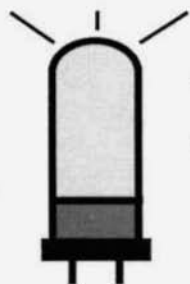


\$2.50

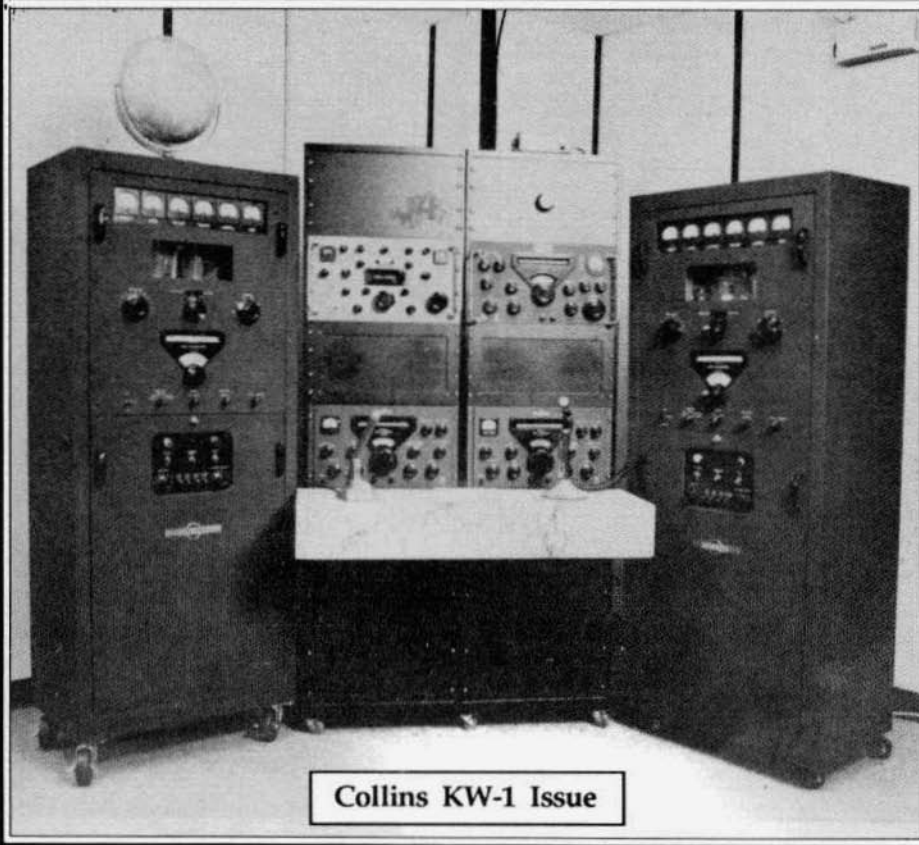


ELECTRIC RADIO

celebrating a bygone era

Number 23

March 1991



Collins KW-1 Issue

ELECTRIC RADIO

EDITOR/PUBLISHER Barry Wiseman N6CSW/Ø

Published Monthly by Barry R. Wiseman

at

145 C.R. 123

Hesperus, CO 81326

Second Class Postage Paid at Hesperus, CO
authorization no. 004611

Postmaster Send Address Changes to:

Electric Radio, 145 C.R. 123, Hesperus, CO 81326

copyright 1990 by Barry R. Wiseman

The Purpose of Electric Radio

Electric Radio is published for amateur radio operators and others who appreciate vintage radio equipment. It is hoped that the magazine will stimulate the collecting of, and interest in, this type of equipment. The magazine will provide information regarding the modification, repair and building of equipment. We will also work towards a greater understanding of amplitude modulation and the problems this mode faces.

Electric Radio Solicits Material

We are constantly searching for good material for the magazine. We want articles on almost anything that pertains to the older amateur equipment or AM operation. From time to time we will also have articles and stories relevant to the C.W operator and the SWL. Good photos of ham shacks, home-brew equipment and AM operators (preferably in front of their equipment) are always needed. We also welcome suggestions for stories or information on unusual equipment. For additional information please write us or give us a call.

EDITOR'S COMMENTS Barry Wiseman, N6CSW/Ø

This issue - that we've been calling "The Collins KW-1 Special Edition" - marks the first time ER has departed from its usual format. I hope there's something here for everyone. It's been fun to put together. However some hard decisions had to be made; which articles to include, which photos and so on. We only have so much space. Most of the photos and articles that were 'left over' will find their way into future issues.

I think the KW-1 is an outstanding example of Collins design and engineering. The rig is big and beautiful and as a self-contained 1 KW amateur transmitter it is without equal. It covers all bands 160 thru 10, it operates AM, CW, NBFM and some were modified by Collins to operate as a SSB linear amplifier with just a flip of a switch or two. It's well designed and engineered and uses high quality components throughout. Collins only made 150 or so and they aren't going to be making any more. It was the 'dream' transmitter when it was introduced in 1950 and for many it still is today. I think it represents a 'high point' in American engineering and manufacturing. My congratulations go out to all those fortunate individuals who own one of these "classics".

Next issue we'll be back to our usual format with our usual fare but as issue #24, it will also be somewhat special. It will mark our survival for a full two years. Somehow it just seems like yesterday that I was struggling with issue #1. Time flies when you're having fun. On to 24.....

TABLE OF CONTENTS

2	In Memory of Edgar F. Johnson and Ethel Johnson	Johnson Week
3	AM Power Issue Update	KW11
4	Electric Radio in Uniform	KJ4KV
12	Collins KW-1, Design and Engineering	K7YOO
16	The List...KW-1s and Owners	N6CSW/Ø
17	Lee Faber, W7EH and his KW-1	
18	Dale Gagnon, KW11 with his KW1s	
19	Sam Thompson, W6H DU and Darrell Brooks, WA5VGO	
20	Mike Palmer, K5FZ, with his prototype	
22	Restoring/Repainting a KW-1	KØDEW
25	Keeping the KW-1 Cool and Quiet	K7VZP
26	KW-1 Audio	KA5DGH
28	Lee Bahr, WØVT, restoring SN 34	
29	Fred Albertson, W4BD, his station circa 1962	
32	Classifieds	

Cover: A display at the Hammond Museum of Radio, Guelph, Ontario, Canada, showing 2 Collins KW-1 transmitters with a Collins R390A, 51J4 and two 75A4 receivers.

In Memory of Edgar F. Johnson and Ethel Johnson

From the "Johnson Week" the E.F. Johnson Company newsletter.

Edgar F. Johnson, founder and former President and Chairman of E.F. Johnson Company, died of cancer Monday, February 11th, at his home on Clear Lake in Waseca, Minnesota. His wife of 67 years, Ethel, passed away just two days later on her 96th birthday. Edgar celebrated his 91st birthday on June 13, 1990. For over 50 years, Edgar headed the Company, retiring from the Board of Directors on October 10, 1983.



Edgar F. Johnson was born on a farm six miles southeast of Waseca in Otisco township, Minnesota, in 1899. At the age of four, he and his family moved into the city of Waseca where his father, Charles Johnson, was a home builder and later owned a hardware store and wood-working shop. Edgar's first experience with electronics occurred when his half-brother, Charlie Johnson, strung lines between two neighborhood houses for Morse telegraphy. That experience and additional exposure to radio in high-school led to Edgar's decision to attend the University of Minnesota where he earned a degree in electrical engineering in 1921. Just last month, the E.F. Johnson Company Foundation pledged \$100,000 for the establishment of an endowed chair in Edgar's name in Electronics Engineering at the University.

As a student at the University, Edgar met his wife, Ethel Jones, who came to Minnesota from California to pursue a degree in education. Prior to their marriage, Ethel taught school at Wishek,

North Dakota, and worked in social services at the University of Minnesota. The Johnsons were married July 28, 1923, in Claremont, California, and made their home in Waseca. In October of that same year, their entrepreneurial spirit led them to pool their resources of approximately \$2,500 and invest in the radio business. The first office of

E.F. Johnson company was in the Johnson's bedroom. When the children came along they opened their first shop in a small frame building on the lot where Katie O'Leary's Restaurant is now located. The original focus of the Company was retail sales of component radio parts to broadcast stations, amateur or ham radio operators, and broadcast listeners. During the 1924 World Series, Edgar broadcast the game to Waseca residents by loudspeaker in front of the store, since few people had radio receivers in those days. In 1925 Edgar's brother, Marvin, joined the business, and another brother, Everett, became a partner in 1940. Marvin's wife, Mildred, and Everett's wife, Ruth, were also involved in the business which became a six-way family partnership.

In the fall of 1936, E.F. Johnson Company built its first factory and office building of 8,000 square feet. Seventeen people were employed at the facility. The components designed and produced there were eventually needed in volume for World War II. Before the War ended in 1945, E.F. Johnson Company had grown to 500 employees with expanded

AM Power Issue Update

by Dale Gagnon, KW11
9 Dean Ave.
Bow, NH 03304

AM Power Issue Update March, 1991

I had business in the Washington area the last week of February and planned to visit the FCC to make personal contact with anybody in the Private Radio Bureau who might be available. I was able to set up a meeting with Robert McNamara, Chief of Special Services, which includes the Personal Radio Branch and William Cross of the Personal Radio Branch. When I confirmed these meetings the day before arriving in Washington I was informed that I would need an ex parte disclosure document describing who I was to meet with and what I would discuss. This was necessary because my recent Petition For Reconsideration of the FCC's denial of the power petitions had just gone out for a 15 day public comment period a few days before. The law states that personal visits must be documented and in the public record for all parties to inspect.

This put me in a dilemma because I was away from the office and I did not have typing or work processing resources immediately available. I called Walt Hutchens, KJ4KV, in nearby Arlington, Virginia, that night to ask for help. He was only too glad to offer assistance. I arrived at his QTH the following day late in the morning and he prepared a document on his computer from my hand-written notes. He also ran me into the M Street location of the FCC in Washington for an early afternoon meeting. I enjoyed the few moments I was able to spend in his shack admiring his beautifully preserved military gear. I will definitely return to Walt's for a longer visit in the future.

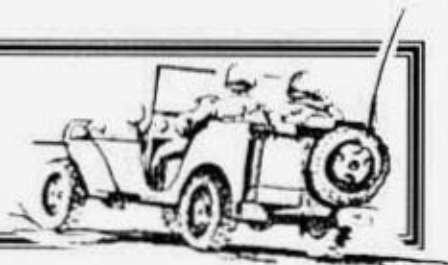
At the FCC I had to sign in and present identification to obtain a visitors badge. This is a new procedure for the Commission as a result of the Gulf War. I was able to speak with Robert McNamara and William Cross for over one and a half hours. I reviewed the merits of my petition. I explained why high power AM users had not modified their equipment in advance of the grandfather clause termination. We had expected the current resurgence of interest in AM to justify special power measurement considerations in 1990 when the issue was reconsidered as promised by the FCC in 1983. I suggested that high-power AM usage had not been a regulation problem for the FCC in the past decade nor is it ever likely to be.

Mr. Cross and Mr. McNamara did not seem fully convinced of this increase in AM interest. I emphasized the importance of the ten-fold increase in comment volume on the AM petitions this last summer in comparison to AM comment volume in 1980 and the roughly comparable positive comment volume for the no-code license petition.

Mr. Cross felt that the general sense of petition comments in support of the AM position were from low-power users who would not be impacted. It is true that a few specifically mentioned that they did not run high power but I told Mr. Cross that I believed he was mistaken. I recognized many high-power users who sent me copies of their comments even though they did not mention their transmitting equipment in their comments.

In a discussion of the financial impact on amateurs, Mr. McNamara compared it to a channel spacing rulechange in the Aviation Service. It was estimated to have a \$93,000,000 equipment obsolescence impact. Some aviators in remote

ELECTRIC RADIO IN UNIFORM



by Walt Hutchens, KJ4KV
3123 N. Military Rd.
Arlington, VA 22207

"The ATK/ARK Television System"

Among the most riveting pictures from the Persian Gulf War are those showing 'smart' bombs diving down an air shaft of a command building, onto a highway bridge, and into a complex of oil field valves. Such weapons are not a new idea, in fact, some of the hardware from a WW-II attempt to build them was familiar to hams of the 50's and 60's. This month we will look at the TV camera from that early hardware and ask why - if we started trying in the 1940's - it took until 1990 to make the idea work.

Overview

The ATK is the transmitting end of a WW-II era Navy television system; the ARK is the receiving end. The ATJ and ARJ are nearly identical systems, in fact the camera unit is designated ATJ/ATK and serves both. This equipment was intended for use in glide bombs and similar applications. It was developed for the U.S. Army as SCR-549 (the transmitting set), and SCR-550 (the receiving set), but we will use the Navy nomenclature. The equipment consists of a camera (called a 'conversion unit'), a transmitter with an average output of perhaps 15 watts, a receiver, a dynamotor, and several test sets, control boxes, and other items. Both transmitter and receiver are continuous tuning from 260 to 320 Mcs, though for operational purposes ten channel frequencies were assigned.

In a typical glide bomb application the

camera and transmitter would be installed pointing forward on the bomb and the receiver in a control plane such as a B-17. The bomb would be carried to the target area under the wing of the control plane, pointed as accurately as possible at the target, and then released. An operator in the control plane would watch the receiver and use a separate radio control set to try to make a direct hit out of what would otherwise be a near miss.

A variation was the use of a worn out aircraft loaded with explosives; the TV-equipped plane would be flown by remote control to the target area and then crashed into the target.

The camera weighs 36 pounds and is 11-3/4" x 9-1/2" x 23-1/2" (H x W x L); the total weight of the gear in the bomb is 99 pounds. The control aircraft equipment weighs 57 pounds. Like other aircraft radios of the time, the ATK/ARK gear must be protected from the weather; the camera was mounted in a closed plywood case under the bomb. My camera came equipped with a moderate telephoto lens; this was probably standard. Both bomb and control aircraft equipment need 28 volt DC; a battery was used to power the bomb equipment.

The ATK transmits a 350 line picture at 40 frames/second giving a horizontal scanning frequency of 14,000 cps. The video bandwidth is 4 Mcs. (Modern commercial TV is based on 30 frames and a



The ATJ/ATK camera. Connectors for power, video and synch to the transmitter, and power and video out to a local monitor unit used in some applications are located on the rear. Hinged panels on the sides allow access to controls and focus adjustments.

