NATIONAL RADIO NEWS

IN THIS ISSUE

Electronics, Inc.

A Modern Television Receiver

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TEN SUGGESTIONS FOR HOLDING AND IMPROVING A JOB

I. Accept and welcome fair criticism. When executives find that certain men resent criticism, they stop criticizing and begin firing.

II. Don't give out unfair criticism. Don't be a chronic grouch or petty complainer. Stop listening to grouchy associates or you'll become like them.

III. Develop a "we" and "our" attitude toward your company. Show an enthusiasm and interest in the company's success. Realize that what hurts company business hurts you also.

IV. Hard work brings success just as fast today as ever. Remember this—if you never do more than you're paid to do, you'll never get paid for more than you do.

V. Prepare yourself to handle part or all of the work of men above you. A good understudy for an executive is too valuable to fire.

VI. Always be ready to lend a hand to others or do new tasks. Willing workers are hard to fire.

VII. Develop confidence in your abilities, but avoid over-confidence. Bluffers eventually get deflated. Confine your clock-watching to alarm clocks, and make a habit of getting to work on time.

VIII. Keep your head when the routine of work is varied or when an emergency arises. Accept responsibility whenever opportunity offers; a refusal kills chances for advancement.

IX. Don't bury your nose in the details of your job. Organize your work and assign routine duties to your assistants whenever possible, so you will have time for more important things.

X. Devote a few minutes of each day to clear thinking about your job, your future and your company's future. Jot down each worthwhile idea immediately, develop the idea in your mind for a few days, then write it up in detail for consideration by your superiors. Initiative of this form is welcomed and eventually rewarded.

J. E. Smith
President.

Television Brings Crime To Electronics, Inc.

With a $9,000,000 ransom and the lives of thirty-seven missing persons at stake, a scientific super-crook flings a challenge at Electronics, Inc. by parading his kidnapped victims across the screen of the television receiver built by our famous science-fiction friends, Jay and Ozzie.

THERE were just two sounds in the Washington radio service shop of Electronics, Inc., which could get action out of chubby co-partner Ozzie during the hour following breakfast: the characteristic doorbell ring of the postman, and the clatter of the telephone.

By L. J. MARKUS

N. R. I. Technical Editor

The postman had already come and gone on this midsummer Monday morning, leaving the customary assortment of advertising literature and magazines. Feet on desk, chair tilted way back, Ozzie lazily opened one envelope after another, carefully unfolded each piece, snorted now and then as he flung a particularly outlandish piece of sales copy into the wastebasket. Those few pieces which merited further attention he piled on the desk. Next came the morning paper, read with one ear always cocked toward the telephone.

Ozzie maintained that any man who regularly consumed a double helping of cereal, four eggs, a whole slice of ham and eight pieces of toast for breakfast was entitled to this hour in which to make peace with an overloaded stomach. His scientifically-inclined partner, Jay Green, personally believed it was more a matter of inability to work after such a meal than any thoughts of kindness to an unseen tummy, but the matter never did come up for discussion. Once Ozzie began stabbing at the day's assortment of ailing radios with his glistening soldering iron, loafing time was quickly made up.

Ozzie repaired or replaced the defective parts and realigned each set, after Jay had located the trouble and marked it on the job ticket. Years of experience in applying effect-to-cause reasoning, plus an uncanny ability to verify this reasoning by a quick check with an ordinary all-purpose multimeter and an all-wave signal generator, was the secret of Jay's ability to spot defective parts.

This morning Ozzie was in a conversational mood, and again crime was the topic. To these two young men who had become famous for their ability to use radio and electronic gadgets in solving baffling major crimes, the thrills and dangers of previous triumphs over crooks made them yearn for more excitement.

For some weeks Jay had been collecting newspaper clippings describing mysterious disappearances of rich tourists. These were just short notices with no suggestion of crime, stating that certain persons had not arrived at their destinations when expected. Jay had been clipping these items despite Ozzie's assertion that there couldn't possibly be so many people kidnapped at one time on the main transcontinental highways.

"But look here, Ozzie," exclaimed Jay as he pulled a folder out of his crime file. "I've already got seventeen missing-person stories from the Washington papers, and four more from the New York papers. Every one of them is fairly wealthy, and there are at least five millionaires. I haven't even looked at papers from other cities —why, there may be dozens more missing by now!"

Ozzie snorted in derision, but his ready retort

was stopped by the clatter of the telephone. Feet banged down on the floor as he lunged forward, grabbed for the receiver on the desk, and answered with a cheery "Good morning — Electronics, Inc."

A gruff, apparently disguised voice spoke slowly over the phone as if reading a message: "*Tune your television receiver to the 66-72 megacycle band at exactly 9:30 tonight. Have the police present. Thirty-seven persons whom I have kidnapped will each appear on the screen and ask for ransom!*" A click signified the end of the call.

Excitedly Ozzie repeated this message, word for word, to Jay. "Quick, Ozzie—ask the operator to trace that call," shouted Jay. "It's probably from a pay station, but we can't pass up any possibilities."

Jay was right—the call came from a phone booth in a drug store just a few blocks away. "That means he may have been spying on us all morning!" exclaimed Ozzie. "But why should he call us instead of the relatives of the victims?"

"That does look as if he were anxious to have Electronics, Inc. on his trail," admitted Jay, "but suppose his entire scheme hinged upon the use of television in place of ransom notes. I've a pretty strong hunch we've got the only television receiver installation in Washington which is effective enough to pick up his telecasts!"

The next telephone call from Electronics, Inc. went straight to police headquarters. The Chief of Police welcomed the message as a drowning man welcomes a life buoy, indicating that another major crime wave threatened. The chief promised to be at the shop himself that evening with a picked crew of men, and asked Jay to provide room also for F.B.I. men and for a select group of newspaper reporters.

"Ozzie, see how fast you can get those radio sets out of here," commanded Jay. "This time we're up against a criminal who's using our own electronic methods, so we've got to clear the shop and be ready for some fast action these next few days. No matter how smart this super-criminal may be, I'm sure we can get just as many hot clues from his telecast as the police could get from ransom letters."

While Ozzie was out, Jay busied himself with alignment of the preselector and oscillator tuned circuits of the television receiver for the 66-72 megacycle channel. Coils for this channel had been incorporated in the set, but since no stations were as yet broadcasting on this frequency, he had not bothered with final adjustments.

By the time Ozzie returned, Jay had determined to film the entire broadcast. Out went Ozzie again to round up two 16-mm. sound-on-film cameras, while Jay rigged up an emergency high-voltage power supply for their spare television cathode ray tube, mounted this tube on the workbench in such a way that both cameras could be focused on it, then connected its signal and deflection circuits in shunt with the corresponding circuits in the main television receiver. The extra tube necessitated many more readjustments to compensate for the added capacity across the video amplifier output stage and across the sweep generator output circuits.

For the initial adjustments, Jay fed the output of a special square-wave signal generator into the receiver and connected a cathode ray oscilloscope to its output. The compensating circuits in the video amplifier were then adjusted until the pattern on the c.r.o. screen had a flat top with sharp corners. At last this desired pattern appeared, indicating that frequency response was uniform right up from 10 cycles to the maximum of 4 megacycles as used in standard R.M.A. 441-line transmissions.

Next came adjustments to make the phase delay in the video amplifier increase linearly with frequency so as to give a constant time delay. Resetting of the damping control in the horizontal sweep channel and the peaking control in the vertical sweep channel completed the initial adjustments.

As a final check of the television receiver, Jay connected their monoscope to the television receiver input and critically inspected "Wahoo" on the screens of both television tubes. This monoscope served the same purpose in connection with television receivers as did a modulated r.f. signal generator for sound receivers. It generated the video signals and synchronizing impulses needed to produce on the television receiver screen a reproduction of the single picture imprinted on the end of the monoscope tube. The particular monoscope tube chosen by Jay provided a picture of an Indian, to whom they had given the name "Wahoo."

By now Ozzie had returned with the cameras. "Look, Ozzie—the tip of every feather on Wahoo is sharp as a knife. This proves that the equalizing circuits are compensating perfectly for the extra television cathode ray tube and for stray shunt capacities in our receiver," pointed out Jay. "Now bring up your sound-on-film cameras, so I can arrange their microphones near the loudspeaker of our television receiver."

With all connections completed and both cameras focused on the screen, Ozzie loaded each camera with a short reel.

"All right, Ozzie, let's see how good you are at movie photography," said Jay. "You'll be handling these cameras tonight, so here's a chance to get some practice. Run off a reel on each camera, with various diaphragm openings. I'll

use one of the mikes to provide some sound effects for Wahoo, to get a check on the photo-electric sound recorder."

With Jay singing his interpretation of "Red Wing" and Ozzie groaning in mental agony as he manipulated the camera controls, the tests were soon completed. Development in the elaborate downstairs darkroom showed the sound equipment to be okay, and revealed the best settings for the camera.

Long before the appointed time, the police began arriving. Ozzie ushered them to chairs grouped around the television receiver, so that all could get clear views of whatever was to appear on the 8" x 10" screen of the receiver.

Jay was at the controls of his special ultra-high-frequency sound receiver. The 66-72 megacycle channel was silent, but police calls could occasionally be heard as Jay tuned to either side of the channel on the chance that the outlaw station might wander in frequency.

At 9:30 on the dot, the hum of a powerful carrier signal filled the room. Jay quickly tuned for maximum volume, then waited. About a minute later, the tense audience could hear the characteristic whining sound which occurs whenever a television picture signal is tuned in on a sound receiver. A glance at the tuning dial showed that the signals were coming in right on the dot at 67.25 mc. Tuning to a point 4.5 mc. higher in frequency, a carrier modulated with a tone of about 1,000 cycles was heard. This indicated that the outlaw was transmitting the standard R.M.A. single side-band television signal for which Jay's receiver was designed.

"He's transmitting test signals now to give us a chance to tune in our set," explained Jay as he turned off the sound receiver, and moved over to the controls of the huge television receiver.

All eyes were on the screen, eager for the first glimpse of the picture. Jay flipped a toggle switch to change the antenna over to the television receiver. In the dead silence of that room, the clatter of the antenna relay sounded like a pistol shot. Even the grizzly veterans of hard-fought gun battles jumped, then grinned shamefacedly at each other as Ozzie pointed out the source of the sound, above an outside window of the shop.

Now the tone modulation could be heard again. Jay adjusted the vernier tuning control for maximum volume, thereby tuning in automatically the video portion of the broadcast. A faint glow appeared on the screen. Watching this pattern, Jay reached over to the work-bench and rotated a calibrated control wheel there through a full 360°. At NNW on the compass card behind the wheel, the picture had brightened noticeably, so Jay swung back to this point and carefully adjusted for maximum brightness. During this, a rumbling sound could be heard overhead.

"That's the electric motor which rotates our special diamond-shaped directive receiving antenna structure on the roof. I can operate it from here by remote control, as this dial tells exactly the direction in which it is aimed," explained Jay. "We know now that the signal is coming from a north-northwest direction, just about on a line between here and Rockville. I'll tilt the antenna up and down now with this other control."

Again the rumble of a motor was heard. Having found the angle of tilt which gave maximum brightness, Jay returned to the receiver controls. With hands flying between the contrast and brilliancy controls, he brought out the image bright and clear. Gasps of surprise came from the policemen. A reporter disgustedly muttered, "just a picture of an Indian." Then came a shout from Ozzie as Jay made the final adjustment: "It's Wahoo!"

Jay realized it was merely a coincidence that the outlaw had chosen a monoscope with an Indian picture for tuning purposes, but it took considerable explaining before the gathered policemen and reporters nodded their heads in understanding. Then, at a signal from Jay, Ozzie started the camera.

Suddenly "Wahoo" disappeared. A short time later, all recognized the face of millionaire J. Ogden Brillton. In a broken voice, anguish in his face, he could be heard saying: "*My ransom has been set at* $500,000. *Sell my stocks, my estate, everything—and give this fiend the money. I'll die if I don't get out of this water-logged cavern before many more days!*"

One after another, other victims appeared on the screen. Each stated a ransom figure and named relatives to whom instructions were given for raising the money. Some of the victims fainted in the glare of photo-flood lights, and masked men could be seen dragging them out of view of the camera.

Ozzie was kept busy at the cameras, switching from one to the other as the reels of film ran out, with all the skill and dexterity of an experienced projectionist. To make sure not a word would be missed, he had both cameras catching the scenes and words near the end of each reel. Between reels he removed the exposed film and reloaded in readiness for the next switch-over.

At last there came an end to the long line of kidnapped men and women parading across the screen. For a few seconds the screen was blank, with the solid gray color of the background giving no indication whatsoever of the location

from which the broadcast was originating. An air of expectancy hung over the group—now was the big moment when the criminal himself would take over the stage.

Suddenly a strange picture appeared on the screen, looking more like an artist's conception of a Martian warrior than like a human being. The movements were those of a man, but he wore a close-fitting suit of armor made of steel links which no ordinary bullet could penetrate. Over his head was a hood of shatter-proof glass, tinted just enough to prevent the features of his face from being recognizable even in the bright glare of flood-lights. Only a pair of gleaming black eyes could be seen as he grasped the microphone, held it close to the bottom of the helmet, and spoke:

"Greetings from Oidar! You have seen my thirty-seven victims. You have heard their ransom pleas. Four days will be allowed in which to gather this ransom. The total, exactly $9,000,000, is to consist of five hundred thousand $10 bills and eight hundred thousand $5 bills, all unmarked.

