and accuracy of parts, considerable amount, your opinion is important. The standard carrier is extremely precise the instrument.

No. 3054 Tube Mounting Parameterizer, \$2.75

The Standard Kent Panel Mounting Parameterizer compares the same dimensions and features of the tube mounting type, and is simply arranged so it can be conveniently adapted to a panel.

No. 4005 Panel Mounting Parameterizer, \$2.75

The Standard Kent Dial is made of cardboard, mounted in the Standard Kent molding plate. Colors are black and brown. Dial graduations and plates are lined below.

3779 Dial Mount, for 5 inch 100 per graduation . . \$2.00  
3784 Dial Mount, for 5 inch 100 per graduation . . \$2.00  
3785 Dial Mount, for 5 inch 100 per graduation . . \$2.00  
3787 Dial Mount, for 5 inch 100 per graduation . . \$2.00

The Standard Kent Rheostat for vacuum tube element control consists of highest quality resistance wire wound on a substandard fiber strip which is secured in the first.

No. 3530 Rheostat, Panel Mounting . . \$1.25  
No. 3566 Rheostat, Tube Mounting . . \$1.25

100 OHM RHEOSTATS  
No. 3041 Mounting Board, 8 1/2" x 4 1/2" . . \$5.00  
No. 3708 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3709 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3710 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3711 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3712 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3713 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3714 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3715 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3716 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3717 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3718 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3719 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3720 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3721 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3722 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3723 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3724 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3725 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3726 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3727 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3728 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
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No. 3730 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3731 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
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No. 3749 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3750 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3751 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3752 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3753 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3754 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3755 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3756 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3757 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3758 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3759 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3760 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3761 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3762 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3763 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3764 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3765 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3766 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
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No. 3768 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3769 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3770 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3771 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3772 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3773 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3774 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3775 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
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No. 3779 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3780 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3781 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3782 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3783 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3784 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3785 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3786 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3787 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3788 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3789 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3790 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3791 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3792 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3793 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3794 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3795 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3796 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3797 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3798 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3799 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00  
No. 3800 Mounting Board, 2 1/2" x 4 1/2" . . \$4.00

ATWATER KENT MFG. CO., PHILADELPHIA  
4217 EIGHTH AVENUE

Figure 39. Early AK radio parts catalog sheet detailing boards and parts.

ATWATER KENT MANUFACTURING COMPANY  
SCIENTIFIC AUTOMOTIVE EQUIPMENT

A. ATWATER KENT  
*President and Treasurer*  
W. J. LITTLE  
*Vice-President*

4937 STENTON AVENUE  
*Philadelphia*

March 15, 1923.

TO DEALERS SELLING ATWATER KENT RADIO EQUIPMENT.

Thru the courtesy of your jobber we are getting acquainted with you direct in the hope that we will be able to help in the sale of ATWATER KENT Radio equipment. There is no question but what you are having a busy season in radio and we hope it is proving to be a profitable one.

This letter conveys to you only a spirit of cooperation and a request that you use our organization for any information or sales helps needed. We will send such literature as you actually need. Any technical information we can give you will be gladly furnished without charge. In other words just tell us your problems and we will give you the best advice at our disposal.

ATWATER KENT Radio equipment has almost become a household word thruout the country and we feel that you have surely done your part in making it so. We appreciate your efforts and want you to feel that we are backing you up at every turn of the road. The enclosed magazine reprint is just one evidence.

Sell your customers Atwater Kent and you'll be safe.

Very truly yours,

ATWATER KENT MFG. COMPANY.

**Figure 40.** AK 1923 letter to prospective dealers. Note the letterhead and the absence of the word Radio.

1923 was a year of significant change in customer relations for Atwater Kent. Figure 40 reproduces a part of a letter to prospective dealers suggesting their affiliation with the Company. Notice in the heading of the letter that there is no mention of radio apparatus. Later in the year the words RADIO APPARATUS were inserted above the address. 1923 was also the year that Kent's radios stabilized with the Model 10 design. This enabled him to increase factory efficiency and at the same time consider the use of magazine advertising to inform the public about his radios. He had advertised in trade journals and through jobbers and sales agencies over the country, even to the point of providing print aids and blocked plates, Figure 41.