525 line picture giving a horizontal frequency of 15,750 cps.) The camera uses 17 octal tubes. The camera tube is an 1846 iconoscope, one of the first production vacuum tubes for this job. The transmitter has 8 octal and 4 special (8025 VHF triode) tubes. The receiver uses 2 6J6's and 7 6AGS miniature tubes and 15 octal types.

History

Experiments with television go back to the early years of radio; commercial TV broadcasting began in the late 1930's. During mid-1941, the Army Air Forces, the Signal Corps, and RCA collaborated in experiments at Wright Field to demonstrate that TV pictures could be used to guide an aircraft. These tests led to an RCA-Victor development contract under which at least two generations of TV systems were produced. There were many problems to be solved and it was June, 1944, by the time a working sys-

tem was sent to England for operational use. This system was used to guide a GB-4 glide bomb from a B-17 aircraft. Unfortunately, the first targets (German submarine pens at Le Havre and La Pallice) had to be attacked over water and the system had not been tested in this situation. Reflections from the water interfered with the direct signal so severely as to make the picture unusable; other targets (approached over land) were successfully attacked later.

Though they barely managed to get into the war, and were in any case militarily unimportant, these sets were used later to control aircraft going where humans could not, such as collecting air samples during nuclear bomb tests. The Navy equipment showed up on the surplus market in the mid-50's, probably because it was replaced with newer gear. I don't know how many were produced; my camera is s/n 751.

ER in Uniform from previous page Design

There's nothing remarkable about the design of this equipment. The camera is built on a 4" deep chassis. The 1846 camera tube is mounted in a saddle at one end.

Inside the tube is a sheet of mica covered with silver particles and coated with cesium. The scene in front of the camera is projected on this 'mosaic' by a lens at the front of the unit. A gun, mounted at a 45 degree angle below and in front of the tube scans an electron beam across the mosaic. The cesium-coated silver particles give off electrons in proportion to the light falling on them; as the beam scans the mosaic, a signal corresponding to the brightness is coupled out by a conductive layer of the back side of the mica sheet.

A camera tube of this design is called an 'iconoscope'. Scanning from the front (and thus at an angle) means that the beam travels different distances to different parts of the mosaic. Also, the electrons knocked from the mosaic form a cloud of varying density in front of it. These effects make the sensitivity of the tube greater in some areas than others; we will see later how this problem is minimized.

The electronics are much like those of the RCA 630-series TV sets of the 1950's. There's a deflection yoke mounted on the neck of the iconoscope. A 6L6 driven by a 12SL7 multivibrator provides horizontal deflection; a 12SN7 vertical output tube is driven by another 12SL7. The five-stage video amplifier uses 1649 tubes which are special low-microphonic 6AC7's; the first three stages are shock mounted to further reduce microphonics - a big problem in high-gain aircraft gear.

There are no external controls (not too useful in a guided missile) but there are about twenty internal adjustments, including all those familiar from the early commercial TV receivers.

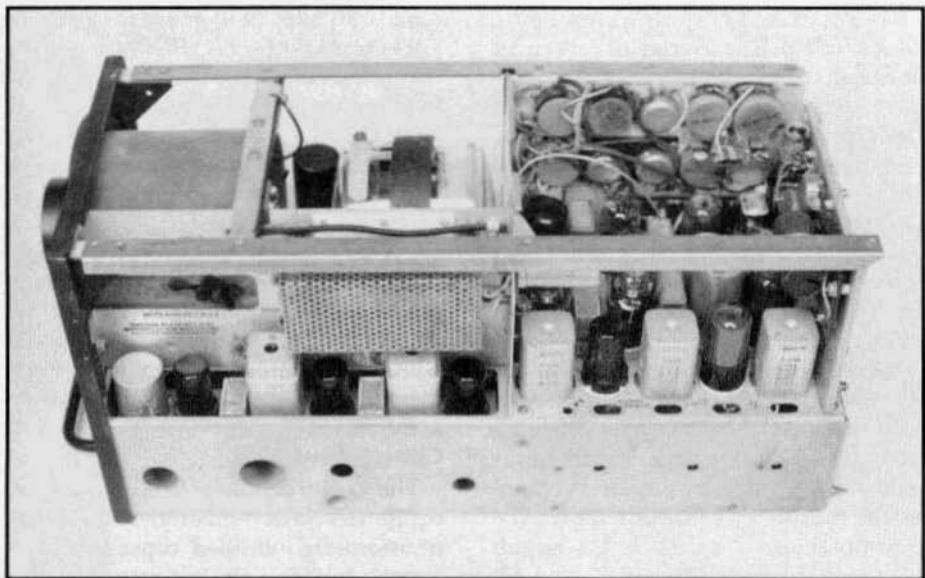
To reduce the effects of uneven mosaic sensitivity, signals are generated to vary the bias on the first video amplifier as the beam scans the picture. These signals can be adjusted to correct one side against the other and to correct the center against both sides in both vertical and horizontal directions.

The dynamotor supplies +405 volts and -50 volts. Positive voltages for critical circuits are stabilized by a pair of VR-150 regulator tubes. The iconoscope also needs -600 volts; this is developed from the horizontal output signal just as in a TV receiver.

The iconoscope filament is near the -600 volt level so it can't be connected to the primary supply; it can't be driven from the dynamotor (as is done in some other military sets needing an isolated filament supply) because with 80 db of video gain, commutator noise would show up in the picture. A 6L6 Hartley oscillator running at the horizontal frequency is used to drive the filament and also to trigger the 12SL7 horizontal oscillator. (In some models of the camera the horizontal oscillator drives the filament supply 6L6; the result is the same, though the circuit is quite different.)

The mosaic can easily be damaged by too much light - such as an image of the sun. An electrically operated shutter behind the lens lets you protect the camera tube until the bomb is aligned on target and ready to be released. Some models also had an orange filter to help see through haze.

The transmitter is a separate unit. The final is a pair of 8025's in push-pull; they are cathode driven by another pair of 8025's in a tuned-plate tuned-cathode oscillator. The video signal is used to grid modulate the final; the horizontal and vertical synch signals plate modulate the tubes. The resulting output is equivalent to a modern TV signal except that it contains both sidebands and has no audio carrier.



Left side of the ATK/ATJ camera. The barrel of the lens assembly is at top left with the top of the iconoscope visible to the right of it. The video amplifier is along the near edge of the chassis with the first three stages shock mounted at the left. At the right far side and rear of the camera are the control panels.



The 1846 iconoscope, an 8025 VHF triode, and a metal 6L6 for size comparison. The second anode connections to the iconoscope are made through one of the four 'plate' caps visible around the bulb; the mosaic (video output) connection is made to another cap on the far side of the bulb. The image is projected on to the mosaic through the surface on the right.

ER in Uniform from page 6

The receiving system is conventional, except for a plastic overlay of concentric circles on the picture tube to make it easier to line up the target.

On The Air With The ATK Camera

Half the fun of these In Uniform projects is getting output from strange pieces of gear. Since I did not have a suitable transmitter, I used a Channel Master video modulator (\$1 at a local hamfest) to get the ATK camera output to the bedroom TV set.

For a unit this old – and an unfamiliar technology at that (when I last worked inside a TV set, 6SN7s were standard) – putting the ATK camera in operation was amazingly easy. I used a spare dynamotor for the 400 volt power supply. The dynamotor also had a 9 volt AC output; this was stepped up, rectified, and filtered to provide the 50 volt bias. The camera electrolytics had to be re-formed; two of them which were much below the right values were shunted with new units.

The horizontal oscillator coil is slug tuned; mine had enough range to hit 15,750 cps without modification. The vertical oscillator is a cathode-coupled multivibrator; shunting the existing 1.2 meg grid leak with a 2.2 meg resistor allowed setting it to 60 cps with the 'vertical speed' pot.

I added a small trimmer cap between the synch and video outputs to provide the 'composite' signal expected by the video modulator, carried the whole mess up to the bedroom, and – it worked! The picture got much better when I reduced the video output by adding a 560 ohm resistor in series with the output jack. Evidently my video modulator had been overloaded by the 1 volt RMS output of the camera and was distorting the video and compressing the synch pulses.

The black bar at the left of the picture comes from the difference between the 18 usec horizontal blanking period of the ATK system and the modern TV stan-

dard of 10 usec. Not only is the percentage of blanking higher (18/77 usec rather than 10/65 usec) but flyback and blanking time are fixed by the inductance and stray capacitance of the deflection yoke so they do not go down when the scanning frequency is raised.

Donald Stoner, W6TNS, described a conversion of this camera in the May, 1957, issue of CQ Magazine. This article probably helped quite a few hams get on ATV; unfortunately he had the model with the 6L6 amplifier for the iconoscope filament supply so it was not much help to me.

Conclusions

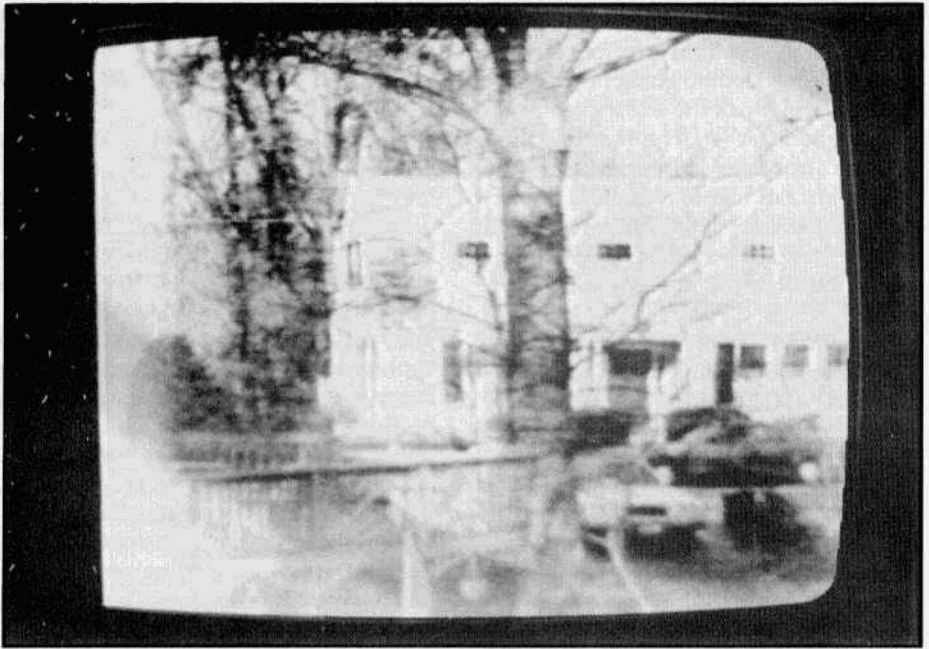
The construction of the ATK/ARK equipment is top-quality, with sealed transformers, oil-filled capacitors, and ceramic tube sockets. It is easy to service and the technical manual is outstanding, with clear and detailed theory and many oscilloscope and monitor pictures as well as the usual tables and diagrams. Particularly noteworthy are the photos showing waveforms with parts of the circuit disconnected, so you can see exactly what (for example) the damper diode does.

Will those who have been 'bitten' by a second anode raise their hands? Me too – but placing the cathode of the ATK iconoscope at -600 volts let the designers ground the much more accessible second anode. Thanks...

Electronically the set is a fine example of the TV technology of the 1940's; its failings are mainly those of that technology.

6AC7s are not ideal video amplifiers; the noise from the first video stage is visible as a faint 'snow' in the TV picture.

The iconoscope has many limitations. The geometric problems caused by scanning at a 45 degree angle to the mosaic make the camera circuit more complicated. The variations in sensitivity over the surface of the mosaic require still



Looking across the KJ4KV back yard with an ATK/ATJ camera. The house is across the street at the back of our block at a distance of about 75 yards. The vertical black bar at the left of the picture is discussed in the text.

more corrective circuits, the corrections are only 'right' at a certain light level, and they are imperfect at best. Most of the controls interact with each other, so adjusting the picture takes several minutes.

Other iconoscope difficulties show up in civilian and ham applications. It needs a lot of light by modern standards; while a cloudy day outdoors is adequate, a room lit for comfortable reading gives no picture at all. It can't handle scenes with a lot of contrast: if there is both a light object in sunlight and a dark object in partial shade, one or the other will be lost.

Technically (as a military TV) the ATK/ARK equipment is fine. But as part of a 'smart' bomb system, there are serious problems.

We often take new technology and look for a problem it can solve: Burger King is probably the result of someone

asking the question "What happens if I throw meat in the fire you just invented?", rather than his (or her) wondering "How do you flame-broil a mammoth steak?" The ATK/ARK equipment is a more recent example of this, as shown in the first paragraph of 'Television Equipment for Guided Missiles' appearing in the Proceedings of the I.R.E., June 1946:

"With the rapid growth of the electronic art, during the latter part of the last decade, there appeared a definite possibility of utilizing television equipment in 'suicide-type' airborne missiles in order to achieve high accuracy. Consequently, a project was established (to develop such equipment) for use in guided missiles..."

But bombs based on the ATK/ARK equipment (which was the result of this project) were militarily a flop, used only a few times and without noteworthy suc-

ER in Uniform from previous page

cess. I believe the reasons were:

(1) Human reactions are too slow to allow guiding a bomb going much faster than an airplane of the 40's to a collision with a small target. The time of flight thus had to be several minutes and the control aircraft had to remain in line-of-sight contact during this time. This ruled out use in areas with heavy AA fire or where the allies did not have air superiority.

(2) Bombs slow enough to be guided by a human are 'sitting ducks' for radar-directed AA gunfire with proximity fused shells - both in use by the close of the war. (A proximity fuse is a tiny radar in the nose of the shell which makes it explode as it passes the target.) The jet fighter and surface-to-air missile also made their debuts in the final months of the war.

(3) If maneuvering caused the target to pass out of the camera's field of view, it often could not be found. There was no way for the camera to 'look around' (as a human would do) and providing a variable field of view was considered too cumbersome. (Because of the great amount of calculations to be done, the modern zoom lens was impossible until digital computers became available.)

(4) There was little of the concern we feel today for the killing of civilians, so small targets could be hit with enough 'dumb' bombs to do the job, even if (as often happened) the surrounding half-mile was also flattened.

Using TV to guide a bomb 'worked', but it solved the wrong problem. Bombing under human control was inaccurate at best. Moreover, by the close of WW-II, 'defense' technology was gaining on 'offense' - the slow bomber (or glide bomb) was out of a job no matter where the pilot was sitting.