"Install in the service truck of Electronics, Inc. a 100-watt radio transmitter radiating a 2,500-cycle tone modulation on a carrier wavelength of 20 meters, using a vertical aerial.

"On Friday evening, load the money into the truck. At 9 p.m., he whom you call Ozzie shall head west out of Washington on the Lee Highway, with no one else in the truck or following by land or air, and no police anywhere on or near the highway. My men will locate the truck with radio direction finders, intercept it somewhere and guide Ozzie to me. I guarantee him a safe return without ransom if he follows these instructions.

"My captives will renew their pleas to you via television each evening at this same time until the ransom is delivered. They will then be released, along with their chauffeurs and guests, so new victims can take their places and contribute likewise to my organization.

"If the ransom is not delivered, there will be additional telecasts until the money is in my hands, with one captive being tortured to death each night before your eyes. This same lingering death awaits any who interfere with these plans. Goodnight."

The screen darkened. The loudspeaker became silent as Oidar switched off his transmitter. For almost a minute the group of viewers sat silently, stunned by the audacity of this new criminal.

First to come to life were the reporters. Out they dashed in a frenzied search for telephones. "Stop the presses! Make way for an extra! Superkidnapper demands $9,000,000 ransom via television! Missing persons seen on television screen!" were the words flashed over telephone wires to city editors and to press agencies.

In the shop of Electronics, Inc., the police were bewildered, and frankly admitted they had no idea where to start their search. One officer asked: "Can you tell where that broadcast came from?"

Jay brought out a map of the region, and drew on it a line radiating out from Washington at the angle indicated by the antenna-rotating control. Glancing at the angle-of-tilt reading for the other antenna motor, he traced outward along this line with a pencil, stopped at one point, made a quick computation, then announced: "Those signals were coming from a point on or near the top of Sugar Lump Mountain, about thirty miles from here." Before he could say more, the police had dashed out into their squad cars and started a mad race to that historical midget mountain which in recent years had become a favorite picnic spot for the younger generation.

"They're just wasting gas on a wild-goose chase, Ozzie," said Jay. "Any man who can build a television transmitter which will send pictures as excellent as those we saw tonight is smart enough to avoid giving away his location so easily. He probably used a portable ultra-high-frequency relay station somewhere on the highway going up this mountain, with a directive antenna oriented to send the signals directly toward us. This relay transmitter could have been picking up the program from any direction of the compass, so direction finders won't be of any use this time. He can have a series of relay stations, changing the location of each one each night, and get his programs to us without a chance of being traced. Naturally each will have its own power plant, and the station will be far enough away from Washington so the police cannot get there during a broadcast."

With extras on the street, the reporters were back for any further information they could secure. Jay asked them to dig up all available newspaper clippings relating to the kidnapped people, in order to determine where they were last seen and in what direction they were known to be traveling. As the reports began trickling in, he made a dot on a large United States map for each last-known location, with an arrow extending from it in the direction of travel.

Downstairs in the darkroom, Ozzie was developing the films of the broadcast as fast as possible, with eager news photographers gathered around and helping as best they could. Extra electric heaters were brought in to hasten the drying. Soon they were picking out choice frames and pulling 8" x 10" enlargements for the newspapers.

Each man wanted a slightly different shot for his paper, so Ozzie good-naturedly shifted the film forward several feet on the enlarger before feeding in another sheet of enlargement paper.

Milkmen were heard making their rounds on the streets outside as the last mark was placed on the map. Jay studied the results carefully, then drew an irregular loop enclosing an area on the map and said: "Somewhere in this area they vanished. From the words of millionaire Brillton tonight we can assume they are in a large underground cavern, but this entire area is riddled with caverns."

"That area doesn't seem so large," cried Ozzie. "Can't we have the police search every cavern until they find this Oidar?"

"That area includes way over 100,000 square miles, and is mostly mountain country," stated Jay as he scaled the dimensions off the map with a ruler. "It would take months to explore the area thoroughly, and even then the searchers might pass over the place. This cavern probably never had a natural entrance, for you could start tunnelling almost anywhere in this region and eventually come to some cavern far underground. Of course, the police will start such a search as soon as they see this map, but chances are they will fail."

Just as Jay predicted, weary police returned, after tramping over every foot of Sugar Lump Mountain, with the report that nothing had been found. Now the facilities of state and local police in the mapped area were concentrated upon the search for Oidar, with newspapers clamoring for quick results. Squad cars, planes, army trucks, every vehicle which could be mobilized was sent into the area so logically mapped out by Jay. With the area extending from Pennsylvania down to the Smokies and including three great mountain chains, the Blue Ridge Mountains, the Shenandoahs and the Alleghanies, the police realized that only sheer luck could make their search successful.

But Jay and Ozzie had no faith in Lady Luck. After a few hours of sleep and a hurried breakfast, they were headed back to the shop, ready to pit their knowledge of science against that of Oidar.

While awaiting the reports from newspaper offices all over the country the previous evening, Jay had analyzed the entire situation thoroughly in his mind. He had long ago developed the habit of considering all known facts about a problem in this way before retiring for the night. Then, while he slept, his subconscious mind could coordinate all these facts, combine them with details which had previously appeared unimportant, and figure out a logical method of attack. Invariably Jay would awake the next morning with his next moves clearly in mind.

Apparently Jay did have a plan in mind that morning, for on arriving at the shop he immediately put the waiting group of reporters to work. They were to secure a list of all stationary internal combustion engines in use in the suspected area, with technical specifications on each, including size, speed, number of cylinders and the nature of the machinery being driven by each unit. "And now, Ozzie," commanded Jay, "help yourself to a few of those reporters and see how fast you all can camouflage our delivery truck. We're going into Oidar's territory today, right past his cavern, and can't take any chances of being recognized by lookouts."

Reporters sprang to attention at this confident statement, but Jay laughed alike at their requests for details, their accusations that he was bluffing, and their requests to come along. "And no use risking your necks trying to follow us, boys," warned Jay. "With that super-charged V-16 engine we just put into the truck, Ozzie only needs a few miles of reasonably straight highway to get out of sight of anything you can dig up in the way of transportation. And we can lay the swellest smoke screen behind the truck, too, if we have to!"

Ozzie immediately put two of the reporters to work washing wax off the car body with gasoline, while he mixed up a batch of gray cold-water paint and loaded it into the shop spray gun. With windows protected by newspapers and scotch tape, the car was transformed in a few minutes into a drab gray which entirely masked the sleek speedy lines so familiar to Washingtonians. With a can of black paint and a one-inch brush, Ozzie next slapped a "Poultry, Fresh Eggs and Vegetables" sign on each side of the truck.

By the time the truck was ready, Jay had selected from neatly-arranged shelves the equipment required for the trip, and had brought it to the rear of the shop. In a jiffy it was loaded, reporters shooed out, and the shop locked up.

Just as they were ready to leave, a reporter called: "Gonna be back in time for tonight's telecast by Oidar?"

Knowing the search might last well into the night, Jay decided to turn over the shop keys to the Chief of Police, so he could have access to the television receiver even if they didn't return. In a trice he had turned on the short-wave transmitter in the car, picked up the hand telephone set in front of him, and was talking to police headquarters. "Jay Green speaking. Send a radio car to the rear of Electronics, Inc."

In a few seconds they could hear a police siren off in the distance. While waiting, Jay explained to the gaping reporters that his truck carried a short-wave transmitter licensed for mobile

operation. In the shop was a receiver tuned to the same frequency, so designed that it would automatically connect to the shop telephone whenever the transmitter came on the air.

To the police officers Jay gave the keys, with instructions to have the Chief of Police bring along a police radio operator that evening to operate the television receiver if they did not return in time.

Straight west out of Washington they headed now, over Lee Highway up into the Blue Ridge mountains. Ozzie was at the wheel, with Jay tracing their progress on the map.

At the first outcropping of rock along the road winding upward toward Skyline Drive, Jay signalled for a stop. Ozzie was then instructed to hold an electrical stethoscope against the rocks, with its connecting cable running back into the rear of the truck. There Jay listened with headphones and manipulated various controls.

The stethoscope was much like the ordinary medical type, except that it had a microphone in place of earpieces. This microphone fed into a powerful audio amplifier which amplified millions of times any vibrations existing in the rock ledge.

Ozzie sweated in the glaring sun while Jay manipulated highly selective audio filter circuits which allowed only a limited range of frequencies to pass. He had previously figured out the vibration frequencies for all common types of engine-driven power plants, and had marked on the map the fundamental frequencies of all engines known to exist in the locality. These frequencies were dependent upon the number of cylinders and upon the speed of the engine, and hence were considerably higher than the frequency of the generated electrical power. Switching in turn from one possible vibration frequency to another, Jay recorded the intensity at each frequency.

With Ozzie rapidly becoming more and more scornful of the whole idea, and more interested in cooling refreshments than hot rock ledges, Jay finally called: "Okay, Ozzie—all through here. Drive up to the next little town, so you can fill up with ice-cold pop while I do a bit of figuring with this data."

With a loud sigh of relief, Ozzie coiled up the connecting cable and hung it up on the correct hook at the rear of the truck. As they whizzed along at maximum legal speed, Jay outlined his plans.

The fact that it had been necessary to adjust the line and frame sweep frequency controls slightly the previous evening, when tuning in the television image, told him that Oidar was using an engine-driven power plant instead of 60-cycle power. Jay knew that the vibrations produced by this engine would be transmitted through rock for a considerable distance. Once he had identified the vibrations of known power plants and become familiar with their own characteristic vibration sounds produced by harmonic vibrations, he would be able to detect a strange power plant immediately once he came within listening distance.

Ozzie marveled at the ingenuity of the entire idea, and was eager to see if it worked. Cool drinks at a small mountain village perked up the spirits of both, and again they were on the highway.

Stops were made about every five miles in rocky country for measurements, and even farther apart in sections obviously unsuited for cavern formation. As Jay became familiar with the adjustments and with the characteristic sounds due to various known power plants, he gradually speeded up the process.

Each time they approached a locality in which a power plant was known to exist, Jay could observe the increase in the intensity of its fundamental vibration. Once they had identified all vibrations in a locality, they merely stopped long enough for Jay to sweep across the audio range and listen for a new vibration.

When Jay pointed out that Oidar would undoubtedly have lookouts posted on mountain tops to watch the highways, Ozzie tried to choose stopping points which were concealed from mountain top lookouts by trees, but sometimes this was impossible.

The last little city on a particular range had been passed, with no more known power plants for miles ahead. "If I were Oidar, I'd spot my hideout somewhere in these hills," commented Jay as they stopped for the forty-fifth time that day. Ozzie clambered wearily across the ditch, somewhat tired by now, and once again held the electric ear against the hard cheek of Mother Nature. From the inside of the truck came a shout: "Ozzie—there's a 160-cycle vibration here I never heard before. Hop in, and with a few more stops we'll know where it's coming from."

At the next stop, about a mile down the mountain, Jay found this vibration greatly increased in magnitude. Stronger and stronger it grew as they progressed down into the valley and up across the next ridge. By now it had grown dark, and traffic had dwindled to almost nothing. The road was only two cars wide, and quite completely bordered with "WINDING ROAD AHEAD" signs.

Jay was driving, for with only one vibration to listen to, there was no further need to touch

the amplifier controls. At each stop, Jay merely reached back for the headphones while Ozzie jumped out.

They were going down hill now, along a stretch where there was a slight fog clinging to the roadway. Ahead was a blind curve, but well banked so Jay did not bother to slow up. Rounding the curve at about 40 miles per hour, Ozzie suddenly shrieked: "The brakes, Jay—the road is blocked!"

Two huge ten-wheeler trucks could be seen tangled together right across the roadway, both on their sides, with a small crowd of people scurrying back and forth in front of the trucks. A doctor was working over one man lying still on the roadway. Several state highway patrolmen could be seen trying to pull another person out of the cab of one truck. All this Jay and Ozzie saw at a glance as their car rushed toward the accident.

Jay released pressure on the accelerator and Ozzie grabbed for the emergency brake lever. The next instant Jay jammed the accelerator down to the floor boards, knocked Ozzie's hand away from the brakes and commanded him to duck below the windshield. Straight into the first ten-wheeler truck they headed at terrific speed, with Ozzie braced for the crash. Jay hung grimly to the wheel, with head so low that he could just barely peer over the windshield.

But no crash came! Right through the accident site they went as if through a mirage. Shouts were heard; bullets whistled through the car from all directions, shattering the safety glass windows.

With the speedometer registering well over 100 miles per hour and still climbing, they were soon out of range of guns. Jay slowed down gradually to a safer speed, then reassured Ozzie who was white as a ghost: "You can get up now, Ozzie. We're safe for the time being."

"But that accident—how did we get around those trucks?" sputtered Ozzie dazedly.

"There was no accident, Ozzie," explained Jay. "That was just a smoke screen across the roadway, with two of the new back-stage movie projectors aimed at it from the other side to give a three-dimensional picture of some accident they must have staged and filmed exactly for this purpose. I knew Oidar must have had some tricky scheme for stopping the cars of his victims without permanently blocking the highway. He overlooked just one point when filming the scene, though; the accident appeared well-lighted, yet there were no floodlights or other sources of light visible anywhere. As soon as I noticed that, I realized we were being ambushed, and decided to call their bluff."