Using advertising to directly influence public opinion was a major change in the way Kent had done business. Prior to the introduction of the Model 10, he had not realized the importance of the national attitude toward the acceptance of his products. He also did not realize his role in influencing that attitude. That part of his marketing mastery was the necessary last phase of his business maturity. In 1925, when Atwater Kent went into



**Figure 41.** Advertising aids; an electroplate and the printed image.

print advertising directed to his potential customers, he chose national magazines with large circulations targeted to the middle-class homes of the country. The liberal use of color and contemporary art in full-page ads suggested that Kent's products were top-of-the-line.

Kent had become aware that for radio manufacturers, particularly, broadcasting was the other powerful means of influencing customers. He started using radio ads to supplement his print advertising in 1925, at the time that the networks were connected. Kent was very particular about the programs that he wanted. They had to offer classical music and be presented by recognized artists. His interest was greater than the simple engagement of musical-program creators. He had to participate in the selection of numbers to be programmed and in selecting the artists who performed. In this participation, Kent revealed an unfulfilled interest in the classics that had been deflected by his extraordinary attention to his business. This interest again emerged after Kent retired to live in Bel Air.

## DEALER SUPPORT

The following year Kent initiated an internal Radio Bulletin Service for his dealers. Its purposes were to offer sales information about the products and to provide service support, and dealer bulletins were issued whenever something of interest occurred. They were continued through 1927. Number 109 of that year announced the millionth set and illustrated the ceremony that took place in the factory.

Starting in 1924 Frank Atlee, K2PI, went to work in the technical publications function at Kent's plant on Stenton Avenue. Frank left Atwater Kent when the Wissahickon Avenue plant closed in 1936 and went to work for RCA in Camden. When the author and his wife moved to the Philadelphia area in 1965 and joined AWA we also went to New Jersey to become acquainted with Frank and Margaret Atlee. We became good friends and through Frank's guidance the author initiated his studies of Atwater Kent. Part of the material in this article is based on Frank's recollections and on his articles in the Bulletin and in *Popular Electronics*.

In 1925 the technical service function started issuing the Service Manual. It was reissued each year until 1928 and then again in 1931. The Manual described the receivers from an operating and servicing standpoint but it did not give the values of the components on the diagrams or in the descriptions. For the values the serviceman used another manual, Electrical Values. If the repair required a part that had to be bought from a distributor or from the factory, another manual was needed. This was the numerical Parts List. To find the price of the replacement part, the serviceman went to the fourth manual, the Parts Price.

Collectors who don't have easy access to these manuals find trouble shooting and repair of an Atwater Kent receiver a frustrating experience. They usually obtain a copy of the required diagram from the Rider's Manuals where the values have been annotated for the convenience of the general serviceman. This practice is not very different from the situation for servicemen in the middle 1930s. Kent's manuals were supplemented through 1936 but only to subscribers. Rider's manuals appeared in 1932 and covered nearly all the radios that a general serviceman would encounter. The relatively common Rider's manuals, compared to the Kent manuals that have become collector's items, indicates that after the 1931 issue, very few servicemen entered new subscriptions.

After the Open Sets became popular and Kent had started to actively involve his dealers and his factory service organization in building sales, Kent set up a Dealer Helps function. He issued a catalog of merchandise that the dealer could buy to furnish his store with eye-catching displays. Figure 42 shows a part of one page from the 1927-28 catalog, along with a page from the 1929-30 catalog. Part of two pages from the 1929 Retail

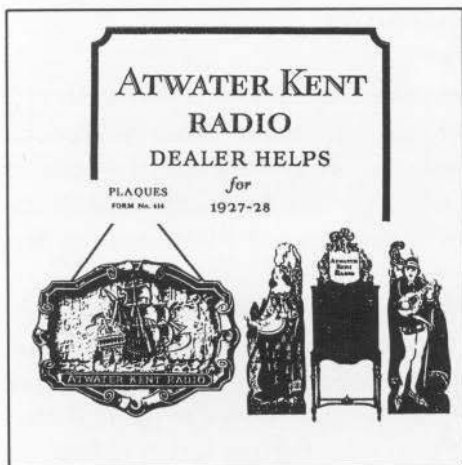


**Figure 42.** *Some of the many AK radio dealer support items, 1927-18.*

Sales Promotion Plan is shown in Figure 43. With this kind of material and with his institutional advertising campaign using print and broadcasting, Kent influenced potential customers as strongly as any other radio manufacturer of that time.