The problems of inaccuracy and low speed could not be solved until the invention of the transistor (1948) which allowed development of small fast com-

puters and servomechanisms, and the still later development of the laser which made it possible to 'point a flashlight' at the right target from a long distance. The bombs we see diving into six-foot square air shafts are based on these developments.

A common scheme is to use a laser beam to point out ('designate') the target; the laser may be carried by the bomber, another aircraft, or even a man on the ground. The beam is kept on the spot to be hit until the bomb lands. The beam is weightless and doesn't have to be 'flown' with ailerons and a rudder, so pointing it is much simpler than steering a bomb.

When the bomb is released, its control system flies it to the laser spot reflected by the target. Since the bomb control system is much quicker than a human pilot the bomb, too, can be fast, making the time of flight a matter of seconds rather than minutes.

The 'TV' pictures we see are from equipment on one of the planes, rather than on the bomb, and in many cases it is TV adapted to work with infra-red light (that is, heat, rather than visible light) so it can 'see in the dark'. This equipment is there to let the weapons officer or pilot see the target and keep the laser spot on it while the bomb is on the way.

The Iraqis had both radar controlled AA guns and surface-to-air missiles but jamming transmitters carried by other U.S. aircraft blinded them. There are missiles capable of following a jamming signal back to the aircraft carrying the transmitter, but Iraq did not have them - so our 'offense' was ahead of the 'defense' in this case.

Application of new technology to military gear has to start somewhere. The trouble is that looking for a problem which can be solved by a new technology can easily turn into labeling something the new technology might do as 'a

problem' (whether it is or not); if it is a real problem a rush to hardware may make it hard to admit the need for solving other parts of it. Attacking one such problem may delay the recognition of others: the ATK/ARK evidently was successful in a more general 'airborne TV' role after the war. And if the first 'problem' is expensive, there may not be money for one which is seen later.

This issue is as current as today's paper. 'Stealth' technology (making a plane nearly invisible to radar by the use of absorbent materials and reflection-cancelling design) was developed as a way to get manned bombers to Russia as part of a nuclear war, first as part of the initial exchange and later as a way to 'roam the rubble' afterward, to be sure nothing survives. The resulting B-2 bomber costs over half a billion dollars a copy so we didn't send any to the Persian Gulf -- but the F-117A fighter (which uses some of the same techniques) played an important role because of its ability to 'hang around' largely unseen to do things like designate 'smart bomb' targets.

Next year's federal budget has \$4.8 billion to build four more B-2's. Will we find the money to build a really stealthy attack plane at a cost low enough to allow using it against another ambitious thug? Or shall we count on him to not have anti-jammer missiles? •

AM Power Issue Update from page 3

areas complained that the rule change was unnecessary and unfairly penalized them. I contrasted our situation to this because unlike the Aviation Service which would realize benefits from the change in the more congested population areas no one anywhere gains from reducing the AM's power.

Mr. Cross and Mr. McNamara indicated the FCC wants a single standard of power measurement (P.E.P.). I asked if this meant one single value (1500

watts). This did not seem to be the case, especially in the light of separate power levels for novice and lower power levels required in the proximity of certain geographical areas. I pointed out that my original petition was consistent with this standard and that I had asked for a 750 watt (P.E.P.) unmodulated carrier power measurement for AM. I mentioned the FCC's original Notice of Proposed Rule-making which cited the well understood relationship between carrier power and the P.E.P. of a fully modulated carrier. I stressed that measurement of carrier power on a P.E.P. meter required no training or expense in the field for the FCC.

The FCC staff seems to come at this from a legal perspective defending the legality of their prior decisions. Mr. McNamara, an attorney, agreed that some situations may have several possible alternatives and regulators may settle on only one of these. I pressed the point that the power regulation alternative does not bring benefit to anyone to offset the harm it causes to the high-power AM operator and that better alternatives exist.

Mr. McNamara asked me if my petition presented any new information, an important ingredient for reconsideration. I mentioned here my suggestion of another temporary grandfather clause, presumably one with a carrier power (P.E.P.) measurement. This middle-ground solution would ultimately demonstrate the continuing interest in AM or prove the FCC's assertions.

After the meeting Mr. Cross accompanied me to the FCC secretary's office so I could file my *ex parte* document and I was on my way to explore Washington's Metro.

The comment period for those in opposition to the Petitions for Reconsiderations ends early in March and the Personal Radio Branch is expected to respond to the petitions by late spring. •

Collins KW-1, Design and Engineering

by Skip Green, K7YOO
POB 595
Winona, MN 55987

In late 1949 or early 1950, Art Collins made the decision that a full gallon transmitter was to be designed and built for the amateur market. This was to be a "no compromise" unit utilizing the highest quality components and incorporating all of the most advanced operating features of the era. This project had the engineering staff very concerned because they realized how much such a unit would have to cost and because there was no established market for such a transmitter. As usual, Art Collins was creating a market and setting a trend.

As head of an engineering section, Ernie Pappenfus, appointed John Foster to spearhead the project and come up with a suitable design. The first phase was tube selection and drawing of the original schematic. The exciter design was derived from existing designs, the 32V and 310A series and was modified to include 160 meter output and more modern tubes. The tank circuitry was designed from charts worked up by Warren Bruene, another Collins engineer who pioneered the use of the Pi-L output circuit for reduction of spurious outputs, which was of prime importance with the advent of television.

Upon review of the initial schematic diagram a couple of items were questioned by Art Collins. The first was a suggestion that an RF ammeter be added. The second was a query over the choice of audio output tubes, 810 triodes. Apparently Art questioned the choice of the 810 because he expected a more modern tetrode in the modulator section. John defended his choice on the basis that it

was a proven design known for its ability to produce a lot of clean audio output. Even though the drive requirements were higher the circuit simplicity and lack of need for a screen supply more than offset this.

The next step was to make up a bill of materials from the catalogs of vendors like E.F. Johnson, Eimac Sangamo, etc. This was (and still is) the job of any design engineer, to spec out stock parts or work with the vendor to come up with special designs to bring his project to completion. The transformer and heavy iron portion was ably handled by Ed Schmeichel (a ham of course) at Chicago transformer. An initial order for enough parts to build 1 unit -the prototype- was placed.

During this phase of the project John worked closely with a mechanical group led by Fred Johnson on layout and parts placement. John decided to mount the chokes on a vertical plate rather than the more traditional chassis for enhanced air circulation and layout convenience. This raised a few eyebrows although nobody came out and directly criticized the design. The controversy really centered around whether it looked "Collins" or not. Tradition strikes again! John perceived this and after a little discussion it was finally decided it looked like a Collins transmitter.

The final design resulted in a unit that was far ahead of any other ham transmitter on the market.

The KW-1 was packaged in a 66 1/2" tall wrinkle finish cabinet. A massive plate transformer sat at the bottom of the cabinet right beside the modulation transformer and both were solidly bolted to the steel base. Immediately above

these transformers was the vertical chassis where the power supply chokes and the high level splatter suppressor were mounted.

The power supply input choke was tuned with a 0.15 uf cap for improved regulation and the supply was a classic dual section choke input filter. No compromise was made in the power supply, an area sometimes skimmed on by some manufacturers. In front of this panel a narrow chassis was mounted that supported the 872 rectifier tubes and 810 modulators. These tubes were accessible by removing the front door of the transmitter. Above these items, at waist level, was the first "conventional" chassis, which contained the low voltage supplies and the audio driver section. The front of this section featured a control panel exposed through an opening in the front door of the transmitter. Audio level and power control switches were mounted on this panel in addition to low voltage fuses, filament voltage control and filament and HV indicator lights. The low voltage supplies all utilized conservatively rated components and each level, -150V bias, 300V and 500V all had separate transformers and chokes.

The audio section had many features designed to improve 'talk power' and a speech clipper as part of the design. A low pass filter following the 6AL5 clipper and a high level low pass filter (splatter suppressor) connected at the output of the modulation transformer was included to tame the audio harmonics and 'backshot' produced when clipping was used to increase the average level of modulation.

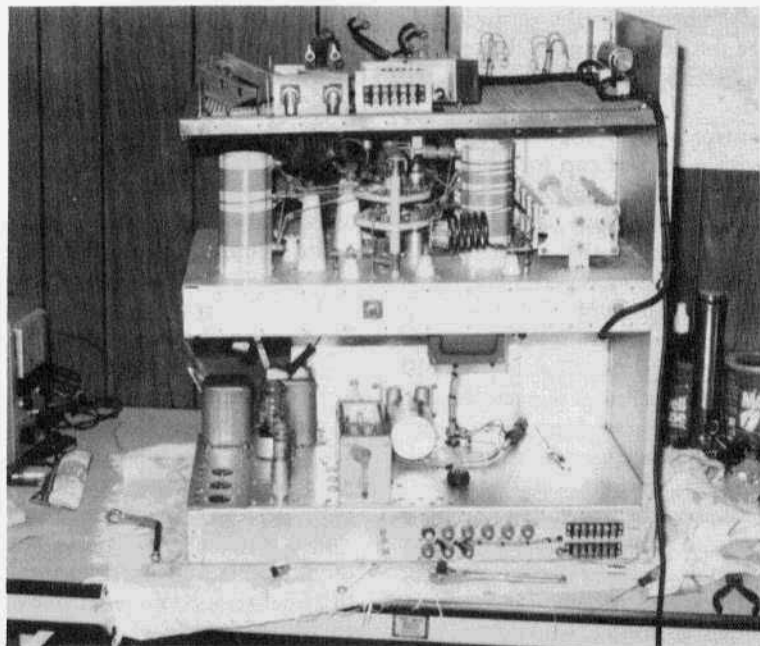
The entire upper half of the transmitter was taken up by the RF section contained in one large box consisting of two chassis in one shielded enclosure. The lower portion consisted of the exciter which was entirely bandswitching and VFO (PTO) controlled. All sections were slug tuned from a common rack, just like

the 75A receivers and 32V transmitters and requiring no tuning adjustments when QSYing from one frequency or band to the next. Most rigs of this era were a 'knob twiddler's delight' and took considerable time to QSY from band to band. The final stage in the exciter was an 807 tube which was always operated as straight through amplifier for driving the grids of the PA tubes. This was done to reduce harmonic content of the output to a bare minimum.

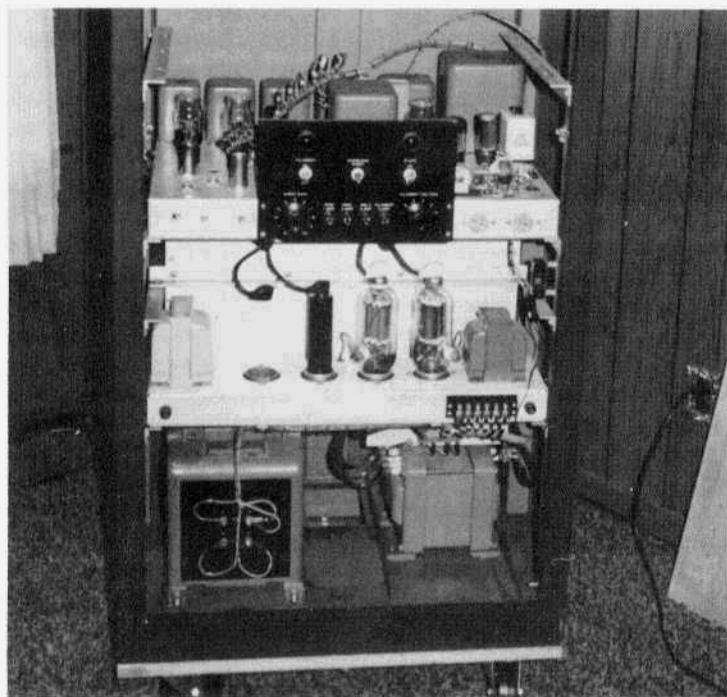
The upper deck consisted of the final tank section which in itself was a work of art. Large ceramic coil forms and silver plated coils were used exclusively and the plate tuning cap was a vacuum variable. The tank circuit was of course a Pi-L, insuring maximum harmonic attenuation and smooth tuning (dipping the final on a KW-1 is unlike any other transmitter).

The 4-250 PA tubes were mounted at the front of the chassis and positioned behind a screened window so plate color could be observed by the operator. Even the neutralizing cap was a small Jennings vacuum unit rather than the less costly cylinder or plate type air capacitor. The only area of apparent compromise was the tank circuit 'Q' was not optimum on 160 meters at the 1 KW level. This is the sole reason for the power reduction of 500 watts, as noted in the manual, for that band. This was of little consequence at the time because 160 M had severe QRM from Loran stations and power restrictions were generally in effect.

The output of the PA was routed through a low pass filter and a coaxial antenna changeover relay was provided. Only a receiver, antenna and a power source were required to put the KW-1 on the air. The crowning touch at the top of the transmitter was an impressive row of 6 meters monitoring all vital functions and giving the professional broadcast station appearance. Like a classic sports car or finely crafted handgun the



RF deck partially disassembled for restoration



Front view, panels removed, showing power supplies and modulator

KW-1 could be (and still is) appreciated without ever firing it up!

During the design and construction of the KW-1 many interesting incidents occurred. One occurred during the final assembly of the prototype. On a Friday afternoon (when else!) Art Collins decided that he wanted to use the KW-1 during the weekend DX contest. Art gave the word that a truck would pick up the rig for transport to his house in the afternoon and final assembly would take place there. It must be realized that up to this point the rig had never been fired up in its entirety and that Don Roberts had the RF section opened up on his bench. The scramble to get the rig ready progressed and as 5 p.m. rolled around everything was loaded up and transported to Art's large radio room in his home. Ernie Pappenfus assisted John in getting the unit assembled.

Art Collins said, "Just get it working on 20 meters". About 6:30 p.m., Art entered unexpectedly with two very welcome plates of steak and potatoes. Ernie began eating but John finished a part of the alignment before joining him. When John had eaten only two bites of his steak, Ernie finished his, stood up and asked, "Where did you put the screws for the rear door hinges?". While John showed him, Art swooped in unseen and removed their plates! Apparently art thought that John wasn't hungry! John is still hungry!

Ernie left after 7:30 p.m. (a bit late for his dinner date) when it became evident that everything was under control. At 11:00 p.m. John finished the alignment and assembly. Art said, "The band is dead now. I'll try it in the morning". John went home, leaving the final big test (the DX contest) for Art Collins. At 8:00 Saturday morning John got a call from Art, who said, "This thing really kills 'em", which pretty well summed up the success of the project.