"The only thing actually across the road," continued Jay, "was a rubber hose pierced with a row of holes through which the special smoke could escape and move upward in a sheet to form the screen. With almost vertical rock walls at that location, no wind ever came down to spread the smoke, and they had a perfect yet instantly removable screen for their moving pictures. Sure did look real, didn't it?"

"Whew," exclaimed Ozzie as he wiped the sweat from his brow. "It was real enough to stop me any time. We'd be in Oidar's clutches this very minute if you hadn't stepped on the gas when you did. And those bullets were decidedly real—I can still hear them whistling past my ears!"

As they traveled slowly back to Washington that night over a roundabout route which kept them far away from the ambush site, Jay and Ozzie discussed plans for capturing the kidnappers.

Jay pointed out that the cavern hideout could be many miles from the point at which their last vibration measurement was taken, and hence was not necessarily at the ambush point. More measurements would be needed to locate even its approximate position, and with Oidar now on the alert, these would be dangerous if not impossible. The gang was undoubtedly using two-way radio communication between headquarters, the lookout points and the movie projector site. Some lookout must have spotted Jay and Ozzie making measurements, despite all their precautions, and flashed a warning to headquarters in ample time for Oidar to order an ambush.

"Do you suppose all of the kidnapped persons were stopped the same way?" asked Ozzie.

"I'm sure they were," replied Jay. "Oidar undoubtedly had lookouts posted at strategic points on all highways in this territory, so he could trace the progress of each intended victim. Knowing the destination from newspaper write-ups, and knowing the route taken across the Blue Ridge Mountains, he could be pretty sure which highway would be taken across the Shenandoahs. He could then set up the projectors and screen at a suitable point along that route. At night, following calm days, almost any spot would do; during the day, though, he'd have to choose a rather dark, shady spot and increase the sizes of the projector lamps in order to get a clear enough image on the smoke screen. With the victim's car stopped, armed gangsters could jump into the car and drive the victim immediately to the cavern hide-out, while others loaded the projection equipment into a truck and proceeded to the next location."

Arriving in Washington shortly after midnight, Jay and Ozzie reported their findings immediately to the Chief of Police, who was still at headquarters directing the brute-force search

for Oidar. A conference with federal agents assigned to the case followed immediately, with three conclusions resulting: 1. No direct police raid could be made on Oidar even though his position was known within a few miles, for by the time the concealed entrance was found and smashed in, crooks could massacre the victims and escape through other entrances; 2. The present search must be continued, for stopping the search would tell Oidar they were hot on his trail, and give the same dire results as a premature raid; 3. Newspaper reporters must be made to believe that the day's search had been a complete failure.

The next day, Jay and Ozzie worked busily at the shop preparing for their final move. The damaged glass in the truck was replaced with heavier bullet-proof glass, and additional armor plate was welded to the inside of the truck body. The camouflage coat of gray was removed, restoring the familiar metallic green finish of the truck and the modernistic gold leaf lettering.

Each evening, police and reporters gathered in the shop on schedule to watch again the parade of victims on the television screen, then listen to Oidar's jibes at inability of police and army men to find his hideout.

On the evening preceding that scheduled for delivery of the ransom money, Oidar gave detailed instructions as to how the money should be loaded into the Electronics, Inc. truck, and how Ozzie, alone and unarmed, was to be given a police escort to a point about 25 miles out of Washington. All searching parties were to be recalled, and no airplanes whatsoever were to be flying over the mountains while Ozzie was delivering the ransom. Instructions as to the exact route appeared on posters held in front of the television cameras, presumably because Oidar feared hi-jacking of the $9,000,000 ransom truck by gangsters who might be listening to the sound portion of the broadcast with an all-wave sound receiver.

After leaving the police escort, Ozzie was to continue in a westerly direction over any route he preferred, with the 20-meter transmitter turned on and with the regular short-wave receiver in the car tuned to 3.5 meters. Oidar's lookouts could thus trace the progress of the truck with radio direction finders on mountain peaks, and give further travel instructions to Ozzie over an ultra-short wave beam which traveled only in straight lines and could be aimed directly at the truck from some mountain peak as far as 25 miles off the road.

All this fitted in perfectly with Jay's plans. Police were instructed to station armed men in civilian clothes along each road leading into the suspected location of the cavern, at points adaptable to perfect concealment. A system of ropes and hooks similar to those used on airplane carriers to slow down planes after they land on deck was to be placed at each location. This was to be concealed in such a way that it could be placed across the road the instant the Electronics, Inc. truck was sighted.

Jay's plan hinged upon the installation in the truck of entirely new electronic weapons against crime. These had to be installed chiefly underneath the floor, under the seat, and behind the existing test panels which were permanently mounted in the truck, so as not to arouse the suspicion of Oidar's men when they first inspected the truck.

Jay and Ozzie worked day and night in their shop getting the truck ready. With unlimited funds placed at their disposal, all needed materials were ordered by long-distance telephone and delivered the same day by air express.

All was in readiness and all tests completed as the zero hour approached for Ozzie. He looked forward eagerly to his encounter with the Public Enemy Number One of the day, reassured by the knowledge that Jay's plans gave him every possible protection.

Elaborate precautions were taken in loading the ransom money into the truck. Armored cars and motorcycle police followed Ozzie out of Washington at the designated time according to instructions, and left him at the appointed spot near the foothills.

Heading westward into the mountains, Ozzie soon picked up a call on the ultra-short wave receiver and changed his route according to the orders. Two more messages came through during the next hour, calling for new routes; the last indicated that the truck would be intercepted in a few minutes by a black touring sedan, so Ozzie knew what to do when such a car came directly toward him as if for a head-on collision. Jamming on the brakes, the cars stopped with bumpers touching. Two men jumped out of the other car, machine guns drawn ready for action, but Ozzie made no attempt to resist capture. After inspecting the truck, kicking a few times at the various pieces of electrical "junk" which they found in the back, and searching Ozzie from head to foot for weapons, they decided all was well and seated themselves alongside him in the truck. Their own car was abandoned. Ozzie was now given orders to drive toward what he knew to be the hideout.

As the Electronics, Inc. truck approached a police ambush point, one of the crooks spotted the ropes lying in the road and commanded Ozzie to speed up. Ozzie responded instantly by jamming the accelerator down to the floor-

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The Laboratory Page

By GEORGE J. ROHRICH

The purpose of this department is to furnish supplemental experiments to students who have completed their Home Laboratory Course, but who wish additional laboratory experience. You are not required to perform these experiments, but you will gain increased knowledge by doing so. Most of the material required will be that received as part of the Laboratory Course. Any other material necessary can be purchased very reasonably and will constitute an investment rather than an expense, as it will serve as replacements in service work or be useful in your shop later.

George J. Rohrich, Engineer in Charge N. R. I. Laboratory

HOW LABORATORY RESEARCH EXPANDS THE MEANINGS OF OUR RADIO VOCABULARY

The man working in the radio laboratory is often called upon to elaborate on, or give his own meanings of words used to describe electrical actions observed in the laboratory.

Such requests follow naturally where older words acquire additional meanings during developments unfolded by laboratory research.

Let me give you an example of the word "modulate" which is one of the older words used long before radio was invented. If you look up the meaning of this word in an "up to date dictionary of 1924" you will find this meaning: Modulate means to vary in tone, inflection, pitch or other quality of *sound*.

Radio telephony began expanding about the year 1922 and new applications were being made in *varying the nature of radio waves*. Here the research man in the laboratory needed a new word to describe this particular action. The older word *modulate* fitted in perfectly. So it was only natural that the meaning was extended to include the *varying of a radio wave*. But additional research in the laboratory resulted in varying the nature also of such other things as of a direct current, of an alternating current and of a pulsating current.

Naturally, "the dictionary of tomorrow" will eventually include the extended meanings of this word *modulate*. Until this becomes a fact I shall give you my own meanings and some elaborations of several words which you and I see, hear and use regularly in our language.

Modulate means to *vary the nature* of something such as of a sound, of a voice, of a wave motion, of a direct current, of a pulsating current or of an alternating or oscillating current.

A *voice* is a *sound* uttered by the mouth, especially when uttered by the human mouth. A person will modulate his voice for the sake of emphasis or for the purpose of avoiding monotony.

We modulate a sound in many ways. This means we vary the nature of sound in many ways. We vary the nature of sound when we vary the strength, or the power, or the amount, or the intensity, or the amplitude, or the tone, or the inflection, or the pitch, or the frequency, or the timbre, or the loudness or any other property of sound.

We modulate a direct current when we vary its nature. We vary the nature of direct current when we change the strength, or the amount, or the intensity, or the distribution, or the density, or the flow, or the speed or the velocity of direct current. Varying any one or all of these properties singly or together is commonly spoken of as "varying the amplitude."

Therefore, in a simple way we say that we can modulate a direct current by varying its amplitude.

In a similar way we can modulate *an alternating current* by varying its amplitude. In addition

(*Next page, please*)

The Laboratory Page (Continued from page 11)

we can *vary the nature* of an alternating current by varying its frequency and its phases.

In Outfit 3BA-1 you have an opportunity to study a great deal about *oscillators* and how *oscillations* are produced and controlled and detected and modulated. The following definitions will aid in getting the clearest "mental pictures" of actions described later in this explanation.

Potential is a property or "peculiarity" in an electrical circuit resulting from the accumulation of electrons.

Potential is equivalent to *pressure* where there is an accumulation of air. As you know, air in a free state exerts a varying *pressure* to the extent of 15 pounds per square inch at sea-level and to lesser values at higher altitudes. Yet other air pressures are measured with relation to the surrounding air pressure. Thus, you can pump up an automobile tire to 30 pounds per square inch at sea-level and upon driving the car to the top of a mountain the measured tire pressure is greater, because the outside air pressure is less. This happens because the measuring device records the *difference in air pressures*.

Similarly, in order to detect a *potential* we must have two places in a circuit where the "accumulation of electrons" (the potentials) are at different values. We then have a *difference* in potentials. This difference in potentials is commonly known as *potential difference* or voltage.

Potential difference is measured in *volts*. Likewise, *potential* itself is measured in *volts*. However, the actual potential at a point is of little consequence. We are usually interested in the *potential difference* which exists between *two* points in a circuit. This *voltage* can be measured with a *voltmeter*.

An *electric current* describes a condition which shows *that electrons are in motion*. The behavior of *electric current* under certain unique conditions has resulted in using names which will describe just how the current is acting.

For instance, a current which flows steadily in the same direction between two points in a circuit is called a *direct current*.

We cannot see a *direct current*. In other words, we cannot see *electrons in motion*. Yet there are many devices which will tell us when electrons are in motion and these devices originally used in the laboratory only, are gradually becoming the tools of an increasing number of radio shops, where experts can check exactly how currents do behave. The *oscilloscope* is such an instrument. From the observance of its actions I can give you the other definitions which follow.

A current which increases and decreases in its intensity but flows always in the same direction is said to *pulse*. The current is called a *pulsating current*. This definition resulted from the similarity to the action of blood *pulsing* through the arteries and veins of our human bodies.

The current in the plate circuit of an *oscillator* pulses.

A *pulsating* current can be produced by *modulating a direct current* with an *alternating current*.

In other words, we can make a direct current *vary its nature*, with the aid of alternating current. The result will be the same as the kind of current found in the plate circuit of an oscillator.

A current, which alternates in its direction of flow, is called an *alternating current*.

During the early stages of radio, the only known way for producing high frequency alternations was by discharging a condenser through a coil of wire. These currents alternated several times during a single discharge, each alternation being slightly weaker than the preceding one. Such currents were called *oscillating currents*.

The condenser was charged regularly with pulsating or alternating current. The discharges were of much higher frequency. The result was that the *high frequency currents* also were "alternating currents" but they were not of the same intensity during their alternations. Thus a distinction was made between alternating currents and oscillating currents.

With the invention of the vacuum tube it was found that high frequency alternating currents, as well as low frequency alternating currents could be produced in a new way, just as you will produce alternating currents in the experiments of Outfit 3BA. "Alternations" of current could be produced with the same frequency as the "oscillating currents" but each alternation was also of the same intensity as any other. Therefore, they were not actually oscillating currents. However, due to their high frequency, these also were later called oscillating currents.

An *oscillator* is a device without rotating parts which produces alternating currents. An *alternator* is an electrical machine with rotating parts which produces alternating or oscillating currents. The original distinction between *alternations* and *oscillations* is not sharply defined at present and consequently the two words are often used interchangeably.

RADIO-TRICIAN
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Service Sheet
Compiled Solely for Students and Graduates
NATIONAL RADIO INSTITUTE, WASHINGTON, D.C.