### KENT SNAPS THE LOCK

The time has come to ask, "Was Atwater Kent really a master marketer?" We established the concepts by which the question could be answered. There had to be a useful product and Kent certainly had demonstrated his capability in both factors of the Making process. He kept himself constantly aware of what his factory could do and how efficiently it ran. He showed many times how he could improve his manufacturing ability by adding new buildings, new machines and new practices. At the peak of Atwater Kent's success in building radios, after the three millionth set in 1931, he made completely clear his understanding and success with the Using process. From the ignition days he made his decisions based on his customers' uses for his products. That recognition stayed through the entire radio production. When Kent understood the effectiveness of changing his customer's expectations about radio in favor of his products, he showed that all the factors of the marketing function were in place and he was applying them effectively to control his business. He was indeed a master marketer.

Leaving the analysis at the peak of Atwater Kent's production only considers the up-side of the business as the base for the assessment. There was also a down-side, all the time from 1932 until he closed in 1936. New conditions altered the factors in the marketing function. The factors in the Making process were altered by the superheterodyne circuit and changing styles. The results were smaller mechanical radios that provided very

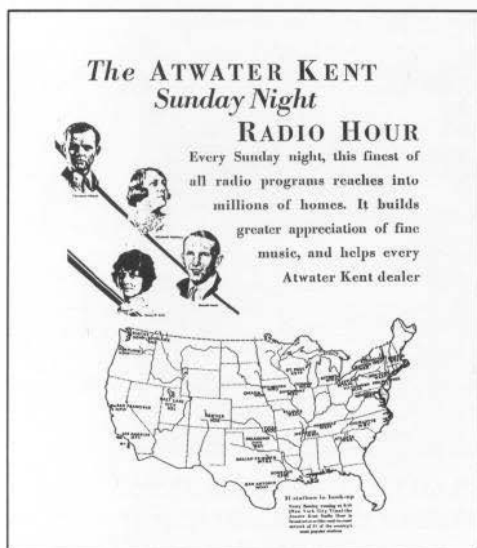


**Figure 43.** Sales promotion of the AK Sunday night Radio Hour.

acceptable performance at a price more in line with what the customer in the 1930s could pay. That impacted the factory two ways; the production procedures had to change, and the costs had to go down.

The investment in the big presses and the big chassis handling equipment no longer paid off since that part of the factory had to be idled. Customers' taste for cabinetry changed to compact sets that had to compete with the offerings of other manufacturers. Unfortunately, there was nearly no margin for profit when the cabinet suppliers' costs were paid.

Kent understood these new factors in the Using and the Making processes. His customers were being pressed by their own economic situations and were therefore increasingly buying for price rather than for brand-name. The total dollar volume was reduced by both the price changes caused by the smaller sets and by the tendency to keep older sets in service instead of replacing them. There was little Kent could do to influence potential customers to buy his line of radios beyond what he had been doing since he started extensive print and radio advertising. After the peak years, Kent's marketing analysis pointed only to negative changes on both the Making and Using processes.

Kent was not alone in this dismal analysis. All the big manufacturers were being forced to the same conclusions. Some saw their future as bleak and retrenched. Some hung on with the hope that things would get better. Some manufacturers were pushed out of the market. One company sharpened its approach and succeeded even through the worst of the depression. That company was not Atwater Kent; it was Philco.

During the early thirties, Atwater Kent tried to continue but several forces were working against him. His marketing function said he could

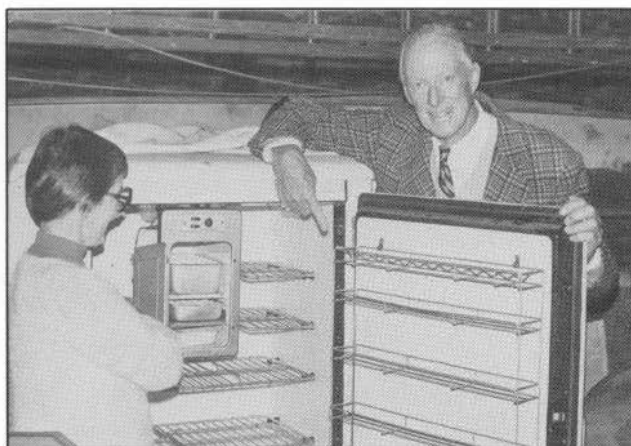


**Figure 44.** *Selling an AK refrigerator. In this photo, taken about 1979, Elinor Williams is shown with Atwater Kent, Jr.*