It is interesting to note that before this project was completed Collins had or-

ders and even deposits in hand. By the time the KW-1 was released for production there was an order backlog of about 20 units. The astronomical price (\$3850) didn't seem to faze those wealthy enough to afford the ultimate rig. John Foster related an anecdote about a doctor who visited the plant at Cedar Rapids during the development of the KW-1. The doctor came in with a friend to admire the prototype and go over some of the technical features with the engineers. The subject of price finally came up and at a lull in the conversation the doctor's friend joked, "Babies are going to start costing more now!"

Because of the price, many of the KW-1's were bought by wealthy professionals and institutions (a few are still at universities). It is because of this that many have survived and can still be heard putting out a fine AM (or CW) signal on the air. Some of the transmitters even ended up in commercial broadcast service on the shortwave bands overseas. The superb engineering and the special history behind every one of the 150+ production transmitters makes them as exciting today as they were 38 years ago.

Thanks to John Foster, W0YDX, Ernie Pappenfus, K6EZ, and others without whose recollections and notes this article would not have been possible.

KW-1 Trivia

1. KW-1 serial numbers are located on the back of the cover on the RF deck as well as being stamped on the left (as viewed from the rear) RF deck support rail.

2. A KW-1 will work FB at the full KW level on 160 meters.

3. Early units were reputed to have better audio because as production progressed audio components were changed to restrict audio bandwidth and enhance 'talk power' at the expense of audio fidelity.

continued on page 25

The List... of KW-1's known to exist and their owners

This list was compiled from information provided by some of the KW-1 owners. It is undoubtedly incomplete and will contain some inaccuracies. If anyone can provide additional information I'll endeavor to print an upgraded list in a future issue. There are many rumors regarding where other units might be. For instance; the CIA is reported to have left 2 KW-1s in Cuba after the revolution and another is reported to be in broadcast service somewhere in South America. I'm sure there are other units in basements and attics around the country. These will probably continue to appear from time to time. N6CSW/Ø

- | | | |
|---------------|--------------------------|-------------|
| 1. WA2OAX | 41. NØHSY | 81. |
| 2. | 42. WW4B | 82. WA1IIE |
| 3. WD5BMD | 43. N4LEM | 83. |
| 4. | 44. W4TVN | 84. WØYXS |
| 5. WBØHUR | 45. Nat. Christ. Network | 85. |
| 6. | 46. | 86. K4MLJ |
| 7. W4BD | 47. WB6NVX | 87. |
| 8. | 48. AA4RM | 88. W3VL |
| 9. W7ISX | 49. | 89. |
| 10. WE5L | 50. | 90. WB5HRI |
| 11. W3MYK | 51. WA2PJP | 91. |
| 12. K4JU | 52. WB6NVX | 92. |
| 13. | 53. | 93. |
| 14. | 54. AC1Y | 94. W6JNR |
| 15. | 55. | 95. W6THW |
| 16. KA9YEP | 56. W3JCL | 96. W6FHC |
| 17. K7CMS | 57. W6OAU | 97. |
| 18. NJ6L | 58. K9MBS | 98. WA3GPE |
| 19. KØUN | 59. VE3HC | 99. |
| 20. W6HYK | 60. | 100. KD1AF |
| 21. | 61. KB6IJX | 101. |
| 22. | 62. | 102. |
| 23. | 63. | 103. KØUN |
| 24. | 64. | 104. K1MAN |
| 25. W1GZS | 65. WA6LSO | 105. K4EDK |
| 26. KCØKT | 66. WA5VGO | 106. |
| 27. | 67. | 107. K9ZVE |
| 28. | 68. | 108. K2NK |
| 29. | 69. | 109. KA2YLZ |
| 30. W4TVN | 70. | 110. |
| 31. | 71. KØDEW | 111. WA2BXX |
| 32. WØVT | 72. | 112. |
| 33. K7VZP | 73. WU8E | 113. |
| 34. KF6EA | 74. | 114. W8YX |
| 35. W7WQO | 75. WA4GGL | 115. W8POZ |
| 36. | 76. KA6PVN | 116. |
| 37. | 77. W8AHB | 117. |
| 38. Destroyed | 78. | 118. W6HDU |
| 39. | 79. K2BBK | 119. WX6K |
| 40. | 80. | 120. KØRZ |

121.
122.
123. KW1I
124.
125.
126. W2KW
127.
128.
129. W2KRM
130. WØBYH
131. KW1I

132.
133. W6CC
134. WA3PUN
135. N4XO
136. KØUN
137.
138. KFØB
139.
140. W4TVN
141. N2DXO
142. AH5A

143. K4GIT
144.
145.
146.
147. VE3HC
148. K7GCO
149. WC6D
150. K2LYC

Prototype #1. W8AU

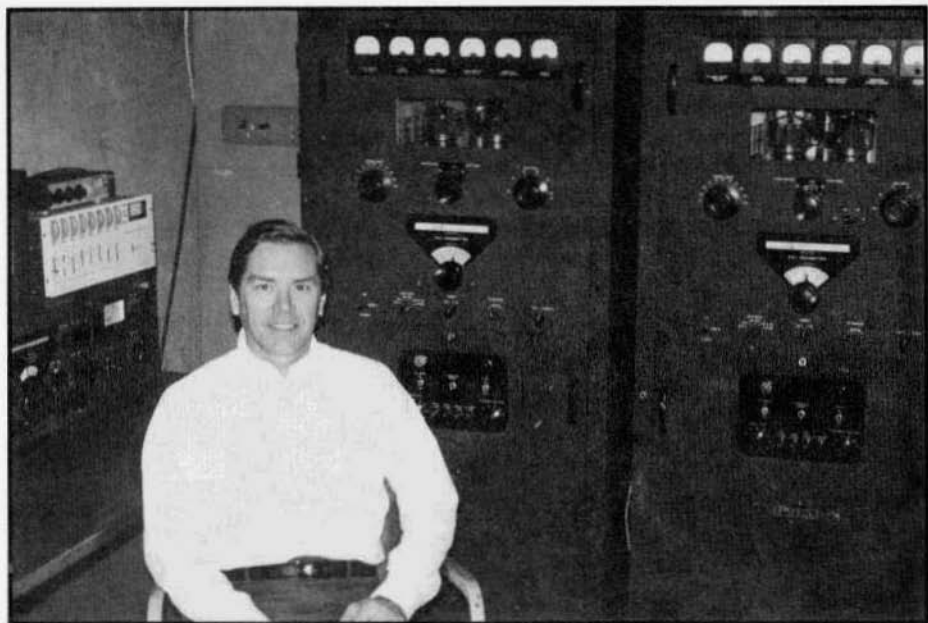
Prototype #2. K5FZ



Lee Faber, W7EH, (then W9EH) in his shack about 1954. Notice the Central Electronics 10A on the left side of the desk. This was CE's first sideband exciter unit. Lee said that when he heard that SSB was coming into the picture he flew the RF deck back to Collins and they made the necessary modifications so it could be used as a linear amplifier. Lee forgets who bought his KW-1 but he does remember that it was someone in Florida. He has no record of the SN. I wonder who owns this KW-1 now?

It's interesting that the issue of QST that announced the coming of the KW-1 - October, 1950, was also the issue that carried the story by Lee, "T-Day in Sandwich" the story of the erection of his 36 element, 10 meter rotary which "towers 125 feet above ground". In a future issue we'll have more information on this "ultimate 10 meter antenna".

N6CSW/Ø



Dale Gagnon, KW1I, with his KW-1s

My AM days started shortly after I was licensed in 1962. I ran a homebrew 6146 transmitter on 6 meters and a converted SCR 522 on 2 meters with a common P-P 807 modulator. Years of SSB intervened and then about 7 years ago I bought a Viking II to use for CW on the new 30 meter band. While tuning on the high end of 10 meters I heard some beautiful sounding AM signals and I became interested in that mode again.

I searched through my junk-box for the 807 modulators I had used 20 years earlier. I plugged them into my Viking II and there began the second phase of my AM experience. I expanded my AM activities to the lower frequencies and started building and acquiring AM equipment.

I was attracted to the whole Collins line, but especially the KW-1. I hoped to own one someday. I inquired about some that were advertised, but I had never actually seen one and they were not close by and they were always very expensive.

During this period I upgraded and thought about changing to a shorter call. I had been watching the Extra Class call sign assignments in the First Call Area and decided to take a chance when they approached the KW1 series. I think it was almost a miracle that I was successful in acquiring the call KW1I. Now that I had the call I became more serious about acquiring a KW-1.

After a while, by just letting people know that I was interested in KW class transmitters, I was fortunate enough to find a KW-1 right here in New Hampshire. Years later, I got on the trail of another KW-1 that had been donated to an amateur club in the Midwest and was out for bid to club members. Miraculously, no one bid on it and I was allowed to purchase it from the club for the minimum bid before they marked it up and put it in the yellow sheets.

I have larger broadcast and military transmitters in service, but the KW-1's are still my favorites and the most appreciated by visitors to the station. •



The shack of **Sam Thompson, W6HDU**, showing his KW-1 on the right, the rear of his 30K-1 on the left and operating position in the center. On the left end of the desk is a Globe King 500B. Next to the Globe King are two HRO-60's on the bottom with a Hallicrafters TV-7 Videometer TV (1951, in operation) and a NC-183D above.



Darrell Brooks, WA5VGO, with his KW-1. He purchased this transmitter - SN 66 - from the original owner, W5NMG, in Sept. of 1988. He says that it had been sitting idle in W5NMG's shack since the early '60's. Darrell thinks there are other KW-1s out there waiting to be found.



Mike Palmer, K5FZ, with his prototype

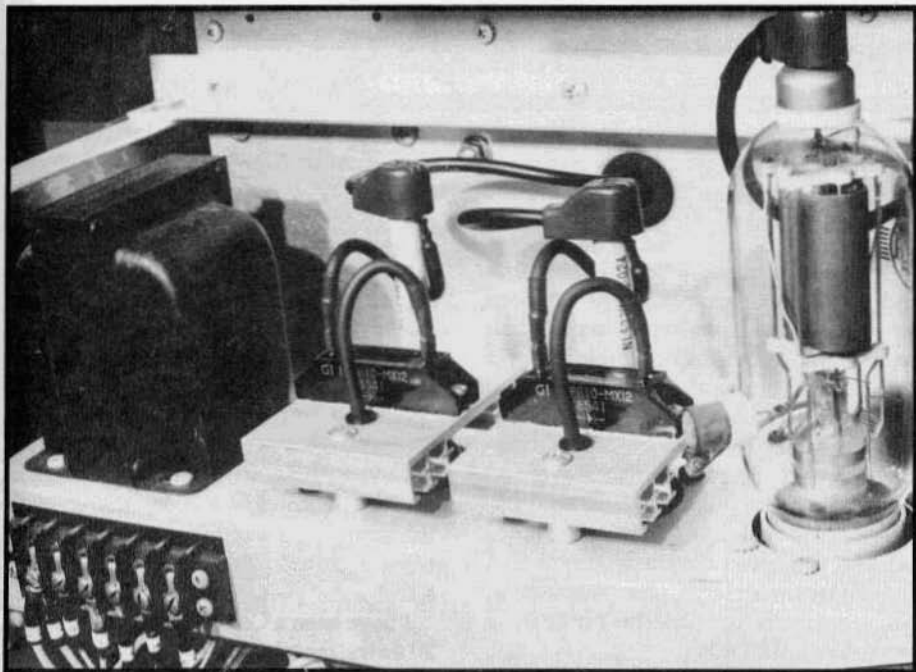
My KW-1 prototype (no serial no.) was obtained in 1987 from Richard Lighthart, WØJTF, former Collins employee, now deceased. It is completely rebuilt and working properly in every respect. Using Lee's (WØVT) KW1 as a comparison, the prototype is 98% that of a production model. It was a blast to restore and a pleasure to resurrect from the radio graveyard.

In January, 1989, telephone interviews with John Foster, WØYDX, Lucky Lukehart, WØSEG and Ernest Papenfus, K6EZ, all former Collins employees yielded me additional information on the prototype. For instance this unit may have been the one that Art Collins evaluated in his shack for a month or so. How Richard Lighthart, WØJTF, obtained it was not clear although there was a "surplus sale" available to employees of Collins. Lighthouse also had in his possession prototypes of the KWS-1 and KWM-1.

The prototype is about 70% true to the production models. Note there is no front door keylock on it. All lettering is engraved, not painted on, and the terminal strip on the 872A/810 chassis is on the left instead of the right.

With the prototype I obtained many giant blueprints and schematics of the KW1 electrical and mechanical development. Among this engineering info were names I looked up in a special callbook listing amateurs by their names, then their callsigns. This led to the telephone interviews.

The big KW1 was a real radio work of art and it's impressive to those who wander into the shack to see it for the first time. I have a deep affection for my old prototype and it will never be for sale or trade. •



Solid State Rectifiers in the KW-1 Prototype

This simple and easy reversible modification reduces warm-up time to one minute. I used two 14 KV/1A diode bricks from "K2AW's Silicon Alley" (phone 516-334-7024) costing about \$10 each. Each diode is mounted on a heat sink (plain 1/8" aluminum ok) using metal spacers directly above the existing tube socket screws. Ceramic stand-off insulators support old plate caps from dead 872's. K5FZ

Dayton HamVention Notes

Attend the SPAM forum at the 40th Annual Dayton HamVention April 27th, Saturday, 1:15 to 2:45 P.M. local in meeting Room 7. An interesting program is planned that will be of interest to all those who operate AM. For further information contact Dale Gagnon, KW1I at (603) 228-8721

The Collins Users Net will be meeting at the Dayton HamVention this year. We will meet at 3:15 in Room 7 at the convention. The speaker for the group will be Kenneth Roland, WØQLU. Ken is a 40 year employee of Collins/Rockwell and has a wealth of information about the Collins Company. Bill Wheeler, KØDEW

Radio wave shortage hurts new technology

Los Angeles - A shortage of frequencies on the radio spectrum continues to hinder new communications technologies, the chairman of the Federal Communications Commission said Friday.

Alfred Sikes said the country has "staked its future on an information-based economy" but that there are no available unused radio wavelengths to accommodate growth.

"Just as businesses will fail without a dependable supply of affordable petroleum products, new communications technologies will be stillborn without an adequate supply of electromagnetic radio spectrum," Sikes said.