DETROLA MODELS 14, 142, 142ES

RECEIVER ALIGNMENT

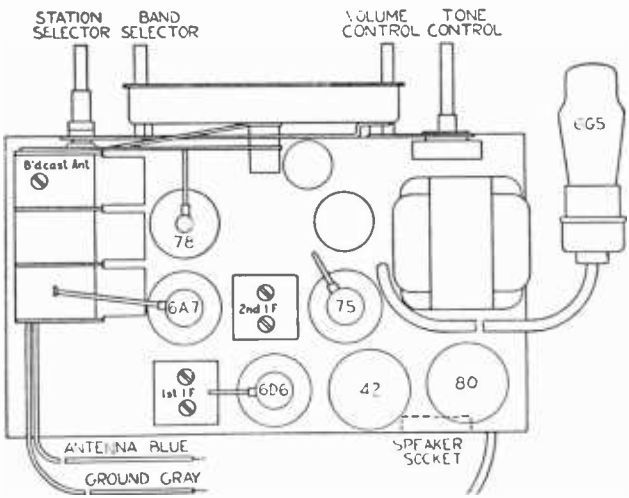
I. F. Alignment. Couple the signal generator to the grid of the 6A7 tube with a .1mfd condenser in series with the "high" lead of the signal generator. Connect the ground side of the signal generator to the chassis. Set the signal generator to 456 K.C. Be sure the wave switch of the set is in the broadcast position and the volume control set at maximum. Attenuate the signal generator so that the signal is just audible in the speaker. If an output meter is used, it should be connected across the voice coil terminals of the speaker. Use ½ volt as standard output.

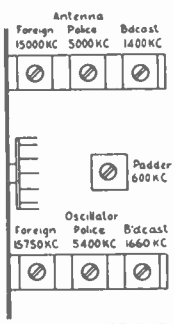
Adjust the 2nd I.F. transformer first. Each screw should be adjusted for maximum output. After number two I.F. has been adjusted, number one I.F. should be adjusted for maximum output. After both transformers have been adjusted, it is necessary to recheck No. 2 transformer and then recheck No. 1. See TUBE LAYOUT for location of I.F. and R.F. trimmers and padder.

R.F. (See diagram for location of trimmers). Using 200 mmf condenser in series with the generator, feed 1660 ke to antenna lead and adjust broadcast oscillator trimmer for top frequency. Set generator to 2400 ke, tune receiver and adjust the *two* antenna trimmers. Set generator to 600 ke, tune receiver to signal and adjust padder. The tuning condenser should be rocked back and forth through the signal while the padder is being set in order to secure perfect alignment.

Using 400 ohm resistor in series with generator, set band selector in center position, set generator to 5400 ke and adjust oscillator trimmer for top frequency. Set generator to 5000 ke, tune receiver to signal and adjust antenna trimmer.

Turn band selector to extreme clockwise position. Using 400 ohm resistor in series with generator, set oscillator top frequency for 15,750 ke—screw trimmer down tight, then unscrew to *second* peak. Set generator to 15,000 ke, tune receiver to signal and adjust antenna trimmer — Screw trimmer down tight, then unscrew to *first* peak, rocking the tuning condenser back and forth through the signal while the adjustment is being made. Above procedure for alignment at 15,000 ke must be followed exactly to insure proper tracking. A dead spot at about 12,000 ke will result if antenna and oscillator circuits are not set in proper relation to each other.





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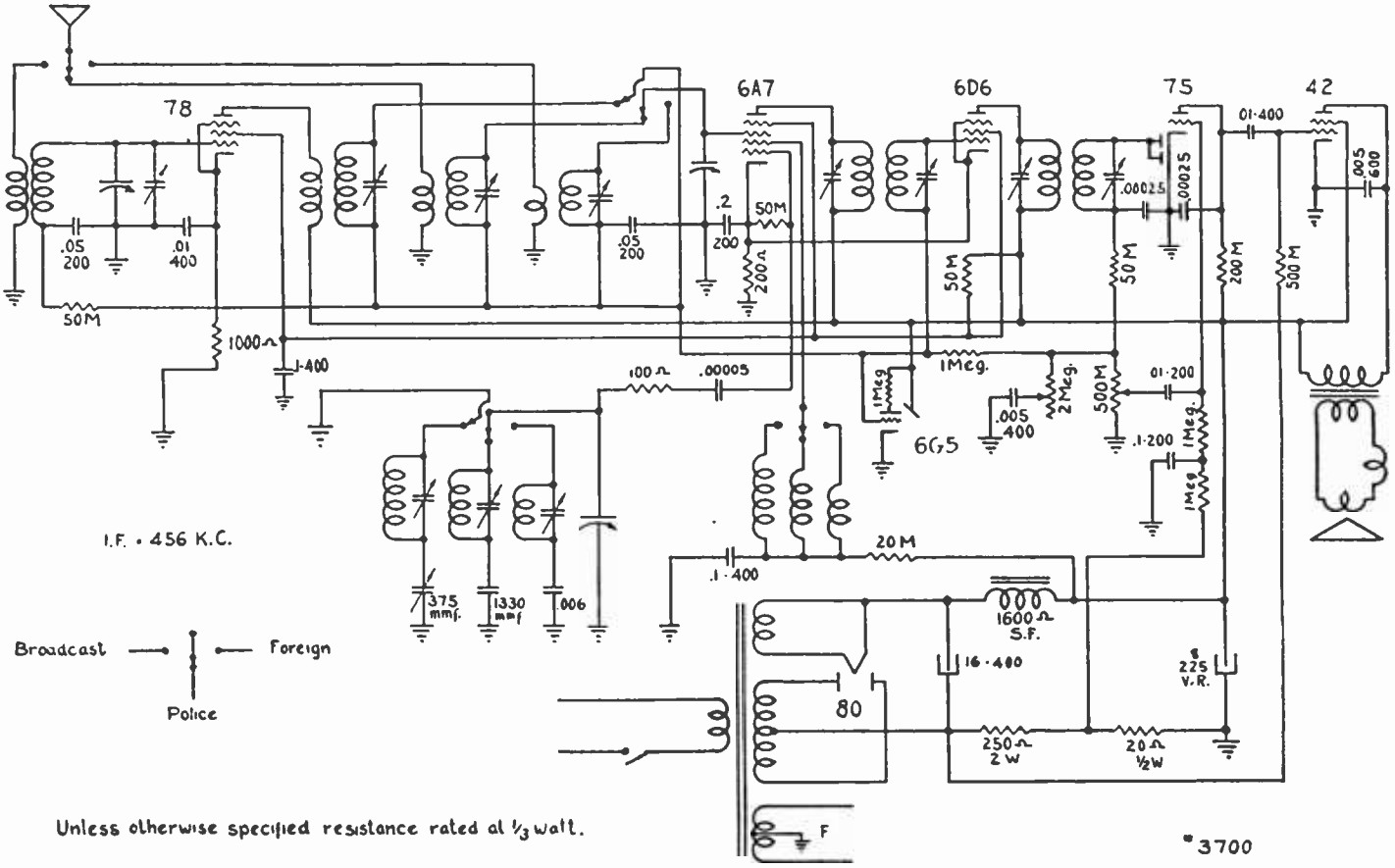


DETROLA MODELS 14, 142, 142ES

Electronics, Inc. (Continued from page 10)

boards. This actuated relays which released a bullet-proof steel and rubber curtain hidden in the cab roof, providing an impenetrable barrier between Ozzie and the crooks. Simultaneously, other mechanisms shot sprays of liquid tear gas directly into the faces of the crooks. By the time grapple hooks had brought the truck to a stop, the men were half-blind and unable to resist capture by the police officers who sprang out of ambush with tommy guns ready for action.

Short-wave radio transmissions, in Morse code so there would be little likelihood of their interception by Oidar's radio operators, had kept Jay informed of the truck's progress as it was spotted by one police lookout after another. As the truck came closer and closer to the hidden cavern site, it had become apparent which ambush point would see action. To this Jay had sped on a motorcycle, disguised in a polo shirt and helmet, and carrying behind a dummy dressed as a girl. The disguise was perfect; Oidar's lookouts took him to be a motorcycle enthusiast taking his sweetheart for a ride.

Jay dashed up to the truck with police, calling anxiously: "Are you all right, Ozzie?"

"I will be as soon as I get out of range of that crying gas," assured Ozzie as he stumbled out of the cab and blinked the tears away.

All gas remaining in the truck was blown out with compressed air. Emergency measures revived the crooks in a few minutes, after which the gas burns on their faces were treated.

Quickly Jay strapped a bracelet-like electrode onto each wrist of each crook, plugged the wires into the high-voltage panel in the rear of the truck, and scientifically adjusted the current through the men to a painful but harmless value. Thirty seconds of this current did far more than an hour of mechanical torture. The men talked fast, revealing all of Oidar's plans and indicating exactly how they were to get into the cavern with the Electronics, Inc. truck.

Jay jumped into the rear of the truck, concealed himself in a space left exactly for that purpose between the piles of money and the back of the seat, and commanded Ozzie to move on exactly in accordance with these plans. Whenever the crooks showed signs of rebelling, Jay momentarily stepped up the current through them a few milliamperes and reminded them that sudden death came at about 40 milliamperes.

Shortly after they passed the point at which the movie projector blockade had been created, one of the crooks sent out a series of code signals on the 20-meter transmitter carried in the car, a key having been provided for this purpose according to the televised instructions.

Immediately Ozzie noticed a solid rock wall swinging inward a few hundred feet ahead, revealing a black hole just large enough for the truck to pass through. The headlights revealed moisture-covered rock walls and a roadway leading straight into the center of the mountain. Jay was applying shocks to the crooks more frequently now, and stepping up their intensity, for everything depended upon their being compelled to act in a normal manner. Having passed the lookout at the door, both Jay and Ozzie donned heavy sound-proof gas helmets, completely bullet-proof, in readiness for the crucial moment. Jay was already wearing a bullet-proof chain steel vest.

After what seemed hours but was actually only a few minutes, they entered a large, low-roofed cavern. Men eagerly dashed up to the truck, expecting to receive the ransom. Jay was ready for them, and began slamming in switches on the control panel. One released mechanisms which closed the car windows and locked the doors. Another switch put the two men in the front seat out of action for a few minutes, in such a way that they could be revived by a counter-shock. One connected the auto engine directly to a large 110-volt a.c. generator under the car, while Ozzie jammed the accelerator down to the floor-boards to get maximum power from the engine.

The next switch connected this generator to what Jay believed to be the most powerful audio amplifier ever built, using dozens of beam power amplifier tubes connected together in parallel and push-pull in its output stage, and driving two of the largest "bull-horn" loudspeakers on the market. Fed with an 8,000 cycle note from a crystal oscillator, this p.a. system delivered a shrill, intense sound so far above the threshhold of pain that the crooks were momentarily stunned. Another switch slammed shut, causing gas to be shot out from the truck in all directions in powerful streams. It was a new and secret gas which brought unconsciousness almost instantly yet was not fatal, and had been released to police by the army chemical warfare service only because of the extreme emergency which had arisen. Men near the truck dropped like blades of grass above a mower as they inhaled the gas.

Bullets thudded harmlessly against the walls of the truck as the crooks farthest from it let loose with sub-machine guns, but these men too were soon overcome by the waves of gas.

(Concluded on Page 20)

A Bird's-Eye View o

By Joseph Kau

Joseph Kaufman

EXCEPT for the presence of the television cathode ray tube screen, the present-day television receiver has much the same appearance as a large console model sound receiver. A closer examination would show that a television receiver has tubes, resistors, transformers, coils, potentiometers, selector switches and a loud-speaker, all identical in appearance and physical make-up with corresponding parts in sound receivers on which radio men work every day.

This similarity between sound and television receivers is quite logical, for the modern electronic television receiver essentially contains only extensions of circuits which are widely used in all-wave superheterodyne receivers. True, there are a certain number of new and highly ingenious circuits in a television receiver, but even these are made up of ordinary and familiar radio parts. A television receiver has a few new controls in order to make necessary corrections in the reproduced images, but these controls likewise consist of familiar variable condensers, potentiometers or variable resistors.

Those who witnessed for the first time the transmission of the human voice over a wire considered telephony a miracle, but the mystery vanished when they learned that sound was simply a vibration in air and could be converted into an equivalent electric current which traveled over the wires and which in turn was converted back into sound at the receiving end.

Radio was likewise considered a miracle by many when it first came to the attention of the general public. Today radio is a commonplace scientific achievement, for we now realize that it essentially involves varying the intensity of a high-frequency current in accordance with the sound to be transmitted, then radiating this high-frequency current into space as a radio wave. The receiving antenna intercepts this radio wave, and the receiver removes the sound signal from its high-frequency carrier and converts the sound signal back into sound again.

Television is now looked upon by many as a miracle, but as it becomes more widely accepted by the public and its basic principles of operation become more generally understood, it, too, will lose its aura of mystery.

This article is intended to make you acquainted with the general operating principles of a modern cathode ray television receiver. In order to accomplish this result, we must consider also the television transmitter, and particularly the television camera which converts a scene or picture into an electrical signal which can be sent via wires or radio in much the same way as sound signals are sent from point to point.

Ordinary optical lenses focus an entire scene on the sensitized plate of the television camera, but this camera is so designed that it acts upon or sees only one spot of this scene at a time. We might say that the camera sees the scene in exactly the same manner as we would read a page of printed matter; that is, the camera looks first at the extreme left of a line, gradually swings to the right along that line to the end, then returns to the left of the scene and starts over again on the line below. This continues until the entire scene or frame has been "scanned," one spot at a time.

When the bottom of the scene has been reached, the camera starts at the upper left corner again and repeats the process. If the rate of repetition is high enough, a moving scene can be converted into a continuous series of electrical intensities which can be radiated through space, picked up by a receiver and satisfactorily reconstructed.