not expect a different future unless he used a totally different approach. In 1934 he decided on a new approach and entered the major appliance business by producing a refrigerator. From the Making process standpoint it was a good choice since the factory could make the panels and frames of the refrigerators using the big presses. They were idle most of the time since they were used for only a few of the big sets that were still being made. The compressor with its condenser and piping was not a difficult engineering or manufacturing task. Refrigerating machines had become standard products by 1935.

The Using process analysis was not favorable. While Kent could easily discern the customers' ways of using household refrigerators he could not easily assess how the average customer could pay for the machine. Worse, there were other manufacturers who had already staked out large portions of the total market. General Electric and General Motors were formidable and Crosley was almost as powerful.

The refrigerator itself was competitive, especially since it used shelves in the door, probably licensed from Crosley who owned the name Shelvador. Figure 44 shows the top Atwater Kent salesman trying to sell one of the refrigerators to a very interested customer. To help you identify the actors in the play, the initials are AAK and ELW. Needless to say, the addition of refrigeration to the radio line did not alter the basic marketing situation.

While changing the entire business approach to radio manufacturing was within Kent's capability as a business man (the example of Philco showed that a different approach was possible), he had to balance the revision of the business and the new demands on his life-style against the payoff. He was a millionaire many times over; therefore money had little appeal. Power as an entrepreneur offered no new satisfaction.

The challenge of the new business was not nearly as attractive this time as those challenges that he had met before, the ignition invention and its success, and becoming the world's largest radio manufacturer. Beyond these negatives was his distaste for the way a business had to be run in the New Deal Era. Kent was a typical American capitalist, rugged, self-centered and unsympathetic to the deplorable conditions of the world in the thirties. He was also nearing the time in his life when he wanted to enjoy the pleasures of retirement instead of the driving achievements of business.

For all these reasons, Kent's personal marketing analysis said that it was time to go. As his son, Atty, told it to us, his dad brought him to the factory, told him to sell the fixtures and the plant, and snapped the lock.



## AN APPRECIATION

In the initial process of analyzing the Atwater Kent radios in the Voice of the Twenties collection, and in responding to questions about their circuits and styles, Elinor and I came to realize that we were studying a person as much as we were fitting together the story of his radios.

Technical details were easy to extract from the radios and from written material, particularly factory publications. Much harder was the gathering of information about Atwater Kent himself. Examination of newspaper and magazine articles amplified the history of the company but told little of the man behind its growth. Our understanding of Atwater Kent has come from people who knew him directly and from historians who studied him.

We take this opportunity to identify and thank the critical sources of the material in the article:

Atwater Kent Jr. When we lived in King of Prussia, PA, Atwater Kent Jr. (Atty) learned that we had a museum that featured AK radios and related artifacts. He visited us and was fascinated by the idea that his father was famous for his radios. We became good friends and Atty shared with us his memories of his father and the few pieces of graphic history that he had kept.

Peter Kent, Atty's son. Peter's interest in his grandfather was strong, so when we arranged a visit to the remnant of the Stenton Avenue factory

Peter recorded our adventure and shared his family recollections, particularly as they related to his grandfather's automobiles.

Franklin and Margaret Atlee. We met the Atlees shortly after we moved to Pennsylvania (and joined AWA). From them we got a strong understanding of Kent's attitude toward his customers and their satisfaction with his products. Frank gave us some of our first breadboard instruments.

Alan Douglas. Over the years we have shared our friendship with Alan and we have been the grateful beneficiaries of his extensive analysis of early radio contemporary publications. Alone that would not have sufficiently characterized AK, but Alan's correspondence and personal contacts with Atwater Kent Jr. and with members of the manufacturing company staff have enriched our understanding of the human side of Kent's career.