From the "Daily Olympian", Olympia, Wash. Sat., Jan. 12, 1991
Sent in by Bill Baker, W7YWP

Restoring/Re-painting a KW-1

by Bill Wheeler, KØDEW
272 Donna Lee
Lebanon, MO 65536

My time for introduction to ham radio and subsequent acquisition of a novice ticket could not have happened at a better time. In this writer's opinion, those of us licensed during the mid '50s did so during the very best of the golden age of amateur radio. To a young person of junior high age, the pages of QST and CQ magazines were filled with pictorial images of mystical equipment to be studied and pondered over with great care. Some boxes were large, some were small, but most were outside the purchasing powers of KNØDEW.

It did not take an abundant amount of knowledge in electronic theory to soon learn that there was more to the various boxes than size and price. To a youthful operator using an AT-1 and S-38C, my thoughts kept returning to a company named Collins Radio. They were always the occupant of the first few pages of QST and CQ and they were there just as faithful as the changing of the moon, once per month, without failure. There was no way this equipment could be for real, it was just put on those old black and white pages to tempt the weak among us and surely no mortal man could own such fine radio equipment. If they were for real, this place called Cedar Rapids, Iowa, must be like the fabled city of Mecca, a place filled with grey boxes on ivory towers.

As time has a way of doing, it passes, but the dreams of youth are not soon dimmed by time. Some place in the back of my mind I could always see myself sitting in front of a Collins KW-1, with a D-104 in hand, working all corners of the known world. I could feel the quality of

pure power when the push-to-talk was engaged, I would command all bands! Many rigs came and went through KØDEW, some new, some used, some good and some bad. About all modes and types of operating have been used during the past 35 years, everything from DX to ragchewing, but no experience in my amateur years can be shared with the thrill I had early last winter. This is when I became the owner of a Collins KW-1.

I have been a Collins collector for about 20 years, mainly staying with the S/Line and KWM-2. But there it was, a genuine KW-1! At first, I just stared in amazement at the big box and reflected back to the days when I would do the same thing to a page in the radio magazines. This was more than a dream come true, it was like returning to 1955 and reliving the first thrills of amateur radio.

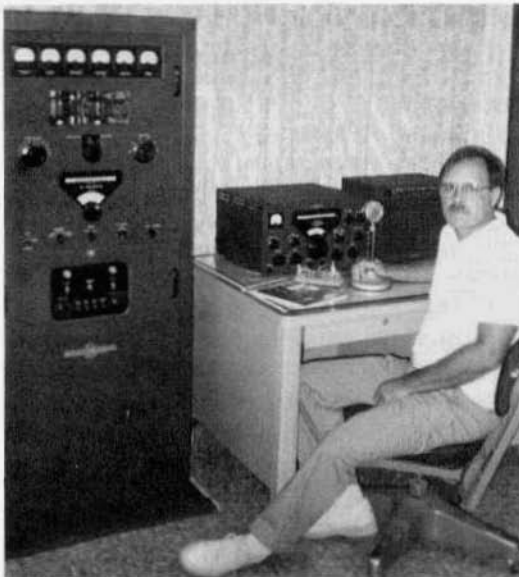
My KW-1 sported a SN of 71, this put it about mid-way in it's production because only about 150 of these magnificent transmitters were made by Collins. Because of my purest method of restoring equipment, it must look and work just like it did when it came out of the factory. Electrically, this is usually not much of a problem, but physical appearance is a totally different story and if you don't know what you're doing, physical restoration is best left to the professionals. I am not a professional painter, but have done some antique car work and have a friend that restores old autos as a profession. Based on my purest method and advice from my friend, the refurbishing of the KW-1 cabinet proved to be somewhat of a challenge.

There were no dents or major scratches in the unit, but the old paint had deteriorated to an unacceptable point and there was some surface rust beginning to appear around the bottom. At this point in time, I elected to totally remove the paint and start from the metal out. "Dip" removal was the only choice. Dipping a large piece of metal removes all

paint and rust and is much easier than trying to sand down the old finish. Depending on the type of dip, acid or lye, the metal will look bright and new. The acid bath appears to do a better job on the rust, so an acid dip was chosen.

Wanting to keep the refurbishing process as authentic as humanly possible, the real research and fun was just beginning; what to do with a fresh, clean cabinet? Local talent had exhausted itself and I needed help and/or instruction in the way Collins Radio did the entire painting job back in 1953. Being the NCS on the Collins Users Net on 20 meters, I brought up the subject on the net for the fellows to discuss and as expected, there was lots of discussion. Almost every QSO I had during the next couple of months with any person, with any knowledge of Collins equipment, resulted in lots of suggestions and lots of guessing as to how Collins put on the paint. Any guess work at this stage would simply not work.

I had waited thirty some years for this radio and a few more months would not



Bill with his restored KW-1, SN 71

hurt, and one thing for sure, the old Collins classic was not eating anything while it was in my shack. Based on past experience, I did not think it would do any good to write or call Rockwell in Cedar Rapids. I have been told by people at Rockwell that all of the old production records have been either lost or destroyed and even manuals for equipment as late

as the S/Line are reduced to microfilm and getting a copy is a very expensive purchase. As the search for information continued, I certainly gained a wealth of information about the Collins Radio Company. I became acquainted with at least four former Collins engineers with some of their work going back into the mid to late thirties. Letters were even exchanged with some of these very fine gentlemen, but still little more than guess work on the painting process. Several places were suggested that I might make a telephone call. I followed each and every lead until it met a dead end.

Between endless phone calls to various paint companies I went over every inch of the wiring in each and every sub-chassis and found what I refer to as "tracks". Tracks can be defined as "poor workmanship made by other owners". There were a few to be sure in the number 71 and these were very carefully reworked until everything looked like it did the day it made its first exit from the factory in Iowa. No major modifications were found, but had I found any, they

Restoring/Repainting a KW-1 from previous page

would have been removed just like a surgeon removing cancer. Only Collins-authorized mods will go in this or any of the Collins equipment at KODEW.

At about this point in the project I was given the name of another paint company. Even with the company being located in Cedar Rapids, I did not make the call with much faith for any results. Not wishing to miss any lead, the call was made anyway and, as I had many times before, told my plight to the young female voice on the other end of the line. Prepared for and expecting a negative comment like all the times before, I was almost shocked when she said, "Mr. Wheeler, I think we supplied paint for Collins during the nineteen-fifties. Joan is the person you would need to talk to, I'll see if she is in her office". In a few seconds there was another female voice and again I told my story. The older, but more wiser voice said they were a supplier of Collins paint, but knew nothing about how it was put on that many years ago. However, there was a man that worked for them on a part time basis that knew something about the paint room over at Rockwell/Collins. She continued that he might even know a person that worked in the paint room many years ago at Collins. Wow! This was almost like visiting with the person that shot the St. James Grey on the old KW-1 back in 1953. Joan then took my telephone number and said she would call back tomorrow between three and four P.M. The next day between three and four I was poised at the telephone with pen and note pad ready for the information I was about to receive. Somewhat disappointed, there was no call. Two more days passed before my wife called me from the yard to answer the phone. Joan identified herself and apologized for not getting back to me quicker, but the older worker had been sick and away from work for a few days. She said that she had talked to the oldtimer and he in

turn had talked to another fellow who had indeed worked in the paint room at Collins back after WW II and had seen a lot of St. James Grey go through a spray gun.

Their information unfolded as follows; steel cabinets at Collins, during that time, were first primed with at least two coats of zinc, with a light sanding between coats. Zinc chromate has a light green color and this part of the story was confirmed because there was a green paint under the St. James Grey on my number 71. ZC is used on a surface that is to retain its original finish and offers protection to steel for many years; sounds just like what Collins would do. This type primer is a two part mixture somewhat like epoxy glue. Extreme caution must be used when shooting it in an air gun. A mask over the nose is a must. Next, a person restoring a KW-1 would need some St. James Grey #180. This needed to be an air dry enamel and shot on with a lot of air. (40-50 PSI) The painter needed to hold the gun off the work more than normal and to use Xylene reducer as a thinning agent. Xylene is a very, very fast drying reducer and if the gun was kept off the work, the results would be the sand paper finish the old radios had. This, I am told, is not a true wrinkle finish. Some of the Collins equipment did have wrinkle paint, but it was usually shot on using the fast dry reducer, especially the amateur equipment. The paint is almost dry by the time it hits the surface and tends to give the sand paper effect needed.

This was just the type of information I needed. Joan also reported that they (Klinger Paint Company) could mix and sell me one gallon of the #180. At this point, the \$95 per gallon seemed cheap. One company I talked to during my search said their minimum was 200 gallons, if they could get the formula for #180. Joan said there was no problem with a COD order and I should have my paint in a few days.

Keeping The KW-1 Cool and Quiet

by Bill Thissell, K7VZP
3333 W. Sunnyside Ave.
Phoenix, AZ 85029

Cooling in the KW-1 is inadequate in my opinion. The following is a brief summary of what I have done to my transmitter for cooling.

I removed the back center access plate on the cabinet floor. I mounted a Dayton 4C548 fan to a 5"x7" piece of 1/4" plexiglass and placed it over this hole to blow up. My KW-1 is on a roll-around base, so air can be pulled in underneath the bottom of the cabinet.

I removed the screen from the inlet of the stock blower and mounted a 8"x20" duct over this blower inlet on the back of the RF deck. This duct extends to the inside surface of the door about 2". You can make this duct out of 2" U channel, letting the RF deck be on one side and the door the other side. I covered all the vent holes in the back door except those over the installed duct. Fresh unheated air now flows through these holes, down the duct, and into the stock blower.

I removed the top screen cover on the

RF deck. This leaves only the screen cover with the T/R switch on it. On top of this screen and over the PA tubes I mounted a 8"x8"x3" high box with one side open and mounted down. In the top of this box I mounted a Dayton 4C548 fan blowing up. A small 5" round duct from the top of the fan to the bottom of the cabinet top was added.

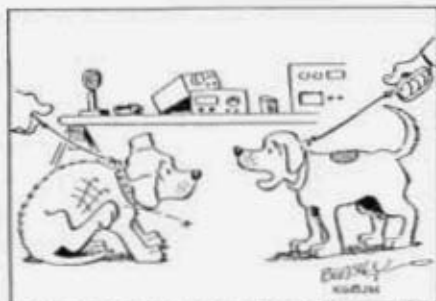
Both fans and blower come on when the filament switch is placed in the on position. When switched off they stay on for 5 minutes through a time delay circuit.

Relay noise, audio out of the modulator and fan noise were a distraction when operating the transmitter. I corrected this problem by lining the inside of the front and back doors with 1/2" duct liner. The sides and top were lined with 1" duct liner. This was all kept in place with Carter's Rubber Cement. The transmitter is now cool and quiet. *

KW-1 Design and Eng. from page 15

4. Existence of 2 serial no. 1 KW-1 units was most likely due to the intense competition for serial number '1' on Collins amateur gear. (This is only speculation, Hi)

5. There are reported to be a few very late KW-1s with factory installed linear amplification modifications. This consisted of a different mode switch with a 3rd position and components to alter grid bias and feed external drive to the finals. I have personally seen these modifications but only as a retrofit by individual owners. *



I KNOW WHAT YOU MEAN --- THESE FLEA MARKETS ARE THE WORSE KW-1S

KW-1 Audio

by Jay Bromley, KA5DGH
8805 S. 28th, #6
Fort Smith, AR 72903

The outstanding thing about the KW-1 is that it is an all triode modulator which was kind of rare in amateur transmitters. I can't remember any of the small rigs that used triodes. Most of them ran 807's or 6L6's which are all beam power tubes. Actually in a KW rig like this they could have used tetrodes like 4-125's, 4-250's or 4-400's. It might have been better if they had gone that way because the 810's are just too expensive and hard to find these days. But the thing I like about using triodes is that they just seem to have a lot better quality. They have their limitations - they take more drive power - and that happens to be one thing the KW-1 is short in. There are other things that are somewhat unique in the KW-1; it has a phase inverter and a splatter choke. The splatter choke is used mainly for the clipper to clean up any harmonics that might be there. The phase inverter is an advantage in that you don't have a coupling transformer like the Rangers, Valiants and 500's. So you can obtain real good low end response.

What would I do to improve the audio on the KW-1? To a point it would depend on what model I've got. About half-way or so through the production run Collins decided to restrict the audio response - to make it more communications quality than broadcast quality.

Basically in the speech amp section this rig is like most other rigs. The audio driver is a little different. A good place to start is the filter caps - change all those - and increase the values. This is using modern hi-fi tube type technology. Make the filter caps as big and as 'stiff' as possible.

I changed all coupling caps out to .1's. Even if you used the stock values you really do need to pull out all those old caps. They've been in there for nearly 40 years and they're bad believe me; change them. Use high quality replacements. In audio the best capacitors are metalized film, mylar and paper. I personally like the metalized film capacitors sold by Antique Electronic Supply in Tempe, Arizona. They're small, they clean up the chassis and they sound fantastic. They're available in 400 and 600 volt. Stay away from ceramic discs and tantalums in audio circuitry; save them for RF. Check all the resistors and if any of the resistors are bad change them out using metal film replacements.

A lot of people might not want the extreme low end that this thing is capable of producing. After these modifications it's capable of going down to 60 Htz 'clean' but it is a little 'raggedy' below that. Big deal.

All this is geared up for a D-104. Change the first grid resistor to a higher value. I usually use 5 Megohms or more. Low end is not just a figure of coupling cap size but of grid resistor size. If you have too much bass response to suit your fancy use a small coupling cap in the D-104.

Now for the high end. Take out the clipper. If you need to go to clipping go to a SSB rig. A clipper is a good way to loose friends in the AM world. Just bypass it. You just take C407 and lift it, lift the leg going to R412, take out the 6AL5 and you'll have very good audio on both the high and low end.

The splatter filter can now be removed. I think they contribute to blowing out the mod transformers in this transmitter. I don't know if this is because people who use the splatter choke and clipper are just overdriving them or what, but in any case broadcast transmitters don't have them - take it out.

There is one other thing, there's C507

and C508 that the earlier units did not have. Clip those out. The earlier one's didn't have these caps and they had a lot better frequency response.

While we're still into the high end there is one more thing that you can do and this is an area that most people overlook even when they're modifying their Rangers and Valiants and stuff like that. You follow the 2500 volt plate line out of the modulator section up to the finals, you'll notice that in the earlier units there's some 500 pf doorknob capacitors going to ground C116, C117 and C118. These should be changed to a later schematic. In the later schematic there's two caps in series - with decreased values - to increase the voltage rating of the doorknobs and this also improves the high frequency response. Even in the old days when the line voltage was 110 and 220 volts, if you modulated the carrier 100% you just about exceeded the voltage rating of the doorknobs.