The television cathode ray tube in the receiver contains a beam of electrons which "paints" this scene on a special light-producing or fluorescent screen, spot after spot, line after line, and frame after frame. The two forms of cathode ray tubes, one in the television camera and the other in the receiver, are the only basically new devices which we encounter in television.

Since the c.r. tube in the television receiver must "know" exactly when to start a new line and when to start a new frame, those special

# of a Modern Television Receiver

ufman, N. R. I. Director of Education

signals which are employed at the transmitter to make the camera see line after line and frame after frame are sent out by the transmitter along with the picture signals. There are two of these control signals, the horizontal or line synchronizing impulse for the end of each line and the vertical or frame synchronizing impulse for the end of each frame or scene. These signals are often referred to as synchronizing impulses because they make the camera tube and the image-reproducing tube stay in step or in synchronism with each other.

Although the time taken by the camera tube in changing from the end of one line to the beginning of the following line is only a fraction of the time required to scan one line, it is nevertheless long enough to permit sending during that interval the line impulse which makes the t.c.r. tube in the receiver start a new line. When the camera tube reaches the bottom of the picture, it takes an even longer time to change over to the top of the picture again, and during this interval the frame impulse can be sent. The frame synchronizing impulse is much longer than the line synchronizing impulse in time duration; by using long and short synchronizing impulses in this manner, we can incorporate in the television receiver special circuits which will separate these two important synchronizing signals.

A television cathode ray tube, commonly abbreviated t.c.r. tube, is merely a highly perfected form of cathode ray oscilloscope tube, designed to draw a very fine line across the fluorescent screen. The brilliancy of the spot which forms this line is controlled by varying the voltage on one of the electrodes in the electron gun which produces the spot-forming electron beam. Varying the voltage on another electrode serves to focus the electron beam to a sharp spot of the desired size on the screen.

A saw-tooth voltage applied to a pair of deflection plates in a t.c.r. tube serves to sweep the beam horizontally back and forth across the screen along each line. Another similar system serves to move the spot vertically from line to line in the desired manner.

In some t.c.r. tubes, currents with saw-tooth wave forms are sent through coils in order to produce magnetic fields which will react on the electron beam and thereby sweep the spot horizontally and vertically in the desired manner. The synchronizing signals control the start of *each new* saw-tooth voltage or current, thereby making the t.c.r. tube reproduce, at each instant of time, exactly what the camera tube sees at the transmitter at that instant.

Courtesy, RCA Mfg. Co.

The chassis of an RCA Victor television receiver passes its final test at the hands of an expert before being installed in the cabinet. It has passed many other test points during the assembly operations.

The picture signal is fed to the control electrode in the electron gun. This signal varies the spot brilliancy in accordance with the brilliancy of the spot being viewed at that instant by the camera tube. In this way, the television receiver is made to reproduce a picture again after it has been carried through space by radio waves.

Circuits in a Television Receiver. When transmitting a television program from one point to another via radio, both the sound and picture portions of the program are sent simultaneously. The sound signal is sent on one radio carrier, and the sight or picture signal is sent on another radio carrier which is exactly 4.5 megacycles lower in frequency. Since the input circuits of the television receiver are designed to accept a band width of 6 megacycles, both sound and sight carrier signals are received simultaneously.

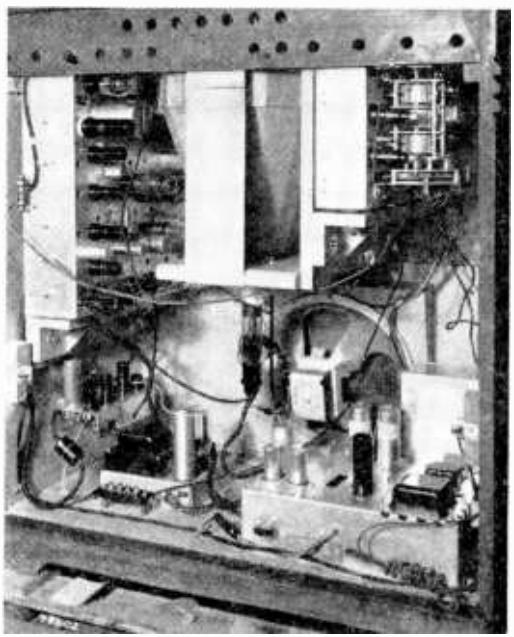
The sound signal is modulated on its carrier and radiated in the conventional manner. Modulation of the sight signal on its carrier is a somewhat more complicated process, for both the picture signal and the synchronizing components must be placed on the same carrier. Rises in carrier level at the end of each line and the end of each

complete frame or scene constitute the synchronizing impulses, while drops in carrier level in accordance with variations in brilliancy along a line constitute the picture portion of the television signal.

The sight and sound signals, on their respective ultra-high-frequency carriers, are radiated into space by separate antennas, and travel along line-of-sight paths to the receiving location. There they are both picked up by the same receiving antenna.

A television receiver is invariably of the superheterodyne type, having a preselector, a frequency converter, i.f. systems, detectors, an audio amplifier and a video frequency amplifier, with vacuum tubes being used in all of these sections.

The sight and sound carrier signals travel together through the common preselector to the



Courtesy, RCA Mfg. Co.

Rear view of an RCA Victor home television receiver. In the rack in the center is the large tube on which the image is reproduced, with the loudspeaker cone beneath.

input of the first detector. There the local oscillator output signal combines with the two incoming carrier signals to produce a sight i.f. carrier signal and a sound i.f. carrier signal, with the carriers still differing in frequency by 4.5 megacycles. At the output of the first detector are two complete i.f. systems, one which allows only the sight i.f. carrier to pass while rejecting the sound i.f., and another which allows only the sound i.f. to pass. We thus see that the sight and sound portions of a television program are separated at the first detector.

After amplification in the sound i.f. amplifier, the sound portion of the program is fed into the audio detector, and the resulting audio signal is fed into a loudspeaker after passing through one or more audio amplifier stages.

The sight i.f. signal is amplified in the video i.f. amplifier, then fed into a video detector which allows only the video frequency signals to pass. These in turn enter the video frequency amplifier, where they are amplified and then made to control the brilliancy of the spot on the screen of the t.c.r. tube. Both picture and synchronizing signals are fed to the control electrode of the t.c.r. tube, for the synchronizing signals are required to darken or extinguish the spot while the beam is sweeping back from the end of one line to the beginning of the next line and while the beam is sweeping from the end of one complete scene to the beginning of the next scene.

From some point in the video frequency amplifier, a portion of the picture signal with its synchronizing impulses is fed into a diode or triode tube which is biased in such a way that it rejects the picture signal and allows only the synchronizing impulses to pass; this stage is often called the *clipper*. The horizontal impulses are then separated from the vertical impulses by passing these impulses through two resistor-condenser circuits, one having a short time constant and the other having a long time constant. Once the impulses are separated, they may be amplified individually before being fed to their respective sweep circuits. The horizontal impulse is used to start each sweep of the spot along a line, and the vertical impulse is used to start a new vertical motion of the spot.

The charging of a condenser with a d.c. voltage applied through a resistor produces the required rising sweep voltage. A tube controlled by a synchronizing impulse stops the rise in the charging voltage, discharges the condenser, and thus causes the process to start over again. In some circuits, the charge-discharge circuit has an impulse generator ahead of it, with this generator in turn being controlled by the incoming synchronizing impulses.

The clipper, the frequency separator, the impulse generator and the charge-discharge circuit are all commonly referred to as the scanning circuit. None of these are found in all-wave receivers; they are new circuits, but they use conventional tubes, resistors, condensers, coils and other radio parts which you will encounter every day in your work. Once you understand the underlying principles involved in these circuits, they should give you no trouble whatsoever.

The saw-tooth sweep voltages move the spot in the t.c.r. tube horizontally and vertically, while the picture signal varies the intensity of the beam and spot, all in step with the corresponding action in the television camera tube at the transmitter.

Although the tubes used in a television receiver, with the exception of the t.c.r. tube, appear much the same as the tubes in an all-wave receiver, the television tubes actually do have somewhat different characteristics. Since these tubes must handle extremely high frequencies, they must have low inter-electrode capacities and high transconductance values.

The r.f. and i.f. circuits in a television receiver are band-passed to such a great extent that low-transconductance tubes would not give sufficient gain. Furthermore, the video detector and video amplifier must pass high-frequency picture signals without appreciable attenuation if high image definition is to be secured; this means that the loads on the video amplifier tubes and on the video detector must have low ohmic values, and again high transconductance is required in order to give sufficient gain.

Since the signals passing through the preselector in a television receiver are always higher than 40 megacycles in frequency, the tuning coils and condensers have extremely low electrical values.

Instead of being about 460 kc., the i.f. values in television receivers are in the neighborhood of 7 to 14 megacycles; furthermore, the i.f. transformers must be designed to have extremely wide pass bands, many times wider than are required even for high-fidelity sound receivers. The pass band for the video i.f. is very much wider than that for the sound i.f. in a television receiver.

The diode video detector and the resistance-capacitance coupled video amplifier are quite conventional in appearance, but are engineered to pass a wide range of frequencies. The picture signals in a high-definition television receiver may have frequency components ranging from 10 cycles to 4,000,000 cycles.

In the larger television receivers, the screen end of the t.c.r. tube is usually protected by safety glass. Sometimes you will view this screen directly, while in other receivers you will view its image in a mirror attached to the underside of the cabinet lid, when this lid is propped up at a 45° angle.

On the front panel of the television receiver will be two sets of controls, one for the sound portion of the television broadcast and the other for the picture portion. There will be a station selector control providing a choice of from two to seven different television channels; sometimes a selector switch may be utilized for this purpose, while in other sets there may be push buttons to take care of tuning. Some receivers may also have a vernier tuning control which is adjusted for the clearest sound after the desired television station has been tuned in roughly with the selector switch. Tuning in the sound automatically gives accurate tuning in of the picture carrier. There will be the usual volume control and very likely also a fidelity or tone control for the sound section of the receiver.

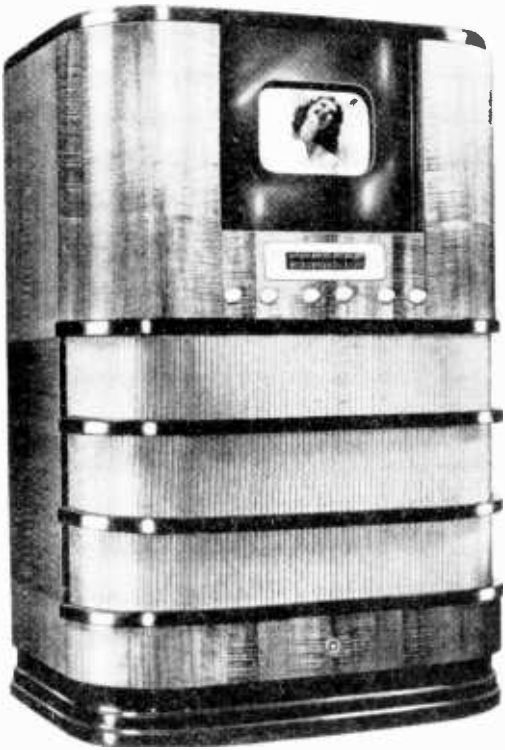
The picture controls will be strange to you at first. There will be a contrast control which regulates the amount of contrast (difference) between light and dark details in the reproduced image. The brilliancy control provides another important adjustment in that it varies the over-all brightness of the picture. There is some interaction between the contrast and brilliancy controls, making it necessary sometimes to adjust first one, then the other to secure the clearest image. Some receivers also have on the front panel a focusing control which can be adjusted to maintain a sharp

Courtesy, Stewart-Warner Corp.

Pictures in the Stewart-Warner television receiver are produced on a 12 inches in diameter cathode-ray tube. Three panel controls regulate contrast, brightness and definition. The latter, the Vernier tuning control, assuring maximum detail of the image. Standard band broadcast reception is available at all times in the Stewart-Warner television receiving set, located to the right of the TCR tube.

spot of the desired size despite aging of the t.c.r. tube.

In addition to the controls just described, a television receiver has a number of controls which require very little adjustment. As a general rule these need be touched only at the time the receiver is installed, and occasionally their adjustments should be checked by a Teletrician. Once adjusted, these controls need not be disturbed for



Courtesy, General Electric Co.

A seven channel television receiver made by the General Electric Co.

months; for this reason they are called pre-set controls or semi-adjustable controls.

Of particular importance are the so-called vertical and horizontal sweep hold controls; these are adjusted so that the synchronizing pulses actually take over the work of starting each new line and each new frame. There may be a distribution control, which is used to eliminate distortion from the reproduced image. There will be two controls which serve to center the image on the fluorescent screen, and two more which adjust the width and height respectively of the reproduced image. These pre-set controls are ordinarily grouped together and are so located that the owner of the receiver cannot readily tamper with their settings.

The operation of a television receiver is simple. The power switch is turned on first. A short time later, after the tubes have all warmed up, the sound portion of the television program is heard, provided a station is broadcasting on the channel to which the set is tuned. The image begins to appear on the screen at the same time. The volume control and tone control are adjusted just as for any ordinary sound receiver, and the contrast and brilliancy controls are then adjusted until the image is satisfactory.

n r i

Electronics, Inc.