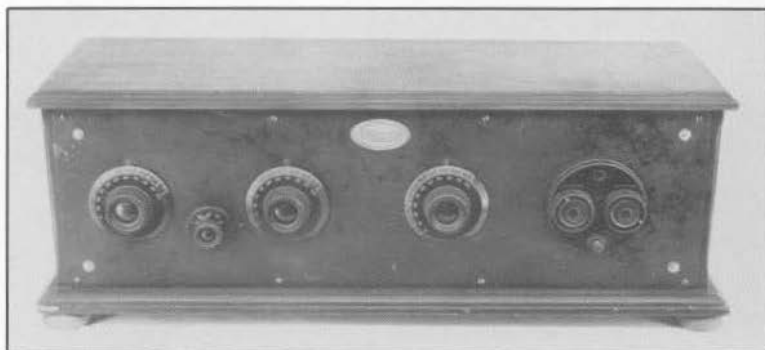
John Wolkonowitz. Almost from the beginning of our interest in AK we have exchanged ideas and analysis with John about AK, his factories and his radios. John's insistence on accuracy and consistency has significantly amplified and clarified our work. Particularly important was his (and Alan's) participation in the day-long visit with Atty and Peter to the early factory facilities.

David Kenig. About 1970, when we first opened the Voice of the Twenties museum, Dave was an interested visitor. He was doing research for a thesis and had chosen early radio as his subject, with the emphasis on Philadelphia manufacturers. A small change in emphasis resulted in his diligent research of the AK growth and success story. His research was both an early guide and a later fact-filled source for our museum and our work on AK history.

Jeffrey Ray. The proximity of Philadelphia and our friendship with Atty led to our strong interest in the Atwater Kent Museum and its role in preserving the city's history. We were introduced to Jeff who welcomed us to the museum, its history and its mission. Like so many others we were disappointed to learn that the museum did not feature AK radios. For our purpose of getting to know Kent himself, Jeff's experience and his friendship were excellent sources of information about Kent's support of the public good.

Ralph O. Williams

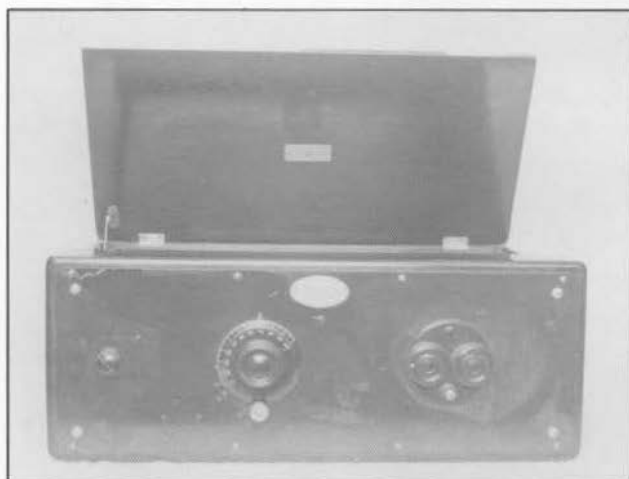
## SOME ATWATER KENT RADIOS



*Model 24*



*Model 37*



*Model 33*



*Model 38*



*Model 43*



*Model 47*



*Model 50*



**RALPH O. WILLIAMS**  
**N3VT**

*Born in November, 1920, coincident with KDKA's first broadcast, Ralph attended high school in NJ, followed by Cooper Union College. When WWII intervened, he studied radar and after serving as a radar officer in China, he completed college at Northeastern University in Boston. After graduating in 1947, he joined General Electric and worked in various aspects of radio engineering. He developed an interest in the history of the radio art, and after a 1965 move to Philadelphia, he concentrated his efforts on the historical material of RCA and Atwater Kent.*

*He joined the AWA, and through association and with the encouragement of other collectors he rapidly built a collection of Atwater Kent radio artifacts. He obtained his master's degree in engineering science; his thesis was on the information-processing efficiency of the Morse telegraph code. Over the years he has been a steady contributor to the various programs and other activities of the AWA. His series of landmark articles on Atwater Kent radio receivers in the first three volumes of the AWA REVIEW, unfortunately now out of print, are considered prime information sources for collectors.*

*After retiring from GE in 1980, Ralph moved to Orient, NY on the northeastern end of Long Island, where he and Elinor and his excellent collection of Atwater Kent material reside in an historic house more than 300 years old.*