Even in the E.F. Johnson gear, where they have .01's to .05's, when you're bypassing RF to keep it out of the power supply and modulator, 500 pf is big enough to do the job and it will help your high frequency response. The KW-1 is not bad but in some of the E.F. Johnson gear they've got so many ceramic discs going everywhere that by the time you get to the finals you're lucky if you can get past 3 K on the high end.

There are two taps on the primary of the mod transformer. If you use the 18,000 taps, it makes the modulator more efficient - the finals drive easier - but two things happen; you don't have the peak

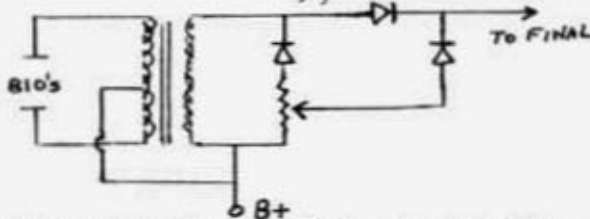
power and you can't get good bass response. Use the 11,000 tap - which will require more drive - but it does improve the peak power and bass response. The negative point of doing this is that you will have some high frequency distortion that you can see on a scope when you're modulating it. But this is not as bad as it is normally with the clipper and splatter filter in place.

The splatter filter does not have to be removed - just disconnected - but I removed mine and in its place put in a small negative cycle loading circuit - not for super-modulation but to cut the negative peaks off at around 80%. It makes the rig sound smoother and protects the mod transformer.

Be sure to check the phase of the speech amp. This can be done by arranging the audio lines at E-501 for maximum positive peaks on a monitor scope. The same thing can be done by reversing the plate caps on the 810s. If you're out of phase you're wasting peak power and bass response.

Lastly - and I think this is very important - use solid state replacements in place of the 872 rectifiers. This does away with the heating problem, with no change in plate voltage. It also gets rid of a lot of arcing and sparking. For obvious reasons I do not change out the low voltage rectifiers.

Editor's Note: Jay has very successfully re-worked the audio on SN 10 which he has since sold to Buck, WE5L. It really sounds great. If anyone has questions or would like to have more detailed information feel free to either call or write Jay.



negative cycle loading circuit in place of splatter filter



Lee Bahr, WØVT, with SN 34

This KW-1 is SN 34 and has been fully restored to like-new condition. It was purchased from Larry, WØYY, owner of Missouri Radio, about 5 years ago. Approximately 150 hours were put into its restoration.

It was totally cleaned inside and out after everything that could be removed, was removed. All paper capacitors, electrolytics and some ceramics were replaced. Each resistor was checked for tolerance and those out of tolerance were replaced. At the same time the low frequency response of the audio circuits was improved. Next, all pots and switches were cleaned, lubricated and replaced if necessary. The high voltage rectifiers were replaced with solid state brick rectifiers. I completely got away from blowing fuses which was fairly frequent when using the tube rectifiers.

Even the wire lugs were replaced that

cosmetically looked poor. The transformers and chokes were sandblasted and repainted and now look like new. The cabinet got a coat of Johnsons floor wax and it now looks near mint.

Under test, one of the doorknob capacitors failed and it had to be replaced. Also, all tubes were checked and bad ones replaced. The tube shields were replaced with the heat sinking black variety. The RF static bleeder choke across the RF output jack to ground was missing and an exact replacement was wound on a 1" diameter, 8" long ceramic rod. The transmitter had been modified to operate on SSB per Collins specs but these modifications were removed and the circuits returned to original specs and configurations as originally wired by Collins. Lastly the rig was aligned and it now works flawlessly, just like it did the day it came out of the factory. •



The station of Fred Albertson, W4BD, in 1962, showing KW-1 SN 7

I installed my KW-1, SN 7, on April 19, 1952, and it has continued in operable condition to this day. The equipment was tagged "OK 9-8-51" and the test data was dated "3-20-52".

Over the years, the equipment has been subject to minor changes and a few condensers, transformers, etc. have had to be replaced. In 1969, I changed the finals from 4-250-s to 4-400A's and in 1982 to 4-400C's. I have always been a CW man, maybe because both my father and mother were Western Union telegraphers and I do not recall ever not knowing the code! So, in 1961, I removed the V401,2,3,4, and 5 tubes connected with AM operation and they have been temporarily replaced only infrequently. Thus my KW-1 has been primarily a CW transmitter. When required, I have also used SSB with other Collins equipment

(KWM-2, 32S-1, 32S-3A, etc.).

My QTH at the time of original installation of the KW-1 was on the third floor of my home, in Washington D.C., and my call was W3FMC; later W3GZ.

I practiced communications law, among other things, for some 40 years in Washington, until 1972 when I retired and moved to a beautiful DX location on a tropical island off the southeast coast of Florida. My call was changed to W4BD, and the KW-1 moved with me.

The present QTH, 310 Harbor Drive, Key Biscayne, Florida, is right on salt water - Biscayne Bay - and the base of the antenna is only 15 feet from the water. The Atlantic Ocean is a mile away on the other side of this Island Paradise. The location is so good that I never need high power, and the KW-1 gets only occasional use. •

In Memory of E.F. Johnson from page 2
facilities in the Lower garage, a nearby grocery store and the Oddfellows Hall.

As the business grew, the Company began to sell kits of parts to ham radio operators so they could build their own radios. These customers began to ask for already assembled radios, so employees took the kits home and assembled them for extra money. In 1949, the first complete amateur radio transmitters were manufactured at E.F. Johnson Company on an assembly line. The Viking I transmitter was an immediate success.

In 1958, the development which brought personal radio communications to millions of people, the Class D Citizens Band (CB) Radio, appeared on the market. Under Edgar's leadership, E.F. Johnson Company dominated that market with products sold under the trade name Messenger from 1959 to 1976. The technological significance of the Messenger is best illustrated by its' placement in the Smithsonian Institute. When the popularity of CB radios diminished, production of cellular mobile telephones began; and in 1982, the Company was merged with Western Union. At that time, Edgar retired from his role as Chairman of the Board but continued as a Board member until 1983.

A double funeral service for Edgar F. Johnson and Ethel Johnson was held Thursday, February 14th, at the First Congregational Church in Waseca. The E.F. Johnson Company was closed in honor of Edgar's life and observance of his death on that day. The Johnsons are survived by two daughters, three grandchildren and six great-grandchildren.

Johnson Week staff asked employees and retirees of E.F. Johnson for their comments on Edgar Johnson as a leader in the Company and a leader in the community. We also asked for favorite stories or anecdotes about Edgar, and this is what they said:

Edgar F. Johnson as a leader in the Company:

"When Edgar spoke, you could count on what he said."

"Edgar brought out the best of people around him. He was fair and gave credit to others. One never heard him say 'I'; it was always 'we'."

"He was not motivated by greed, ego or selfish interests. Rather he was motivated by basic Christian values of love, kindness, trust and fairness. He believed that management must provide the working environment that would motivate employees at all levels to excel in their own area of expertise. He did succeed in providing that creative atmosphere. He developed a strong team effort from the top to the bottom of the organization."

"He believed in steady, measured growth. He was definitely concerned about his employees. When he was there it was a family atmosphere."

Edgar F. Johnson as a leader in the community:

"Along with being the founder and head of a highly successful electronic design and manufacturing organization for many decades, he was also a very public spirited individual, as evidenced by his many contributions locally, statewide, nationally, and even internationally."

"The world is definitely a better place for his having been in it."

A favorite story or anecdote about Edgar:

When the Methodist Church on 2nd Avenue built a new church on Clear Lake, Edgar knew that the old building was for sale. He was determined that the facility would not become a blacksmith shop or bar and decided that it should become a museum. It is now the Waseca

County Museum, and Edgar took an active part in planning the repair and remodeling of the building.

In 1953, Edgar walked into the Second Avenue machine shop, approached a machinist and said, "We are going to start a new program called Profit Sharing, and I would like you to be on a committee to discuss how we should start it out." The employee was concerned that he was all greasy from working on the machines and told Edgar that he should find someone from the office that knew something about it to be on the committee rather than him. Edgar said, "You know just as much about this as anyone else does." He did, and the group got it going. E.F. Johnson was probably the second company in Minnesota to have Profit Sharing.

Bob Chaffin, Edgar's son-in-law, and I were working on Bob's motor home. We needed a piece of steel wire to fix a problem underneath the unit. I asked Bob if he had a piece of "baling wire". He told me he didn't but we should ask Edgar for some. Edgar asked me what diameter I needed. Not having any idea what size baling wire is and not fussy either, I had him show me the sizes he had. On the back of his workbench were several neatly coiled rolls of steel wire with a size diameter carefully written on a piece of tape above each roll. ".036 should be good" I told him, trying to act like the wire size was real important. On the way out of the house Edgar asked where I thought he got the wire. I told him I had no idea. "Every Christmas the Boy Scouts sell wreaths and we buy one of them. After Christmas I take the wire off the wreath before throwing it away," he said.

Editor's Note: I am very grateful to the "Johnson Week" for allowing me to reprint their memorial to Mr. and Mrs. Johnson. Also, thanks to John Foster, WØYDS, for bring it to our attention. •

Restoring/Repainting a KW-1 from page 25

The zinc chromate primer was purchased at an auto supply store and the Xylene reducer was found at a regular paint store. The instructions on both cans confirmed what Joan had told me from Cedar Rapids. I did take the stripped KW-1 cabinet to my friend's body shop, mainly to get it in a controlled environment; dust free is a must for a job of this kind. I am not a professional painter, as I said, I am an elementary school principal, so having someone nearby with more experience was good also. The old box was shot on two different work sessions because the inside of the cabinet was smooth, not the sand paper finish like the outside. The inside was painted in the regular way, with regular enamel reducer. After the inside had dried for at least two days, the inside was masked off and the outside was painted, using the very fast dry reducer. Enamel dries from the outside in, so it was several more days before the new cabinet was moved to its permanent home. Even after two weeks of drying time enamel can be very green and care must be taken when replacing the heavy parts that make up the transmitter.

I am sure the reader must be saying at this point, why would anyone go to this amount of work and expense on an old radio. And the condition of the exterior of a radio has nothing to do with how the radio will sound on the other end of the QSO. There is no defense for this position, but the old KW-1, SN 71, will occupy a place of distinction in my shack and I will speak of it with pride to anyone that will stand and listen to the story. It will have a home at KØDEW for as long as that call is around. Now when I relax in my radio room by looking at or operating the 6 foot, 800 grey box, not only does it take me back to the dreams of youth, but now I can reflect on how more recently I brought the dead mass of steel back to life. •

CLASSIFIEDS

Advertising Information

Subscribers receive 1 free - 25 word- ad per month. Extra words are .15. Here's how to count the words in your ad: the heading - For Sale, Wanted, etc count as 1 word. Your name, call, address and telephone number count as 6 words. Hyphenated words count as 2 words. Please count the words in your ad and if you're over 25 words send payment for the extra words.

Non-subscribers: \$3 minimum for each ad (up to 30 words). Each additional word is .20. Please call or write for display rates.

VINTAGE EQUIPMENT ONLY

E.R.

145 CR 123

Hesperus, CO 81326

303-247-4935

DEADLINE FOR THE APRIL ISSUE: APRIL 3

FOR SALE: Do you need tubes, parts, schematics? Send SASE. Nick Marshal, 2207 Peachland Ave., Sebastopol, CA 95472.

FOR SALE: Dention Clipperton L amplifier, w/10 m, excellent cond. - \$500 plus shipping. Craig Larson, KØNR, 3823 Wellington Court, Owensboro, KY 42303. (502) 683-6972

FOR SALE: Drake 2A w/spkr and Q-mult. - \$75; Hallicrafters HT-40 - \$35; Heath 620 Scanalyzer - \$75. All include manuals. Bill Owen, KFØIE, (612) 722-9125

FOR SALE: New catalog of old books on wireless/radio is now available. Send \$50 (stamps) to: Rainy Day Books, POB 775, Fitzwilliam, NH 03447.

FOR SALE: Repair and restoration on all vintage equipment; 35 years experience. Barney Wooters, W5KSO, 8303 E. Mansfield Ave., Denver, CO 80237. (303) 770-5314

WANTED: For R4-C: AM filter, MS-4 spkr, noise blanker NG-4. Levy, 8 Waterloo, Morris Plains, NJ 07950. (201) 285-0233

FOR SALE: Tubes, new in box. Please send \$1 for list of 300+ tubes. Refundable. Wilson Hauck, BTB, Inc. E.R., 6820 Stout Rd., Memphis, TN 38119

WANTED: ARC-5 xmtr variable capacitors with worm gear drive; Johnson and Millen neutralizing capacitors; B&W turns counters; 10V CT 10 amp filament transformers. Clark Hatch, WØBT, 2546 SE Peck Rd., Topeka, KS 66605. (913) 235-2721

FOR SALE: Old ARRL and Radio Handbooks. Also Allied and Newark Radio Catalogs. Send #10 SASE for list and prices. Charles Simmons, W6PDH, POB 6238, Buena Park, CA 90622. (714) 994-6843

FOR SALE: Bigelow Electronics has been in the electronic mail order business since 1954. Vintage parts and equipment available. Request free "Vintage Flyer". Bigelow Electronics, Box 125, Bluffton, OH 45817.

WANTED: U.S. Amateur Callbooks 1912 thru 1940. Bob, W4JNN, POB 166, Annandale, VA 22003. (703) 560-7161

CLASSIFIEDS

WANTED: General Electric YRS-1 sideband adaptor, outside condition not important; Heathkit VF-1, AC-1, HW10 and HW20. Charles Connor, KØNG, 1801 So. 48th St., Lincoln, NE 68506. (402) 488-9336

FOR SALE: New 450T; 833As, 4-400s, 250TH pulls. Will swap for 813s; (2) Globe Champion 300s - \$250 for both. **WANTED:** Building HIB rig (813s-813s). Need 10V, 10 A fil. xfmr; BC-610 220 V primary plate xfmr; HRO-50 broadcast coils; modulation xfmr (813s-813s); 220 V variac; round meters. Jeff Garrett, KEØMT, 2822 W. 55th Ave., Denver, CO 80221-1616. (303) 455-5658

WANTED: Complete AN/GRR-5 or components as R-174 rcvr, PP-308 ps, CY-615 case and tech manual. Homer Henrioud, 2772 Plantation Dr., East Point, GA 30344. (404) 767-0404

WANTED: ARC-65 and ARN-7 equipment, accessories, etc. Mark Meltzer, 335 Prentiss St., San Francisco, CA 94110-6140. (415) 826-3889 home or (415) 826-8994 ext. 3019 work

FOR SALE: ARC-5, BC-453 modulator - \$35; used 813s - \$15; 8666 - \$5. SASE for list. Gary Cain, 1775 Grand, #302, St. Paul, MN 55105.