(Concluded from Page 15)

From a far corner came a steady stream of bullets from a heavy-duty machine gun. It was manned by Oidar, who apparently was behind a current of air which carried gas away from him. Jay leaped boldly out of the truck into the stream of bullets, carrying a weird form of gun which was connected to the control panel by heavy insulated wires. Staggering momentarily under the impact of the machine gun bullets, he took careful aim and pulled the trigger. Out flew a heavy pointed weight, pulling with it a fine copper wire. Jay's aim was perfect; the weight hit Oidar. The crook jerked violently, then collapsed to the floor, unconscious from the jolting electrical shock delivered by this unique electrical gun. Quickly Jay dashed over and applied handcuffs, then signalled Ozzie to turn off the amplifier and gas pumps.

By this time police had smashed their way into the cavern entrance, having followed the Electronics, Inc. truck to the site with headlights extinguished to prevent detection. Troopers equipped with gas masks quickly placed handcuffs on the fallen crooks, then headed for a lower level from which could be heard the screams of the kidnapped persons. None were injured, for all guards had come into the main room to await the arrival of the ransom money. The intense sound and the gas had likewise not affected them, because of the intervening rock and the closed timber door at the entrance to their cell.

Ambulances which had been stationed outside the mountain area at Jay's suggestion were called by short-wave radio, and guided right into the cavern by state troopers. Doctors first administered stimulants to the victims, then hustled them into the waiting ambulances.

It was a triumphant procession which headed back to Washington after flashing the news to all the world by wire and radio. Extras were on the streets long before they reached the White House, announcing another triumph of Electronics, Inc. in the war on crime.

RADIO-TRICIAN
REG. U.S. PAT. OFF.
Service Sheet
Compiled Solely for Students and Graduates
NATIONAL RADIO INSTITUTE, WASHINGTON, D.C.

DETROLA MODEL 223 SERIES

ALIGNMENT PROCEDURE

Connect a high impedance AC voltmeter across loud-speaker terminals. Volume control should be set a few degrees back of maximum volume position. Use a weak signal from generator, strong signals tend to cause improper adjustments.

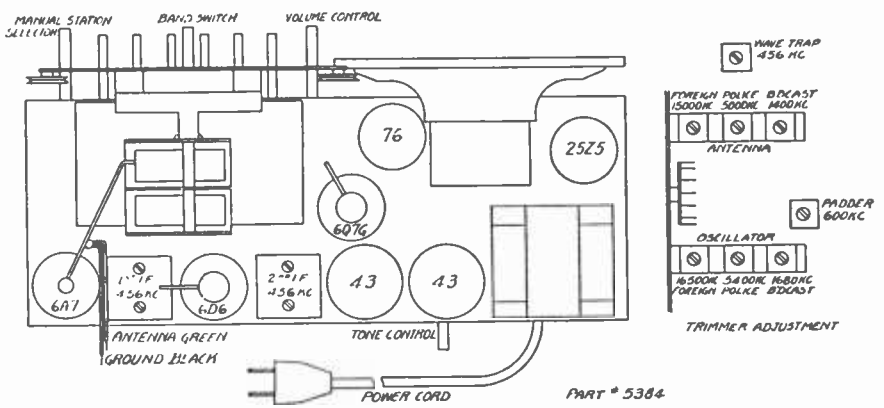
I.F.: Connect the generator ground to receiver chassis. Using .1 mfd. condenser in series with high side of generator, apply 456 kc. signal to grid of 6D6 I.F. amplifier tube, and align transformer No. 2. Connect generator to grid of 6A7 tube and align transformer No. 1.

RF. (See diagram for location of trimmers).

Using a 200 MMF. condenser in series with the high side of the generator, turn band selector switch to left hand position and the tuning condenser to about 600 kc. Feed a 456 kc. signal to the antenna and adjust wave trap trimmer for minimum response. With the tuning condenser at minimum capacity feed 1660 kc. signal to the antenna and adjust broadcast oscillator trimmer for top frequency. Set generator frequency at about 1400 kc. Adjust broadcast antenna trimmer. Set generator for 600 kc. Tune receiver to signal and adjust the padder. The tuning condenser should be rocked back and forth through the signal while varying the padder in order to assure perfect alignment.

Using 400 ohm resistor in series with generator, set band selector in center position. Set generator to 5400 kc. and adjust oscillator trimmer for top frequency. Set generator to 5000 kc., tune receiver to signal and adjust antenna trimmer.

Turn band selector to extreme clockwise position. Using 400 ohm resistor in series with generator, set oscillator top frequency for 16,500 kc.—screw trimmer down tight, then unscrew to *second* peak. Set generator to 15,000 kc., tune receiver to signal and adjust antenna trimmer—screw trimmer down tight, then unscrew to *first* peak, rocking the tuning condenser back and forth through the signal while the adjustment is being made. Above procedure for alignment at 15,000 kc. must be followed exactly to insure proper tracking. A dead spot at about 12,000 kc. will result if antenna and oscillator circuits are not set in proper relation to each other.



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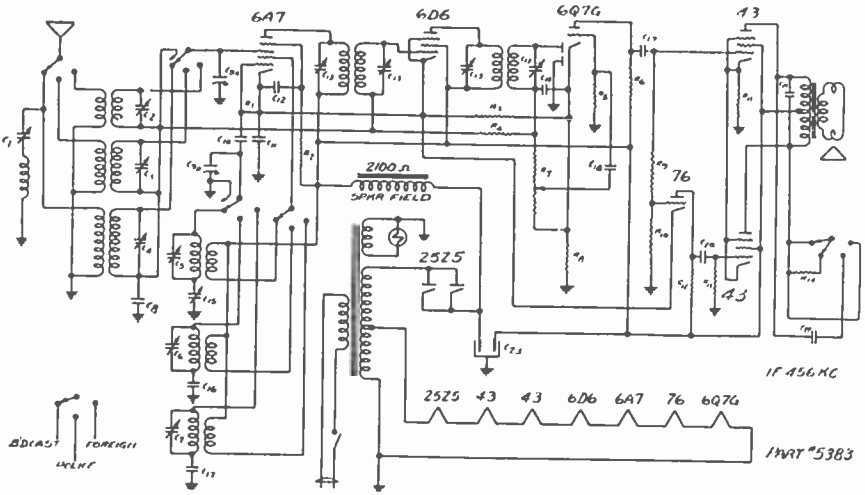


DETROLA MODEL 223 SERIES

PARTS LIST

No order for parts will be accepted unless PART NUMBER, DESCRIPTION and CHASSIS MODEL NUMBER are given.

Symbol	Part No.	Description
C-1	3272	30-140 mmf Trimmer
C-2, 5, 7	1611	3-35 mmf Trimmer
C-3, 4, 6	2597	1-10 mmf Trimmer
C-8, 11	572	.1 200 V.
C-9a, b	5377	Tuning Condenser
C-10	2780	50 mmf Mica
C-12	580	.05 200 V.
C-13		IF Trimmer
C-14	4810	.0005 400 V.
C-15	2560	220-500 mmf Padder
C-16	2741	1330 mmf 5%
C-17	3871	.006 600 V. 5%
C-18	568	.01 400 V.
C-19, 20		.02 400 V.
C-21	581	.005 600 V.
C-22	2600	.02 600 V.
C-23	5389	20, 12 mf Electrolytic
R-1, 10	631	50M 1/3 W.
R-2	617	20M 1/3 W.
R-3	2605	200 ohm 1/3 W. 10%
R-4, 5	624	1 Meg. 1/3 W.
R-6	598	200M 1/3 W.
R-7	5332	500M Volume Control
R-8	2698	100 ohm 1/3 W. 10%
R-9	2881	400M 1/3 W. 10%
R-11	5395	500 ohm wire wound 10%
R-12	603	100M. 1/3 W.
R-13	615	500M 1/3 W.
R-14	4529	10M 1/3 W. 10%
	5393	Power Transformer
	3463-10	1st IF Transformer
	3463-4	2nd IF Transformer
	5096	Oscillator Coil
	5392	Antenna Coil
	5390	Band Switch
	5394	Tone Control Switch
	530	Pilot Light Bulb
	5387	Dial Chart
	5396	Escutcheon
	5397	Button escutcheon
	5353	Tuning Buttons
	5357	Call Letter Sheets
	5388	Speaker
	3904	Knobs

Novel Radio Items

—BY L. J. MARKUS—

Electric Organ Talks In Church!

The electric organ amplifier in a Kansas City, Missouri church recently picked up an amateur Radiophone broadcast right in the middle of a church service. The trouble was undoubtedly due to signal pick-up by improperly shielded parts or wires in the first stages of the amplifier. One of the amplifier tubes was sufficiently non-linear to give demodulation.

n r i

Television Is Newest Treasure-Finder!

Searchlights and television cameras can be lowered from ships in place of divers when seeking wrecked ships or sunken treasure. Ocean-bottom scenes will be reproduced on the screens of television receivers aboard ship or on shore. The cameras can stay under water indefinitely, day and night, and can withstand tremendous pressure if properly constructed.

n r i

Photocell Foils Bill-Dodgers!

A photocell and light source installed on the back stairs of a mid-western hotel causes a bell to ring at the clerk's desk when any one takes this way out. The clerk then pushes a button which locks the back door, and calls for help in catching the would-be bill-dodger. (Fire rules require an open back door in certain hotels).

n r i

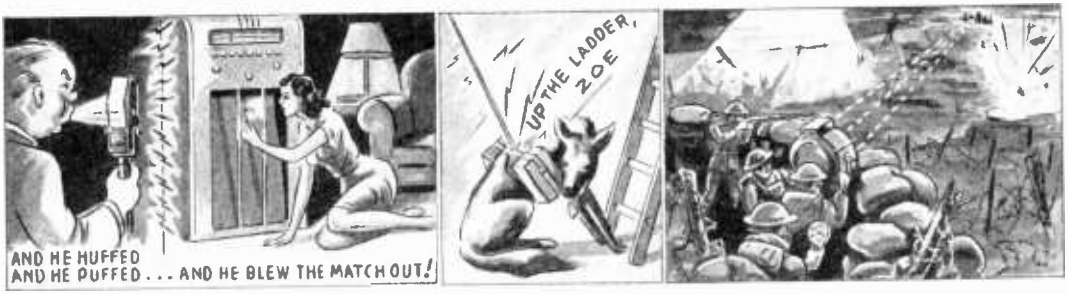
Phono Records May Fight Wars!

A French inventor suggests that armies be equipped with powerful public address systems which can, on dark nights, reproduce the recorded sounds of an attack. Phantom tanks could clank and rumble while imaginary shells whizzed and crashed, machine guns stuttered, and ghosts of marching infantry charged forward. Enemy soldiers could be kept exhaustingly alert by a sufficient variety of recordings; barrages of sound effects reinforced with a few real guns might also serve to prevent attacks or cover retreats.

n r i

Television Eliminates Shopping!

According to one television expert, department and grocery stores a few years hence will put on television programs each morning, in which products on sale that day will be displayed. Housewives will simply watch their television screens, note the number and price of articles they like, then telephone their orders.



LOUDSPEAKERS BLOW OUT MATCHES! Announcer Pat Buttram of station WLS asked listeners to hold lighted matches in front of their radio loudspeakers during a recent broadcast. He then blew vigorously into the microphone. Some listeners reported their matches went out, others said the flame only flickered, while a few claimed nothing happened. Blowing air into a mike produces strong low-frequency audio signals; these can make a loudspeaker diaphragm push air outward with sufficient velocity to extinguish a small flame. Only high-fidelity receivers with high audio output power will reproduce these low notes satisfactorily, hence owners of small table model sets and poor-fidelity consoles observed *little or no* result during this unique experiment.

DOG OBEYS RADIO COMMANDS! Constable Denholm of the Sydney, Australia, police force has succeeded in making his dog "Zoe" climb a ladder, turn on a faucet, and obey many other commands transmitted by Radio. A miniature battery-operated short-wave receiver with loudspeaker is strapped to the dog's back, and commands are spoken into the microphone of a portable shortwave transmitter which can be a considerable distance away.

HEAT WAVES CARRY SECRET MESSAGES! Invisible heat waves are carrying music through space at the Westinghouse exhibit at the New York World's Fair. This system can be used in wartime for communication between points up to one mile apart when wire lines are broken and Radio messages are being intercepted or jammed by the enemy. A glow lamp connected to an a.f. amplifier creates infrared radiations which vary in intensity according to the sounds being transmitted. These rays are concentrated by lenses into a narrow beam which is projected into the collecting lens at the receiving point. A photocell there converts this modulated light beam into audio signals which are fed into headphones after amplification.

Boys Told to Specialize in One Job and to Look into Radio by RCA Head

By a Staff Correspondent of the Christian Science Monitor

Boys of the United States today have a suggestion from David Sarnoff, President of the Radio Corporation of America, to specialize in their studies on one subject so that when they go out to look for work they will have a "better chance" of finding it. At the same time, Mr. Sarnoff, speaking before the Boys' Club of America at the Commodore Hotel, emphasized the importance of Radio as a field for young men because of its unlimited opportunities for achievement in the future.

"As one who has been a participant in Radio since its infancy," Mr. Sarnoff said, "I can tell you that what lies ahead is far greater than what lies behind. The boy of today will find in the Radio of tomorrow opportunities for achievement that we who have struggled as its pioneers could hardly have dreamed to be possible.

"There is one thought I would like to leave with the members of the Boys' Club. Don't be misled into believing that somehow the world owes you a living. The boy who believes that his parents, or the Government, or anyone else owes him his livelihood and that he can collect it without labor, will wake up one day and find himself working for another boy who did not have that belief, and therefore, earned the right to have others work for him.

"While I am making suggestions to the boys in my audience, let me add another one: learn to do some one useful thing thoroughly. Then when you go out to look for a job, you will have a better chance of finding one."

Former President Hoover, Chairman of the Board of the National Organization, was Chairman of the meeting and, introducing Mr. Sarnoff, told the boys that "our desire is to build you to the place where you can begin to build your citizenship."

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Our Cover this Issue

RCA Victor Television Receiver Model TRK-5 is shown on our cover. This attractive receiver has 5-inch Kinescope, reproducing images 3⅜" by 4⅜" for direct viewing. It has 24 tubes plus Kinescope and incorporates electric tuning in the 8-tube, all-wave Radio chassis. The impressive modern style cabinet is built of brilliant woods and is skillfully finished. The size is 43⅜" high, 29⅜" wide and 18-13/16" deep.

Graduate Builds P. A. System for School

Above is a photograph of a 15-34 watt P. A System built by our Graduate F. R. Hills for use in the school at Regina, Sask., Canada, where he is an instructor. Special broadcast can be picked up and amplified for the students in the school auditorium. It may also be used for broadcasts of music or recordings for dances in the gymnasium. It is quite a novel outfit.

It is mounted in a rack 18" x 18" x 4½' with hard rubber wheels so it can be easily and quickly moved to any location. A solid front (not shown) places everything under lock and key.

Power pack and amplifier are mounted separately on chassis 14" x 15" x 3¼". Chassis sides are 20 gauge galvanized sheet iron and tops are 1-2 mil aluminum polished a dull natural finish. Sides are black crackle finish. Power transformer and two 30 Henry chokes, each weighing approximately 25 pounds were designed and built by students.

Power transformer secondary is tapped and by simply turning a switch, 15 or 34 watts output is instantly available. Good stability was obtained by shielding all wiring, and securely grounding the shielding. Blocking condensers placed in each input plate lead remedied low voltage encountered.

N.R.I. ALUMNI NEWS

Earl R. Bennett ..... President
Clarence Stokes, C. B. Morehead ..... Vice-Pres.
Allen McCluskey, F. E. Oliver ..... Vice-Pres.
Earl Merryman ..... Secretary
Louis L. Menne ..... Executive Secretary

BUILDING THE BRIDGE

AN OLD MAN, going a lone highway,
Came, at the evening, cold and gray,
To a chasm, vast, and deep, and wide,
Through which was flowing a sullen tide.
The old man crossed in the twilight dim;
The sullen stream had no fears for him;
But he turned, when safe on the other side,
And built a bridge to span the tide.
"Old man," said a fellow pilgrim, near,
"You are wasting strength with building here;
Your journey will end with the ending day;
You never again must pass this way;
You have crossed the chasm, deep and wide—
Why build you the bridge at the eventide?"
The builder lifted his old gray head:
"Good friend, in the path I have come," he said,
"There followeth after me to-day
A youth, whose feet must pass this way.
This chasm, that has been naught to me,
To that fair-headed youth may a pitfall be.
He, too, must cross in the twilight dim;
Good friend, I am building the bridge for *him*."

—*Will Allen Dromgoole*

Here and There Among Alumni Members

Walter E. Scott, graduate of 1932 is Chief Radioman on board U.S.S. Barry. You members who know the Navy can tell the world that Scott's job carries plenty of thrills.

n r i

J. J. Plunkett of Roxbury, Mass., was an acrobat in Circus and Vaudeville from 1921 to 1935. An accident laid him up for eighteen months and ended that career. Then Plunkett turned to Radio and for the past year has been doing nicely.

n r i

Jim H. Johnson of Kamloops, B. C., Canada, passed away in his sleep. Only twenty-three years of age he apparently was in good health. Jimmy was a Sergeant in the Rocky Mountain Rangers of the Canadian Militia and received full military honors.

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Chief Radio Operator T. S. Norton, Police Radio WQOX, Hamilton, Ohio, is a charter member of the Alumni Association. His name is engraved on the silver cup which was presented to N.R.I. by the charter members of the Alumni Association in 1929.

n r i

Earl R. Dudley, Designer and Chief Engineer, announces the Dudley 1939 Baby Boy, Model "A", released June 12, 1939. two lung power—free squealing—water cooled exhaust—changeable seat covers—streamlined body—economically fed—cry control—must be seen to be appreciated. Name, Richard Earl, weight 7 lb. 1 oz.

n r i

Robert E. Altomare of the U. S. Naval Reserve Corps was Radio operator on the destroyer, U.S.S. Reuben James on a recently completed two weeks' cruise in northern waters.

n r i

Arthur Cherpoff of Brooklyn, N. Y., had his appendix removed and is at home resting up. Art says the medico got to him just in time, and that he will be shelved for about two months.

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J. B. Rickerl of Clinton, Iowa, joined the National Guard as a Radio operator.

n r i

Walter H. Smith of Montreal, P. Q., Canada, is in the service of the Canadian Government as Radio operator on the C.G.S. N.B. McLean, an ice breaker and ice patrol ship. Just now they are preparing for the annual trip to Hudson Bay and Baffin land. There's adventure for you.

n r i

Graduate M. S. Marcinkowski, P. O. Box 409. *Warsaw, Poland, is main control room engineer for the Polish Broadcasting Company. He is interested in corresponding with members of N.R.I.*

Mrs. George Hehir of Smith Falls, Ont., Canada, writes that her son and our member Alfred Hehir is aboard ship just completing his fourth trip to Argentina. He has been in New Zealand, Gibraltar, Tunisia, Egypt, Palestine, England, and other foreign countries. Some adventure!

n r i

Jack Maier of Headquarters sent in a "Believe-it-or-Not" to Ripley. In due time he received a telegram asking him to come to New York to participate in a broadcast, collect $50 *and have all his expenses paid. Lucky Jack.*

n r i

Stanley Earl is represented in "The New York World's Fair Anthology." His poem, "Life's Holy Grail," is included in this volume. Many of his verses have received the honor of publication as well as broadcast.

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H. E. Saylor says he hasn't lost a day's work since he graduated more than ten years ago. He is Chief Radio Operator for the Portsmouth, Ohio Police Department.

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James F. Barton claims his daughter Ann, now eight months old, is the best crooner in South Carolina.

n r i

Fred G. Smith of Bridger, Montana, recently lost his mother who had lived to the ripe age of eighty. Smith, in his letter to us, paid his mother a beautiful tribute. Her fine influence is clearly reflected in the character of her son.

n r i

C. C. Walden is confined at the U. S. Veterans Hospital, Memphis, Tenn., recovering from an operation. Says he has plenty of time to catch up on his reading.

n r i

Here's an idea! Alfred J. Girard of Worcester, Mass., suggests our members wear a neat uniform for service work with some distinctive insignia on the back.

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Paul F. Carlson has purchased the Ken Bucklin Supply Co., in Omaha, Nebr., doing Radio servicing work.

n r i

And Vernon Blake formerly of Aberdeen, South Dakota, has set up a full time Radio servicing business in Farley, Iowa. Good luck, fellows.

n r i

Clyde F. Krueger of Rhinelander, Wis., is the busiest man in town doing all the servicing for Crosley, Stewart-Warner and Grunow dealers, besides his own business.

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W. F. Doll of New York City now has a Second Class Radiotelegraph license with First Class phone endorsement. He has been chief operator at an amateur club station for the past year.

The Service Forum

Conducted by

J. B. Straughn, N. R. I. Service Consultant

Send in your service notes. We will re-word them for publication. To qualify your note for the NEWS *you must have observed the same trouble on two or more identical receivers.*

RCA MODEL 9-K — **DEAD**

When this condition accompanied by lack of voltage on the R.F. and I.F. screens occurs, the trouble is generally due to an open in the 22,000 ohm section of the candohm resistor assembly mounted at the rear of the chassis. A 10 watt replacement resistor will be satisfactory.

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RCA 1939 MODELS WITH ELECTRIC TUNING — **PUSH-BUTTON NOT LOCKING**

The position of the chassis in the cabinet with respect to the push-buttons is important in obtaining positive latching action. Simply elevate the front of the chassis about one-eighth inch by placing washers under its mounting feet. This should restore normal operation.

———— *n r i* ————

ARVIN MODELS 32 AND 42 — **VIBRATOR HASH**

Hum and vibrator hash in these receivers may be eliminated in the following manner: First remove the ground clip and lead to the end of the tuning condenser nearest the gearing to the outside case. Then disconnect the volume control ground return lead from the lug on the oscillator coil to which it originally connected. Extend this lead and ground it to the lug of the 6X5G rectifier tube located in the power pack. Replace the 6Q7G cathode by-pass condenser with one having a rating of 10 microfarads at 25 volts.

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ARVIN MODEL 42 — **DISTORTION**

If distortion occurs when this receiver is used with separate speakers the trouble may be attributed to an unbalanced 6X7G tube. Try another tube as this will probably clear up the distortion. Rattling is usually due to loosening of the nuts which hold the name plate in place on the speaker grill.

————*n r i*————

CROSLEY MODEL 178 — **DISTORTION**

Probably due to the magnetic speaker armature being out of adjustment. Adjustment of the armature and its set screws is quite critical.

EDMUND KELLEY, Montana.

ZENITH MODEL 6J230 — **DISTORTED AND MUFFLED**

If one or both of the pilot lamps are burned out, distortion will occur as they are connected in the filament circuit of the push-pull output tube. For replacement purposes use a 2.9 volt, .17 ampere bulb.

EDMUND KELLEY, Montana.

————*n r i*————

TUNING EYE TUBES — **INTER-CHANGEABILITY**

The 6U5, 6H5, 6G5/6H5 and 6T5 may be replaced by the 6U5/6G5 tube.

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SILVERTONE MODEL 4137 — **DEAD AT LOW FREQUENCIES**

This may be due to a shorted antenna condenser.

HENRY O. TYNER, Arkansas.

————*n r i*————

SILVERTONE MODEL 4537 — **DEAD**

This is often due to a defective on-off switch. With the batteries disconnected, check the switch for continuity with an ohmmeter.

HENRY O. TYNER, Arkansas.

————*n r i*————

AIRLINE MODEL 62-251 — **DEAD**

Look for an open in the oscillator coil. An open in the tuning section will not affect any of the electrode voltages.

HENRY O. TYNER, Arkansas.

————*n r i*————

AIRLINE MODEL 182 — **MOTOR BOATING**

Generally caused by an open electrolytic condenser in the plate supply circuit of the output tube. Check the condenser for an open by shunting it with an 8 microfarad 450 volt unit. If the motor boating clears up when you do this, replace the old condenser.

HENRY O. TYNER, Arkansas.

(Page 29, Please)

New York Chapter

At one of the meetings Chairman Stock asked for volunteers to build our service bench and we want to extend our thanks to Henry Fick, one of our newer members, who agreed to undertake the job. The details have been thoroughly discussed and approved by the Chapter. We are ready to go ahead. This service bench will be a great help to our members. We voted to buy a nine-inch volt-ohmmeter and Chairman Stock is donating a tube tester, as part of our equipment.

We held our usual service forum at our last meeting. Whenever we do not have a special speaker we fall back on the service forum which is always good for a lively session and plenty of ideas are advanced. Chairman Stock leads the discussions and that means lots of action.

Attendance is good, but we want some new members. Every student and graduate in the New York area should be a member of this Chapter. You will get the inspiration, Buddy, if you will pay us a visit. This Chapter is for your benefit—and we need you to help us carry on our work. You will find a real co-operative spirit here.

L. J. KUNERT, Secretary.

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Detroit Chapter

We have been continuing our work with the experimental units. When they are all completed we will have cause to effect demonstrations; also discussions on how to use various pieces of test equipment.

Television has been discussed pro and con. We are alert to the advancement of Television, but we are also convinced that Television has a lot of hurdles to jump before it reaches the public commercially. At a recent meeting we read the views of the Zenith Radio Corporation, which point out why they do not consider Television is ready for the public.

We have some fine speakers lined up. These men are ready to come to address us any time we say so, but our attendance should be better. We are very anxious to have our members come out to our meetings to assure our officers of sufficient attendance to justify the valuable time of a capable speaker.

The warm months will soon be over—now is the time to lend your presence in helping us map out real constructive programs for this fall and winter.

We admitted five new members since our last report.

F. EARL OLIVER, Secretary.

Chicago Chapter

The first and perhaps best news is the fact that we have been getting a lot of new members. New blood helps us put life into our activities. Chairman Ed Sorg is making a big hit with the way he is conducting our meetings.

The idea of pitching right in to do practical work is popularly received. It amounts to a clinic at which stubborn jobs are discussed step by step until we locate and adjust the trouble. You can't beat that sort of practical work.

We have our social side, too. Recently we had a party at the home of Earl Bennett. It was a complete success. Some of us stayed until the wee small hours of the morning.

Next on our schedule is a picnic. These are annual events with us and we always have a big attendance. There will be the usual foot races, base-ball games and sore muscles. Complete report will reach you after the casualties are counted.

R. A. CORDERO, Secretary.

n r i

Philadelphia-Camden Chapter

At our last meeting we arranged a group attendance at a Television demonstration at Franklin Institute, Philadelphia. Meetings are still being held at 4711 Longshore Street and the discussions of various circuit diagrams are conducted alternately by Al Wysoczanski, Dave Blackwell (our regular who never misses a meeting, even though he has to travel fifty miles) and Chairman Charles J. Fehn. Speaking of long distance regulars, mention should also be made of Oswin Wentling, Jr., who drives down from Pennsburg, Penna., just to attend our meetings.

Our dauntless Treasurer, Clarence Stokes, is at it again. Not only does he operate a live Radio shop, but now he has become a regular broadcaster. After becoming acquainted with a couple of hill-billy artists from Virginia, who had been on the air in Washington and Pennsylvania, Stokes conceived the idea that he could get a new contract for them with Stokes himself as part of the cast. So Stokes started on a tour of the town calling on merchants. He sold the idea of the program and then contracted with the Radio station for time on the air. And now we have the Friendly Businessmen's Program on the air four times a week over station WIBG, Glenside, Penna., at 9:15 A. M. on 970 KC on the dial. Uncle Chris (Stokes) does the announcing for the Texas Twisters, Rusty and Dusty. We are proud of that team.

You can tell the boys Philadelphia-Camden Chapter is doing mighty well.

ALLEN SCHIAVONI, Secretary.

The Service Forum (Continued from page 27)

GRUNOW
MODEL 5E — **INTERMITTENT**

Try a new .1 mfd. 600 volt plate filter condenser. This condenser frequently opens up thus causing intermittent reception.

HENRY O. TYNER, Arkansas.

———*n r i*———

LOKTAL TUBES — **INTERCHANGEABILITY**

The following Loktal tubes are interchangeable and you will find both types in general use: 7B8 and 7A8; 7B6 and 7C6; 7A7 and 7B7. The difference in type numbers is due to the difference in filament current characteristics. The 7B8, 7B6 and 7A7 require 300 milliamperes while the others require only 150 milliamperes.

———*n r i*———

MOTOROLA
MODEL 9-24 — **DEAD**

If the trouble is traced to failure of the oscillator, replace the 7A8 tube with a 7B8 or with one of the very latest type 7A8. This weakness in the 7A8 tube has been corrected.

———*n r i*———

AUTOMOBILE RECEIVERS — **WIND STATIC**

Wind static will be encountered if the ball tip is lost from cowl and door hinge aerials. If the tip becomes lost it should be immediately replaced with a new one.

———*n r i*———

CHRYSLER AUTOMOBILE 1939 MODELS — **AERIAL INSTALLATION**

In all 1939 cars of Chrysler manufacture, use the right-hand corner post for the antenna lead. It is free from other wires which would result in motor noise.

———*n r i*———

MOTOROLA
MODEL 9-49 — **CHANGE IN TONE**

The tone of this receiver can be changed by lifting the one terminal of the music coupler that is soldered to the chassis ground. Later productions now use a .01 mfd. 400 volt coupling condenser instead of the music coupler. In some instances better customer satisfaction can be obtained by the above change.

———*n r i*———

AUTOMOBILES 1939 MODELS — **INTERFERENCE ELIMINATION**

The following list prepared by Motorola gives the items which may be required for a good clean installation free from motor noise. Buick—Suppressor on distributor; Condensers on generator and coil.

Cadillac—Suppressor on distributor; Condensers on generator, coil and clock.

Chevrolet—Suppressor on distributor; Condensers on generator, ignition switch, and ammeter.

Chrysler—Suppressor on distributor; Condensers on generator and fuel gauge.

De Soto—Same as Chrysler.

Dodge—Same as Chrysler.

Ford—Condensers on oil pressure gauge, and on generator or voltage regulator.

Graham—Suppressor on distributor; Condensers on switch, generator and ammeter.

Hudson—Suppressor on distributor; Condensers on generator, fuel gauge, heat indicator, and ignition switch.

La Salle—Same as Cadillac.

Lincoln-Zephyr—Condensers on oil gauge, heat indicator, coil, voltage regulator, and fuel gauge.

Mercury—Same as Ford.

Nash—Suppressor on distributor; Condensers on voltage regulator, oil gauge, and heat indicator.

Oldsmobile—Suppressor on distributor; Condensers on generator and ammeter.

Packard—Suppressor on distributor; Condensers on generator switch and ammeter.

Plymouth—Same as Chrysler.

Pontiac—Suppressor on distributor; Condensers on generator.

Studebaker — Suppressor on distributor; Condensers on generator and low tension side of distributor.

———*n r i*———

MAJESTIC MODEL 490 — **INTERMITTENT RECEPTION**

This difficulty is generally due to opening up of the .02 mfd. coupling condenser between the plate of the 85 and the control grid of the 42. This condenser has a yellow lead which is also common to the .03 mfd. tone control condenser. If the yellow lead which goes to the plate of the 85 is cut, it will be necessary to replace both condensers. If this is done use 600 volt units.

———*n r i*———

MOTOROLA
CHASSIS 10-1 — **NOISE**

If noise only occurs on the broadcast tuning range it is generally due to a partial open in the plate winding of the R.F. broadcast coil which is shunted by the 47,000 ohm resistor. Replace the defective coil with Motorola part number 13-11-37235.

———*n r i*———

MOTOROLA
CHASSIS 10-1 — **SHRILL TONE**

This difficulty together with loss of bass response is due to opening of the 8 microfarad condenser connected from the low potential end of the speaker field to the chassis. Use a replacement condenser rated at 450 volts D.C. or more.

———*n r i*———

MOTOROLA
CHASSIS 10-1 — **DISTORTION**

Replace the .05 mfd. 400 volt coupling condenser feeding the control grid of the 6V6G power output tube. Use a 600 volt replacement condenser.

Baltimore Chapter

We are all primed for a visit from N.R.I. Alumni Association President Earl Bennett and Vice-President C. B. Morehead. They are to be with us at our next meeting. Moreover we expect J. E. Smith, E. R. Haas, J. A. Dowie, J. Kaufman, J. B. Straughn, L. L. Menne and several others to come over too. The program is a surprise, except that Mr. Kaufman is to address us on the subject, "Requirements of a Television System." You can't afford to miss that, fellows—and remember Chairman Pete Dunn promises plenty of other good things.

The Chapter sponsored a raffle which was a big success. The holder of the lucky ticket was our good friend George D. Parlett who walked off with a portable radio that is a dandy (see illustration). Plenty of the girls at N.R.I. will be disappointed because about forty-eleven of them wanted that radio. We greatly appreciate their support and in behalf of the officers of Baltimore Chapter, I am requested to extend thanks to every person who contributed in one way or another to make this little event such a success.

Joseph Kaufman, Director of Education, N. R. I. presents a portable Radio to lucky George D. Parlett, while Pete Dunn, Chairman of Baltimore Chapter, smilingly looks on.

For disposing of the most books of tickets the Chapter awarded a special prize and, of course, our hard working chairman, Pete Dunn, got that —a pair of pliers. In his light colored palm beach suit and with pliers in his hand Pete looked all the world like a dentist. R. Newland got a screwdriver for disposing of the second largest number of books. These fellows worked hard enough to earn an automobile, but the treasury could stand for only a pair of pliers and screw-driver —take it and no back talk. Once again thanks to Jensen, Gralley, Gosnell, Hachemeister and all for your help in putting the raffle over in great style.

Preceding the drawing, talks were made by J. Kaufman, J. B. Straughn, Lou Menne and B. S. Lavins. Mr. Lavins is comptroller at N.R.I. and he gave us some good points on keeping records.

We closed the meeting with refreshments and a bit of off key harmony.

L. A. Willett, *Secretary.*

———*n r i*———

Executive Secretary Menne snatched this photo from a collection proudly cherished by Earl Bennett. It was made at a somewhat recent party sponsored by Chicago Chapter. Everybody seems to be having a good time. We could be right at home in a chummy crowd like this.

———*n r i*———

Additions to N.R.I. Ham List

The following amateurs reported their call letters recently.

W8TFC—Howard C. Temple, Kalamazoo, Mich.
W9ODS—Vernon Strait, Julesburg, Colo.
W9FTL—Lester Ribling, Beardstown, Ill.
W8SKK—Bruno Yoka, Bridgeport, Ohio.
W8TJF—John B. Hecox, Jr., West Branch, Mich.
W4FDX—Frank Courtney, Augusta, Ga.
W3GHI—Samuel Levine, Pulaski, Va.
W9UYL—Robert G. Bryarly, Jr., Valparaiso, Ind.
W4EVX—H. Woodard, Lawrenceburg, Tenn.
W8TKP—Tabor P. Baker, East Syracuse, N. Y.
W8PRR—William F. Kline, Cincinnati, Ohio.
VE2KQ—W. L. Guenette, Montreal, P. Q., Can.
VO1T—Walter Sellars, St. Johns, Newfoundland.
W9RXB—W. B. Martin, Kansas City, Kan.
W3HAT—Griffith Sechler, Allentown, Penna.
W9LJP—R. E. Glatfelter, Jr., Milwaukee, Wis.
W7HOM—Richard W. Anderson, Milwaukie, Ore.
VE1AKO—R. Boswell, Hudson Bay Jct., Sask., Can.

This Is the Way to Do It

I find lots of good information in the Service Forum, Laboratory Page and Service Sheets with set diagrams. All of which I immediately place in my Radiotrician Binder so that I'll be able to have all of your valuable information at my finger tips.

FRANK W. ALLEN,
Honolulu, T. H.

n r i

Dr. George B. Thompson's Article

The most important thing for any man to remember is not to lose confidence in what he has undertaken. The very things that were covered by Dr. George B. Thompson in the last issue of the NEWS are what I have in mind.

MILLARD DEWALT,
Pine Grove, Penna.

n r i

It's Nice to Get These Letters

Have just finished reading the latest N.R.I. NEWS which I always look forward to and enjoy very much. As the saying goes N.R.I. really has something there. The item, "1939 is Television Year!" was very interesting.

R. A. LUCKER,
The Pas, Man., Canada.

n r i

Thank You, Mr. Ritsch

I've been receiving the NEWS about three years now and so far haven't found an article from cover to cover that wasn't helpful and interesting. Especially Service Sheets and Service Forum, they are tops with me in whichever form you print them. And the special articles explaining new developments and giving us the low down are just swell.

ELMER RITSCH,
St. Louis, Mo.

One of Several Similar Comments

I just read the writeup in the NEWS by Dr. George B. Thompson of California on Home Study work which I thought was very good.

EINAR W. HOVE,
Hartland, Minn.

n r i

Card Index System

Am enjoying every issue of the RADIO NEWS, especially the technical items by L. J. Markus. I appreciate the Service Forum too, and am building up a card index system for all makes of Radios with their common ailments. The facts are, I really enjoy every page of the NEWS, each and every issue. Keep up the good work.

W. J. WILKIE,
Leacross, Sask., Canada.

n r i

Handy Instrument

I have built one of the aural and visual vacuum tube indicators described in Mr. Kaufman's article in the Silver Anniversary Issue of the NATIONAL RADIO NEWS. It is a handy instrument.

HORACE B. GERMAN,
Ridgewood, N. J.

n r i

Electronics, Inc. by Popular Request

I must say I am mighty proud to belong to the N.R.I. Alumni Association. I enjoy NATIONAL RADIO NEWS immeusely and find it most valuable. Especially the features dealing with new developments in commercial Radio receivers, do I find useful. But to top off all eager absorption, I enjoy diving right into the experiences of "Electronics, Inc."

ANTHONY T. KOBAYASHI,
Okanagan Centre, B. C., Canada.

Some Notes On Wind Chargers

Mr. J. A. Dowie, Chief Instructor
N. R. I., Washington, D. C.

Dear Sir:

I always look forward to receiving NATIONAL RADIO NEWS, the best Radio magazine I've read. I was reading the excellent article by L. J. Markus on wind chargers when I came to a picture of a man working on a machine without a cap on. I've done considerable work on wind chargers but always with a good sheep-lined coat on and ears well covered. Wind chargers don't seem to go bad in summer. Remember, I'm in North Dakota.

Here are some notes on wind chargers in general, which might be of some value. In repairing collector springs on deluxe wind chargers with the brake drum, a screwdriver or wedge placed between the brake rod and the clamp on the brake rod will securely set the brake so the brake wire can be removed. The generator can then be raised so as to make the collector springs accessible.

The storage battery terminals, if not kept clean, can cause the relay to burn out. (The generator can burn out, too.) If the generator doesn't seem to be charging good and the cut-out cover is warm, look for poor connections, particularly at the battery.

The deluxe wind charger collector brushes are mainly copper strips which wear through and curl up, hitting the cup, shorting the generator. In this country they last on the average of one year. The new brushes, which need only one strap to each ring, have copper blocks on each end. I believe that they will greatly outlast the old ones.

Sincerely yours,
HOMER GROVE,
Bordulac, North Dakota.

— n r i —

New Meissner Literature Is Available

Meissner Manufacturing Company, Mt. Carmel, Ill., announces a new 1939-1940 catalog and also an up-to-the-minute Vibrator Guide.

This literature is now available to the trade through Meissner dealers and distributors or may be had for the asking by writing directly to their offices.

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L. L. MENNE, EDITOR
L. J. MARKUS, TECHNICAL EDITOR

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