WANTED: Turn counter for 1/4" shaft. Bob Alderisio, N5IO6, POB 424, El Prado, NM 87529. (505) 586-0309

FOR SALE: Miscellaneous odds and ends, antique radios and parts. LSASE for list. Hidyne Research, POB 3342, Williamsport, PA 17701. (717) 326-2148

WANTED: Machine shop work. Knobs shafts, bushings, etc. made to your sample or drawing. Reasonable. Jim Dill, Box 5044, Greeley, CO 80631. (303) 353-8561 evenings.

WANTED: RCA AR77 manual; RME 9-D receiver. C.L. Zitterich, 1725 Oak Hill, Corinth, TX 76205.

FOR SALE: National Radio Institute Electronics course, 1976, absolutely mint condition, 9 books, 27 lessons, 8 1/2 by 11 format - \$100. I'll pay UPS. Bob Lemanek, K8HVG, 14565 Garfield, Allen Park, MI 48101.

WANTED: SCR-399A;HO-17 shelter;BC-610E; BC-312; BC-939; BC-614; JB-70A;tuning units; coils; chests; reels; whips; cables etc. Bill Iarris, W7KXB, 852 W. Jerome Cir., Mesa, AZ, 85210. (602) 838-0215

WANTED: WW-II military radio sets, operating spares and mounting racks. Sam Hevener, W8KBF, 3583 Everett Rd., Richfield, OH 44286. (216) 659-3244

WANTED: Any model of Brown Brothers Machine Company key, paddles or bugs. Jim Zimmerman, KG6VI, 2316 W. Dallin St., Lancaster, CA 93536-5702. (805) 945-6539

FOR SALE: Transmitting/Receiving tubes, new and used. LSASE for list. I also collect old and unique tubes of any type. Maybe you have something to trade? **WANTED:** Large tubes and sockets from the old Eimac line; 750T through 2000T for display. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455

WANTED: WW-II military radio sets, manuals, accessories, mounting racks, etc. Must be in military condition. Sam Hevener, W8KBF, 3583 Everett Rd., Richfield, OH 44286-9723. (216) 659-3244

FOR SALE: Hallicrafters receivers: SX-115 - \$375; SX-122 - \$140; S-22R - \$90; S-19 - \$90; R-48 speaker - \$23. All mint condition. Ward Becht, 625 Tufts Ave., Burbank, CA 91504. (818) 842-3444

WANTED: UTC S-49 plate transformer, 4200, 3600 and 3000 volts CT with 115 volt primary. Andy Howard, WA4KCY, 105 Sweet Bay Lane, Carrollton, GA 30117. (404) 832-0202

CLASSIFIEDS

FOR SALE: Vintage Hallicrafters Super-Skyrider, uses 6B7, 42, 80, 6D6, etc tubes; E-200D B&K signal generator, solid state; modified BC-474 transceiver; several BC-221 freq. meters, one with stock power supply and modulation; audio, mod, power transformers. Send SASE for details on this and other equipment. Henry R. Kuhn, W8ERG, 1397 Washington Circle, Forestville, OH 45255

WANTED: WW II equipment. BC-966/SCR-695, Navy ABK IFF RT-53/TRC-7, ID-59/APA-11, AN/APN-2. Leroy E. Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707. (714) 540-8123

FOR SALE: ART-13; BC-221; BC-348; RT-77/GRC-9; misc. ARC-5 units (tx and rx); misc. audio transformers. Ken Kinderman, WB9OZR, 362 Echo Valley Lane, Kinnelon, NJ 07405.

WANTED: Multi-band tank type MB-150 in good condition; B&W Type 850 band-switching coil assembly. Roland Matson, K1OKO, RFD #1, Box 2943, Kennebunk, ME 04043.

WANTED: Johnson Viking 122 VFO. Two needed. William J. Knish, WB9KEK, RR 1, Box 123, Waseca, MN 56093. (507) 835-4420 before 5 PM CST weekdays.

FOR SALE: Rare Hammarlund rcvr, Model HQ-215, w/matching spkr, CW filter and original manual, excellent condition - \$275. Charlie, KD4AJ, (404) 396-0276

WANTED: Collins 32W-1; TCS transmitter; T-368 transmitter. Tom Smith, N5AMA, 13034 Elmington Dr., Cypress, TX 77429.

WANTED: Tube type Collins, Gates or RCA audio limiter, working or repairable; Chicago & Stancor xfmr catalogs; Radio Master catalogs from 40's & 50's; Taylor T125 tubes. Mike Carroll, N14N, 108 Wessington CT., Hendersonville, TN 37075. (615) 822-0082 after 6 PM CST

FOR SALE: Machine shop service. Knobs, shafts, bushings, etc made to sample or drawing. Reasonable. Jim Dill, Box 5044, Greeley, CO 80631. (303) 353-8561

FOR SALE: RBB-1 w/ps, RBC-2 w/ps - \$100 each; R-390, excellent - \$225; TCS receiver, transmitter, loading coil - \$90; Swan 406B VFO, no case - \$20; Central Electronics Multiphase RF Analyzer MM-2 - \$40; LM-18, LM-21, BC-221AH freq. meters, HP-608D, LP-5 - \$35 each; Ballantine 310A, HP-410BR, Eico 232 VTVMs - \$20 each. Shipping charges extra. George Babits, WA7HDL, Rt 1, Box 178-A6, Salmon, ID 83467. (208) 756-4147

WANTED: Restoring KWS-1, 75A-4. Need spare parts etc. Phil LaMarche, W9DVM, 717 McDonald St., Mt. Dora, FL 32757. (800) 940-2382 days.

WANTED: Main tuning knob for Collins KWM-1; table top AC supply for same; mech. filters for 51J4, 3 and 6 kcs. Stan Hojnacki, WA2NPL, 108 Wilson Ave., Blackwood, NJ 08012. (609) 435-8975 after 5:30 PM.

WANTED: Manual /info on R45/ARR-7 and matching AC supply. Both by Hallicrafters. David, WA7ZYQ, 238-10th St., St. Maries, ID 83861. (208) 245-2070

WANTED: A few WW II or other RF ammeters, thermocouple type. L. Burkhardt, NSLTPJ08 465, Los Alamos, NM 87544.

FOR SALE: 100+ item list of vintage ham gear and antique radios. Send SASE. Jim Weil, K8EAP, 15915 Armada Ctr. Rd., Romeo, IL 48065. (313) 784-9860

WANTED: Hallicrafters SX-62A, SX-100 and National NC-303. Excellent please. James B. Goer, 604 King Dr., Bedford, TX 76022. (817) 268-1985

WANTED: Coil L-6 for HF osc. board in SB-34 or junker SB-34. Marvin Moss, W4UXJ, Box 28601, Atlanta, GA 30358.

CLASSIFIEDS

FAIR RADIO SALES

1016 East Eureka Street 419/227-6573
POB 1105, Lima, OH 45002 FAX 419/227-1313

Radio-Electronic Surplus Since 1947!

- * Military Radio
- * Test Equipment
- * Electron Tubes
- * Transformers
- * Variable Capacitors and Coils

We have most R-390A spare parts (except meters)!

*3TF7/RT510 — used, checked - \$15 each

* 26Z5 - used, checked - \$7.50; unused - \$9 each

Write or Call for our 1990 catalog!

FOR SALE: Tubes: 211, 802, 803, F-102A - \$18 each; 1625, 807, 837, 3B28, 836, 3E29, 2C39, 829B, 6336 - \$5 each; 4CX-250B - \$20. List of 2400 others \$1 plus LSASE. George Babits, WA7HDL, Rt 1, Box 178-A6, Salmon, ID 83467. (208) 756-4147

WANTED: Manuals for 756-3B/32S-3, WE and Johnson KW. Call if you have these manuals. I will pay phone and copying costs. Butch, KØBS, (507) 288-0044

WANTED: Assembly manual for Lafayette Explor-Air. Copy ok. William Swiger, Rt 1, Box 142A, Bridgeport, WV 26330. (304) 842-4635

Electric Radio - the first year - all twelve issues delivered First Class in a padded envelope - \$30. #13 thru #23 - \$3 each. #5, #10, #11, #12, #13 and #14 are reproductions.

WANTED: Tobe All-Wave tuner for Browning '35" receivers; Rider's manuals 18 thru 23; Electronics Illustrated June 1961. AL Bernard, NI4Q, POB 690098, Orlando, FL 32819. (407) 351-5536

FOR SALE: Please send SASE for 5 page list of vintage gear for sale; xerox's available for over 200 vintage manuals - 10 cents per page. Mike Horvat, 112 E. Burnett, Stayton, OR 97383.

FOR SALE: BC-1031 panadaptor - \$50; CV-591-A SSB adaptor - \$50; R-28/ARC-5 receiver - \$35; APR-4Y receiver - \$125; lots more, list - \$50 (coins). U. Joe Orgrero, Box 32, Site 7 SS 1, Calgary, AB T2M 4N3 Canada.

FOR SALE: New pair of 6MJ6's - \$10 ea or both for \$18; new pair of 6DQ5's - \$7 ea or both for \$10. Plus UPS. **WANTED:** Power supply for Harvey-Wells TBS-50C and HQ-145 speaker. Bernie, WA6IDY, 452 Oxford Dr., Arcadia, CA 91007. (818) 445-2891

CLASSIFIEDS

***** "REAL RADIOS GLOW IN THE DARK"®

Bumper sticker - \$1 each with a #10 SASE. We service American made amateur radio products circa 1940's, 50's and 60's. Manuals and/or schematics available for most rigs and radio sets back to mid 1920's. Call or write for a quote on your service or tech data requirements. **Classic Radio**, PO Box 3486 Eureka, CA 95502. 24 hour phone (707) 444-3911. K6VHP

WANTED: Turret assembly of receiver 6010 by Radcom/Westrex. Edward J. White, WA3BZT, 809 Seymour Rd., Bear, DE 19701-1121. (302) 322-1313

WANTED: Harvey Radio Labs FT-30 xmitr (FOG p. 257); National SW-4, SW-5, NHU and RME-9. Best deals or cash/reward. Robert Enemark, WIEC, Box 1607, Duxbury, MA 02331. (617) 934-5043

WANTED: KWM-1; T-368; Viking 500; VF-1; AT-1 meter and IF cans from 75A2/3. David, W3BJZ, (814) 487-7468/487-4277

TRADE: Williams pin ball machine (Cyclone) from 1930's for AM gear; receivers/transmitters/test equipment. Best offer, pu only. Warren Dittmer, K2LXW, 10 Revere Rd., Ardsley, NY 10502. (914) 693-1040

FOR SALE: Used technical books; radio, electronics, mathematics, military, magazines, catalogs, handbooks, etc. \$1 for large list. Stamps ok. Softwave, Dept. ER, 1515 Sashabaw, Ortonville, MI 48462.

WANTED: Any information regarding the Collins 32B transmitter (circa 1934), especially schematics. Original documents will be fairly compensated for, all copy expenses reimbursed. Dave Swanson, WB9K, 4667 Candamone Lane, Rockford, IL 61111. (815) 633-1954

FOR SALE: We have a large selection of HV capacitors, 400V to 6KV. New, long lead, many types and styles. Priced right. Vintage, surplus, N.O.S., new parts, crystal calibrator kit, more. Call or write for our FREE catalog. Steve, NW2F, Two Fox Electric Co., POB 721, Pawling, NY 12564. (914) 855-1829 12 noon to 8:30 p.m. EST

FOR SALE: Riders vol 6, 8, 9 and 12, mint con. Found more ARRL Amateur Handbooks. Now 52 handbooks from 38 thru 78 plus 15 other old electronic books. Prices lowered to move. Hallicrafters HT-32 - \$80 plus shipping. **WANTED:** Pre 1942 ARRL Handbooks; vfo and ps for Harvey-Wells Bandmaster. Bob Schafter, WA7HN, POB 442, Aumsville, OR 97325. (503) 749-1149 h.. (503) 749-1149 eve.

FOR SALE: Collins F45J-31 mech filter - \$20; (2) 5V CT-26A fil. xfms, 25 K isolation - \$15 each; 4-1000A, broadcast pulls, tested good - BO; 813s - \$15; Hallicrafters SR-160, w/ps - \$100; sockets for most xmitting tubes. **WANTED:** (2) 6C21 tubes (Machlett); Collins R-389. Name your price. Russell Hunt, 201 Sharon Dr., Barrington, IL 60010.

WANTED: BC-610H or I model or GPT-750 transmitter. Must be in good condition and working. Willing to travel. Dick Wagner, KB2EGG, (914) 855-9573.

WANTED: Small RCA tube caddies approx. 17" by 9" by 7". Cliff Fleury, A17Y, 64174 Tumalo Rim Dr., Bend, OR 97701. (503) 382-9162

WANTED: Heath HX-11 transmitter; Johnson Adventurer and Challenger transmitters; Hallicrafters HA-5 and Johnson 122 vfos. Speed Gray, NS8V, 1260 Troon Ct., SE, Grand Rapids, MI 49546. (616) 676-2153

WANTED: Measurements Corp. Megacycle Meter model 59LF (this is a 100 khz - 4.5 Mhz grid-dip meter). Al Smith, 25 Stonehedge Rd., Lincoln, MA 01773. (617) 259-9351

CLASSIFIEDS

WANTED: Need good 828 tube and manual/schematic for my RCA BTA-250K broadcast transmitter. Also want several good 810 tubes. Sam Thompson, W6IDU, 1031 San Antonio Ave., Alameda, CA 94501. (415) 521-1429

WANTED: B & W final tank coils for 40 and 80 meters. Type BCL, 100 watts, with or without jack bar (base). Wes Chatellier, W5DFM, 1950 Chevelle Dr., Baton Rouge, LA 70806.

FOR SALE: Eico 753 xcvr, w/spkr and ps, nice shape, needs TLC - \$75; DX-60, HG-10B, HR-10B with HB console - \$100. Shipping extra. Richard Lucchesi, WA2RQY, 941 N. Park Ave., N. Massapequa, L.I., NY 11758. (516) 798-1230

FOR SALE: NIB Eimac 4-125A - \$25 or trade for NIB 3B28's. **WANTED:** Dow-Key coaxial antenna relay; HRO-60 "AC" coil. Al Coil, KO9S, 607 Countryside Lane, Hudson, WI 54016. (715) 386-5284

FOR SALE: (12) 813 tubes, (new/used ?) - \$10 each. **WANTED:** 813 ceramic sockets, prefer unused. Dale Welch, N6DW, 2955 Euclid Ave., Concord, CA 94519. (415) 685-7364

FOR SALE: T-368 - \$500; 75A1 - \$275; 75A3 - \$325; 75A2 - \$250; TMC manuals. SASE for spring list of vintage ham gear. **WANTED:** 4 and 5 pin tube sockets, ceramic octagonal and brown wafer style with tube numbers stamped on; Sylvania 1D or 210 tubes with ceramic base and graphite plate. Parker, W1YG, 87 Cove Rd., Lyme, CT 06371. (203) 434-7783

FOR SALE: Lafayette HA410 10 meter AM transceiver in excellent condition, w/manual, AC cord, mobile bracket, desk mic and crystals - \$175 shipped. Harry Schools, KA3B, (215) 468-1512

WANTED: Operational Hammarlund HC-10. J. Lucas, N1ZA, 160 South Fourth St., Lindenhurst, New York, 11757. (516) 589-1051 8 P.M. to midnight Eastern

"The First Fifty Years: A History of the Collins Radio Company and the Collins Divisions at Rockwell International"

This is a second printing of the original book by the same printer using the same plates. Identical in all respects to the first printing except that this printing has a linen finish soft cover.

*232 pages plus cover

*152 pages printed 1-color

*80 pages printed 4-color

*Cover: Printed 5-color

*200 halftones

*Size: 8-1/2 by 11

To Order:

send \$49.95 plus shipping and handling. Colorado residents add 3%

U.S. - \$3.25 (priority 1st c)

Canada - \$5.25 (Airmail)

Japan/Australia - \$ 16.75 (Airmail) Other countries please enquire.

Electric Radio, 145 CR 123, Hesperus, CO 81326.

CLASSIFIEDS

SKYPOINT HAM CENTER

101E. Holly Ave., Suite 3
Sterling, VA 22170
(703) 430-5555

Gil, N4QAS

- * Largest inventory of used gear on the East Coast
- * Large inventory of vintage and nostalgia rigs
- * Rig repairs, modest rates and quick turnaround
- * Newrigs, station accessories, antennas - no problem

FOR SALE: Telegraph relays, sounders, keys and a responder. Roland Matson, K1OKO, RFD#1, Box 2943, Kennebunk, ME 04043. (207) 985-3751

WANTED: Lever knob for AVC - OFF-MVC switch on BC-348N. Pete Hamersma, WB2JWU, 87 Philip Ave., Elmwood Park, NJ 07407

FOR SALE: GR 500 pf prec. condenser - \$25; McMurdo Silver Micromatch, w/manual; B&W Electronic T/R switch, w/preamp - \$25; Johnson Electronic T/R switch, 4 KW - \$20; NC-125, good cond., w/orig. manual - \$75; Hal ST-6000 w/manual - \$100; Heath Scanalyzer SB-620 w/manual for 3 Mhz RX IF - \$55; Variac 0-140 VAC, 20 amp - \$75. Some military stuff, free for freight. **WANTED:** Coils for SB-620 and SB-610. These are hard to find. I would appreciate the time it takes you to locate them. Clyde Sakir, N7IOK, 4243 E. First St., Tucson, AZ 85711. (602) 323-1120

WANTED: T-368; Collins 32V-3; R389 and original manual for 51J4. Tom Smith, N5AMA, 13034 Elmington Dr., Cypress, TX 77429

FOR SALE: Amplifier, 4-250 modulated by pair of 805s, commercial made on heavy chassis with 19" rack panels. Heavy, pickup only - \$150. **WANTED:** UTC CVM-5, Bruce, W9OTM, (708) 474-8910

FOR SALE: Radio Receptor Co. type "TMR" FAA omni beacon transmitter, 200-400 khz, excellent condition, museum piece from 1947. Too heavy to ship - Make offer; (3) 3CC00A, 1 in factory sealed envelope, with new tube socket and spec. sheet, (4) 3CX100-A5, original boxes and spec. sheets, (2) Y-319, orig. plastic envelopes, w/spec sheets - asking \$500 for the lot of 9 tubes; (4) RCA 872A rectifiers in RCA boxes, (5) 8008 rectifiers, pull-outs, usable - \$50 for the lot; (1) UTC S-22 500 watt mod. transformer, (1) Thordarson T-21M-62, matches P.P. 6L6s to VT-4C modulators, (2) VT-4C tubes w/bases - \$150; (1) B&W CX-40A butterfly with both neutralizing caps - \$50; (10) type 1625 tubes (pull-outs) - \$25 for the lot; (5) type 837 tubes (pull-outs) - \$25 for the lot. You pay to ship. Art Robertson, W0IWW, POB 719, La Junta, CO 81050. (719) 384-4990

ER Parts Unit Directory

At this point the directory has 150 units in it and it's growing daily. If you need a part for a vintage restoration send \$1 and an SASE for the list. If you have a parts unit consider putting it on the list. Your dead unit can help bring others to life.

CLASSIFIEDS

WANTED: Radar equipment, units or whole systems. Early TV cameras also sought. Allan. H. Weiner, 14 Prospect Dr., Yonkers, NY 10705. (914) 423-6638

FOR SALE: Antique spark gap, four adjustable gaps in series on heavy ceramic base, copper cooling vanes - \$125 firm. Ira Groff, W3ZLK, Box 308, Atlasburg, PA 15004. (412) 947-3392

FREE: 1991 Catalog Available. Dealers in surplus electron tubes. Electron Tube Enterprises, Box 311, Exxex VT 05451. (802) 879-0611. FAX (802) 879-7764

FOR SALE: TS-13E handset, T-17, RS-38A, Electrovoice 205-STC mikes - \$10 each; commercial mobile mikes - \$5; HS-30D - \$4; TCS noise limiter kit w/o tubes - \$5; MP-57, MP-22A mast bases - \$15 each; MS-49 through 54 mast sections - \$1.50 each; National ICN vernier dial - \$6; Heath HS-24 speaker - \$8. Shipping extra. George Babits, WA7HDL, Rt 1, Box 178-A6, Salmon, ID 83467. (208) 756-4147

TRADE: RU17, GF12, Blaupunkt WW II receiver, ANWRR-2 for W.E. tubes. Vogt, 330 S.W. 43rd St., #47, Renton, WA 98055. (206) 251-5420 ext. 247

FOR SALE: Two self supporting Dentron 33 foot verticals, solid construction - both for \$95 plus shipping; new instruction manual for FT-301D - \$17.50. W7LJL, 291 Coachman Dr., Eugene, OR 97405.

FOR SALE: Mint SX-101A manual - \$10.
WANTED: Hallicrafters S-120 receiver; QST 1950 - 1965; Handbooks 1950 - 1965. John Feltz, 973 East First St., Junction City, WI 54443. (715) 457-2506

FOR SALE: Communicator III, 6 meter transceiver; Comm. III, 6 meter amplifier; Comm IV, 2 meter, tubes and solid state; Comm IV, 6 meter, tubes and solid state. Ronald Matson, K1OKO, RFD #1, Box 2943, Kennebunk, ME 04043. (207) 985-3751

FOR SALE: Ranger; Viking II; ART-13; HF 10-20; new tubes: 4 each - CX150B, 465-A, 815, 2 each - 100TH, Telefunken LS180,LS50 and LV30 in original boxes; used tubes: (2) 4-1000A and 1 4-400A. **WANTED:** Schematics for 75A-2 and 32V-3; tubes: 4D32s, 807s, 2E26s,6146s and 5R4s; Morrow twins, MBR-5 and MB-560 plus power supplies. Eugene Clayton, W7MXM, 508 S. Amman Rd., Idaho Falls, ID 83406. (208) 522-5854

FOR SALE: Globe model V10 VFO, 7 bands, 160-6 - \$39; Signal Corps wavemeter, SCR-125 - \$12; Hallicrafters S38E - \$39. Shipping extra. Henry Mohr, W3NCX, 1005 Wyoming, Allentown, PA 18103.

WANTED: CQ Anthology volumes 1 and 2; CQ Surplus Schematics; Index to Surplus by 73 Magazine and Understanding Amateur Radio by the ARRL. Alan Mark, POB 372, Pembroke, MA 02359.

WANTED: Vibroplex Lightning or Champion bugs in good condition. Call days leave message if unavailable. Ron Bramhall, KQ5A, 7877 S. Magnolia Way, Englewood, CO 80112.

FOR SALE: National 183D in very good condition, works - \$125; U.S. Army BC-459-A, untested - \$50 or BO. Kevin Eftink, 16 Edgewood Dr., Quincy, IL 62301. (217) 228-2221

FOR SALE: Shortwave Craft magazines, 43 issues 1932-1936 in Shortwave Craft binders, excellent condition. Charles Stinger, 404 Ross Ave., Hamilton, OH 45013. (513) 867-0079

FOR SALE: SX-42, w/manual - \$115; Pierson KE-93, w/manual and AC supply - \$70. Plus UPS. Dan Mason, 1325 N. Lima, Burbank, CA 91505. (818) 848-9474

Please remember to count the words in your ad. If you are over 25 words please send 15 cents for each additional word.

CLASSIFIEDS

ROCKWELL-COLLINS S-LINE INSTRUCTION BOOKS

- * Rockwell-Collins Authorized Publications
- * Printed from the latest editions
- * Money back guarantee

* 756-3/3A, 32S-3, 30L-1 - \$25

* 516F-2 - \$15

* KWM-2/2A - \$35

* 312B-4/5 - \$20

* 756-3B/3C, 32S-3A, 30S-1 - \$30

Ohio Residents add 6% sales tax. U.S. orders add 7% for shipping and handling. International orders please write.

VISTA TECHNOLOGY INCORPORATED

3041 Rising Springs Ct., Bellbrook, OH 45305 (513) 426-6700

WANTED: Buy and sell all types of electron tubes. Harold Bramstedt, C&N Electronics, 6104 Egg Lake Road, Hugo, MN 55038. (800) 421-9397, (612) 429-9397, FAX 612-429-0292

WANTED: McElroy bugs, especially with MAC-KEY nameplate. Tom French, W11MQ, 120 Great Road, Maynard, MA 01754. (508) 897-2226

FOR SALE: Parting a DX-100; R44 spir - \$27; Drake W-4 - \$55; KWS-1 - BO; DC ps for PMR-8 - BO; HRO-60, no knobs, no coils - \$50. Joe Sloss, K7MKS, 4732 119th Ave., SE, Bellevue, WA 98006. (206) 747-5349

FOR SALE: Parted out a Hallicrafters HT-9 and have xfms and chokes. Roland Matson, K1OKO, RFD#1, Box 2943, Kennebunk, ME 04043. (207) 985-3751

WANTED: SX-100 for parts. Steve Funk, N6TTPU, 27 Alhambra, Apt. 103, San Francisco, CA 94123.

FOR SALE: Antique radios, parts, tubes, books, 150 panel meters, knobs, amateur, test equipment, transmitter crystals, etc. 13 lists. SASE + \$2 cash (no checks). Richard & Rose's Radio Mart, POB 691443, Tulsa, OK 74169.

WANTED: 6L6GC, 6CA7/EL34, 6550A, 7027A and transmitting tubes of all types. Send list to Bob Booker, K0NT, 2120 S. Brownell, Joplin, MO 64804.

WANTED: Intelligence museum wants German, Japanese, Italian, Russian and Chinese communication equipment and any British or U.S. spy radios. LTC William Howard, 219 Harborview Lane, Largo, FL 34640. (813) 585-7756

WANTED: Very old or unusual Hallicrafters equipment, entire 1934 "T" and "Z" line of Silver Marshal, parts, memorabilia and manuals. Chuck Dachis, "The Hallicrafter Collector", WD5EOG, 4500 Russell Drive, Austin, TX 78745.

BOOKS, MAGAZINES WANTED: Modern Electrics, Experimenter, Science Invention, Radio News, Radio Retailing, Radiocraft, M.I.T. Radiation Laboratory Books, OTHER TECHNICAL BOOKS, MAGAZINES, also CRYSTAL SETS, MICROPHONES. State lot price for resale. Delton Lee Johnson, WB6MNY, 14 McKeveitt Heights, Santa Paula, CA 93060. (805) 525-8955, evenings

ELECTRON TUBES: All types - microwave, transmitting, receiving, obsolete, military - Large inventory. Daily Electronics Corp., POB 5029, Compton, CA 90224. (213) 774-1255; (800) 346-6667

TUBES • PARTS • SUPPLIES **YOUR COMPLETE SOURCE**

TUBES:

3000 audio, receiving and industrial types in stock, including early and foreign types. Discount prices!

CAPACITORS:

High voltage electrolytic and mylar capacitors for tube circuits.

TRANSFORMERS:

Hard-to-find power transformers, audio transformers, and filter chokes for tube equipment.

SUPPLIES:

Chemicals, test equipment, wire, batteries, tools, etc.

LITERATURE:

Extensive offering of literature and books on antique radios, hi-fi, communications equipment, tube data, and circuit diagrams.

PARTS:

Resistors, lamps, tube sockets, potentiometers, grill cloth, knobs, vibrators and more.



"Write or call for our 28 page wholesale catalog"

ANTIQUE ELECTRONIC SUPPLY

6221 S. Maple Avenue, Tempe, AZ 85283, Phone (602) 820-5411, FAX (602) 820-4643

A directory of vintage parts unit rigs available to subscribers for \$1 and a LSASE. Presently there are 150 units in the directory and it's growing daily. The list of units is by manufacturer in alphabetical order followed by the owners address and telephone number. If you have a parts unit please let us put it on the list.

Subscription Information

Rates within the U.S.

\$20 per year 2nd class

\$30 per year 1st class

Canada by Air (only).....U.S. \$32

Other Foreign Countries by Air (only).... U.S. \$55

Guaranteed Refund at any time for issues remaining on subscription

subscribe by mail or phone

ER

145 CR 123

Hesperus, CO 81326

(303) 247-4935

SECOND
CLASS

ELECTRIC RADIO
145 CR 123
Hesperus, CO 81326



TO:

