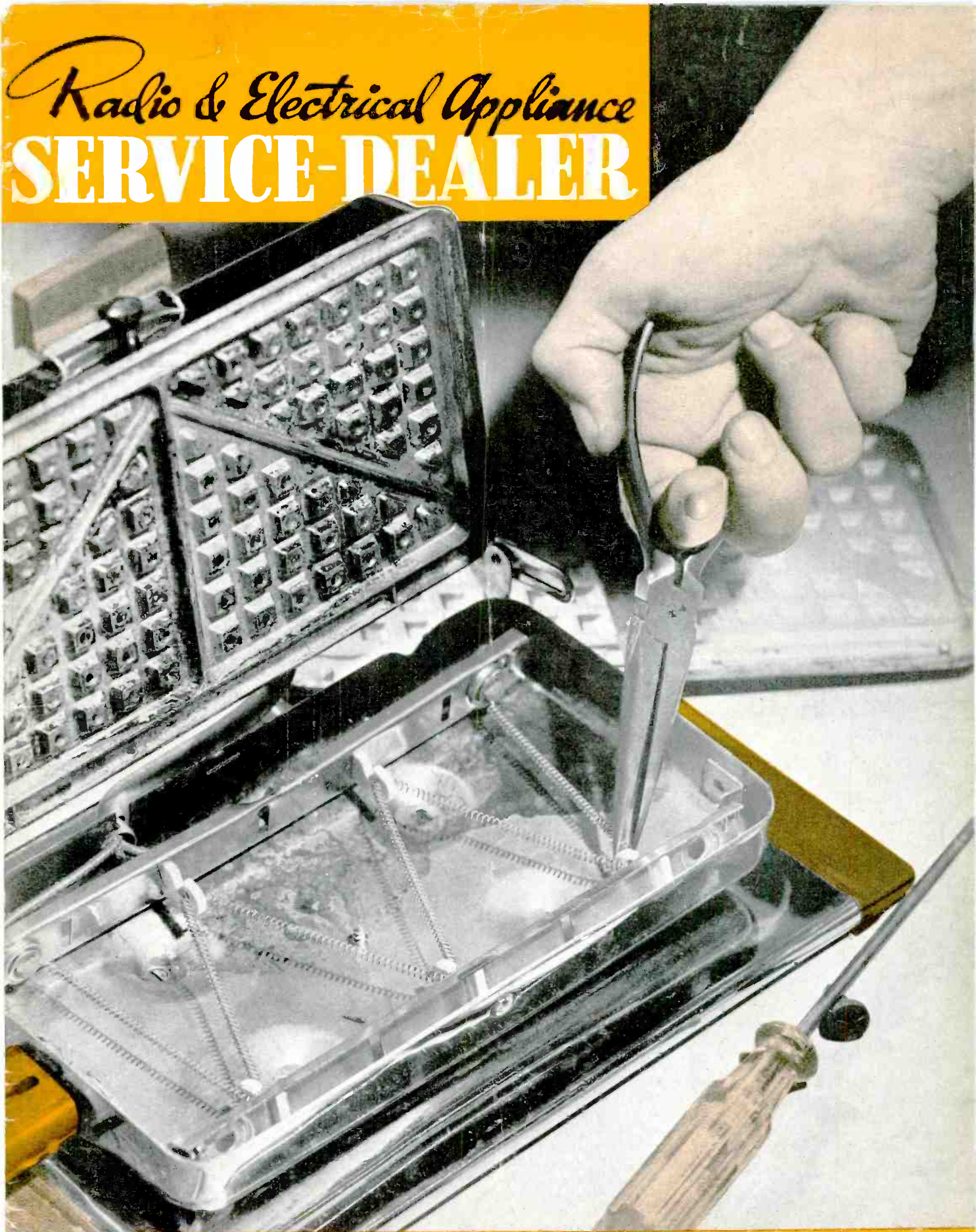
Radio & Electrical Appliance SERVICE-DEALER



In This Issue:

Profitable Customer Relationships

★

Toaster Maintenance—Speaker Repairs

march, 1944
25c

Two Suggestions

. . . On How To Replace Bias Type Volume Controls with the 10,000 Ohm Linear Units

The bias type of volume control circuit makes use of a variation of bias voltage applied to the tubes to control the volume of the receiver. Several forms have been used, such as grid return to the negative "B" potential, cathode connection to voltage divider tap, etc. However, the most popular was the simple variable resistor usually connected in the cathode return of RF stage or stages. The "Original Circuit" illustrates this system.

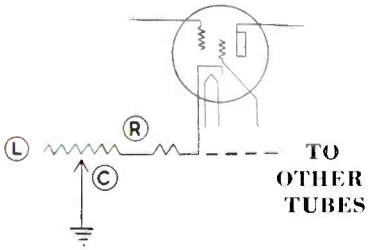
Here are two suggestions for using a 10,000 ohm linear control, either carbon or wire wound type, for applications using resistance values of 2,000 to 20,000 ohms in the bias control system. Care should be exercised with installation of the carbon type in cases where two or more stages are controlled through the unit, or where a considerable bleed current is employed.

The possibilities of wartime substitution are many. For special assistance on problems of this kind, write the Mallory Technical Information Service. We'll be glad to help.

Buy More War Bonds

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

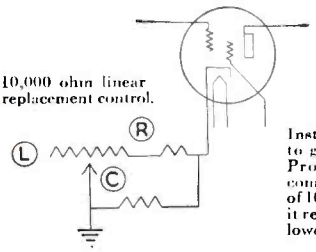
Original Circuit



Original Control has a resistance of 2,000 to 20,000 ohms; usually a right-hand taper, although a few are linear.

Replacement Suggestion No. 1

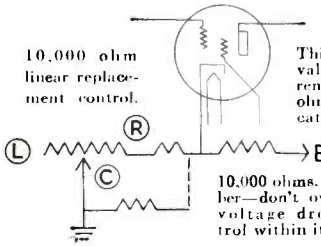
(Where Original Control Has a Value of 10,000 Ohms or Less)



Install shunt resistor to give taper action. Proper value will compensate the use of 10,000 ohms where it replaces original of lower value.

Replacement Suggestion No. 2

(Where Original Control Has a Value of More than 10,000 Ohms)



This resistor, of proper value, will bleed current through the 10,000 ohm control to duplicate the voltage drop required where the original control was over 10,000 ohms. A point to remember—don't overdo it. Keep the voltage drop across the control within its power rating.

Shunt resistor may assist in taper action.

Mallory Helps for the Radio Service Engineer

MYE TECHNICAL MANUAL —408 pages of complete data on capacitors, noise suppression, receiving tubes, loud speakers, vibrators, phono-radios, automatic tuning and other valuable information. Available from your Mallory distributor...Price, $2.00.

4TH EDITION RADIO SERVICE ENCYCLOPEDIA . . . Complete information on repairing any make or model of receiver. Circuit references, original part numbers and recommended replacements. Available from your Mallory distributor . . . Price, 95 cents.

Radio & Electrical Appliance
SERVICE-DEALER

Covering all phases of radio, phonograph, sound and electrical appliance merchandising and servicing.

VOLUME 5, NUMBER 3

MARCH - 1944
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DISCussion

An Open Letter To Record Manufacturers

Gentlemen:

We are the long-suffering dealers who sell your estimable product to the *ickies,* the *hep-cats,* the *long-drawers* and the public. From the terms we use, you can see the type of reviews we have been forced to digest. All seem to be written for the public and not for us. Here is our story!

Our dear buyers are interested beyond words in the goings on of their favorites, the doings of the famed orchestra leaders, and whether or not *Toscanini* will make another record. This information they read in *Metronome, Variety, Down Beat* and—for all we know—a dozen or more periodicals. Many of them also receive record reviews directly from you or your distributors . . . some even from us, occasionally.

Bea Wain, popular *RCA-Victor* recording artist (left) and Ella Mae Morse who is heard on Capitol Records are best sellers. (*Down Beat* Photographs)

While we have a passing interest in these fumings and peripatetic stories, nevertheless we are more concerned in knowing what may be coming in the way of records so that we may, in turn gage our purchases thereby. It is well known to the manufacturer when a certain record will be in big demand. If it were not, they could not make enough pressings to take care of their trade. Why not give us this information? And do it without fanfare, verbosity and public relations' embroidery!

So we are writing this open letter to you . . . or to your distributors, appealing to you to furnish us, or this magazine and others, with material which would enable us to make our purchases intelligently.

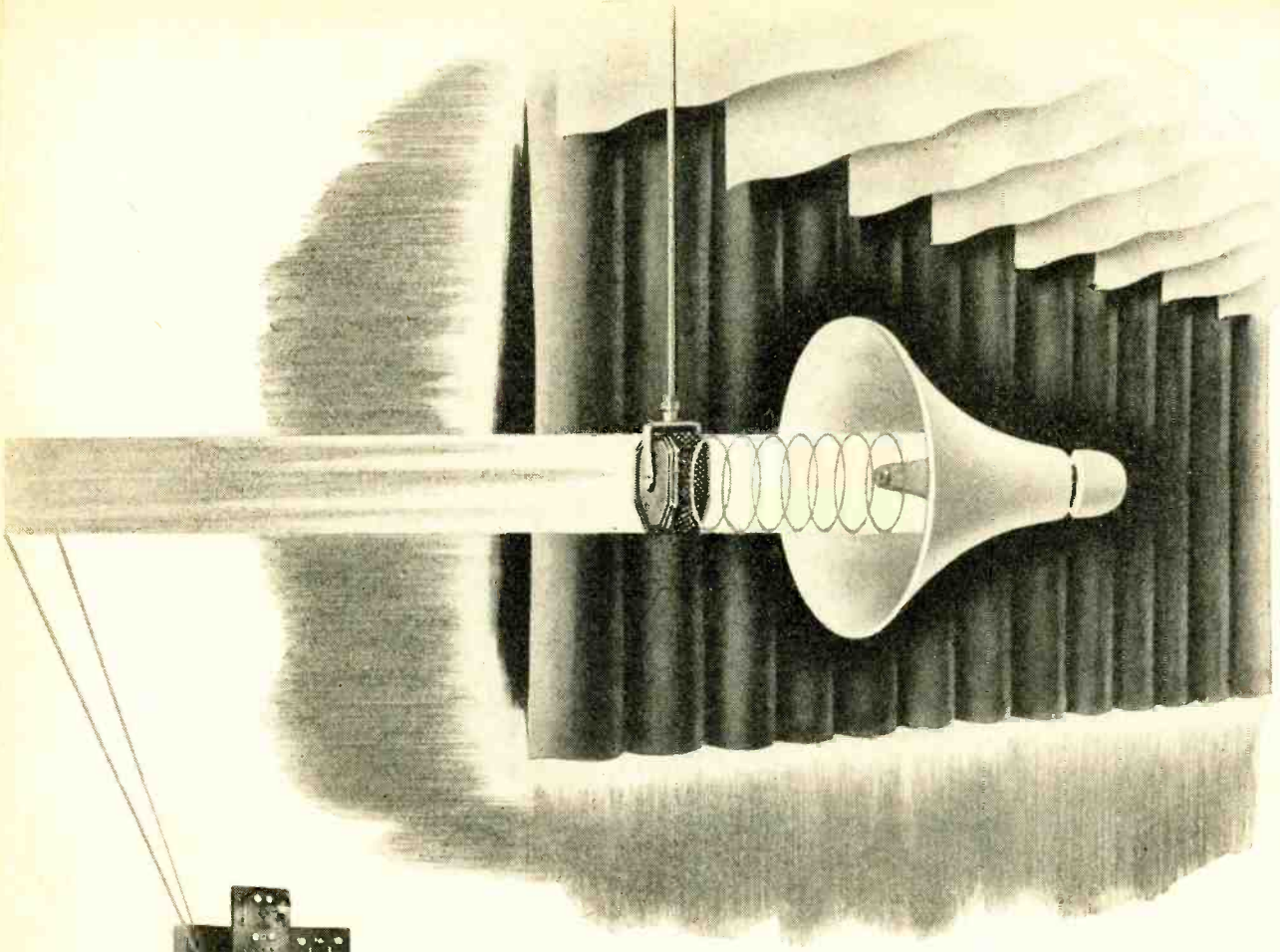
Can you help us?

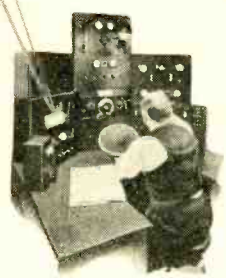
Thank you, and may we hear your side of the situation

Sincerely yours
"A Record Dealer"
Chicago, Illinois

We hope that the manufacturers will take notice of this letter, because it states a real demand for information which up to now has not been available to the dealer. We believe that such information could be furnished him, much in the same manner that the Motion Picture Companies distribute theirs to the million or so movie houses. Then if it were also made available to

(Continued on page 30)





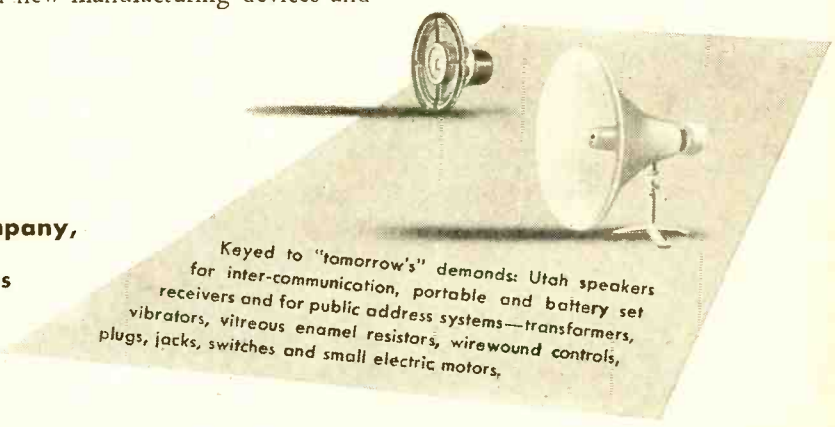
silence that makes sound!

In this "dead" room only the sounds which come out of the speakers are recorded. Sounds which would otherwise bounce back from the walls, ceilings or other objects are trapped and lost forever. The absence of reverberation permits scientifically accurate testing in the sound absorbing room of Utah's *complete* testing laboratory.

In making practical the many war-created radio and electronic improvements—in adapting them to today's needs and for the commercial requirements ahead, Utah engineers have designed new parts and products, developed new manufacturing devices and methods and have instituted new, more comprehensive testing techniques.

★ ★ ★

Every Product Made for the Trade, by Utah, Is Thoroughly Tested and Approved



Keyed to "tomorrow's" demands: Utah speakers for inter-communication, portable and battery set receivers and for public address systems—transformers, vibrators, vitreous enamel resistors, wirewound controls, plugs, jacks, switches and small electric motors.

utah **Radio Products Company,**

836 Orleans Street, Chicago 10, Illinois

with the editor.....

The Customers Always Write

WE ARE BEING DELUGED with letters from service-dealers claiming that many jobbers are taking unfair advantage by diverting the bulk of replacement "M-R" tubes received to their own service departments which, like dealers', are bulging with repair jobs.

Tube manufacturers apprized of the situation are helpless. In good faith they ship "M-R" tubes to jobbers trusting that they will be honorable and resell them to servicers. But when a jobber proves to be a tube hoarder and selfish, serving only his own service department's needs, the tube maker can do naught but cut him off and that would not attain the objective of putting tubes in servicers' hands.

There is a solution to the vicious jobber malpractice problem. Such selfish jobbers must be put out of business. They must be cut off and the communities they serve must be penalized for patronizing them until the wrong is righted. Boycott hoarding jobbers and ask their tube suppliers to do likewise. Organize and use passive resistance. Picket their establishments if necessary. Inform local Chambers of Commerce and newspapers. Let the facts be known and the public will support you. We doubt whether legal action claiming unfair trade practice or restraint of trade can be instituted but competent legal advice on this score should be obtained.

Jobbers wail that they, as a class, are being discriminated against by government regulations and others. If the tube-diversion complain of service-dealers is true offending jobbers deserve being discriminated against. In fact they should be obliterated from competition. Honorable jobbers will support this contention.

★ ★ ★

Consistently Inconsistent

THE PAPER SHORTAGE is acute. It is said that delivery of munitions for fighting men is impeded due to lack of packaging cases and cartons which cannot be made in sufficient quantities because of the paper shortage. Yet at the same time a large amount of valuable paper is being printed into American-French currency for use when we invade the Continent. We belive this a rather bad planning. As arm-chair generals we feel that we must get munitions to France before we get money there. Literally we are sore about it because our back aches. You see, we just spent a week in the stock-room pulling out several tons of back issues to donate to the waste-paper scrap pile. Did you make your contribution?

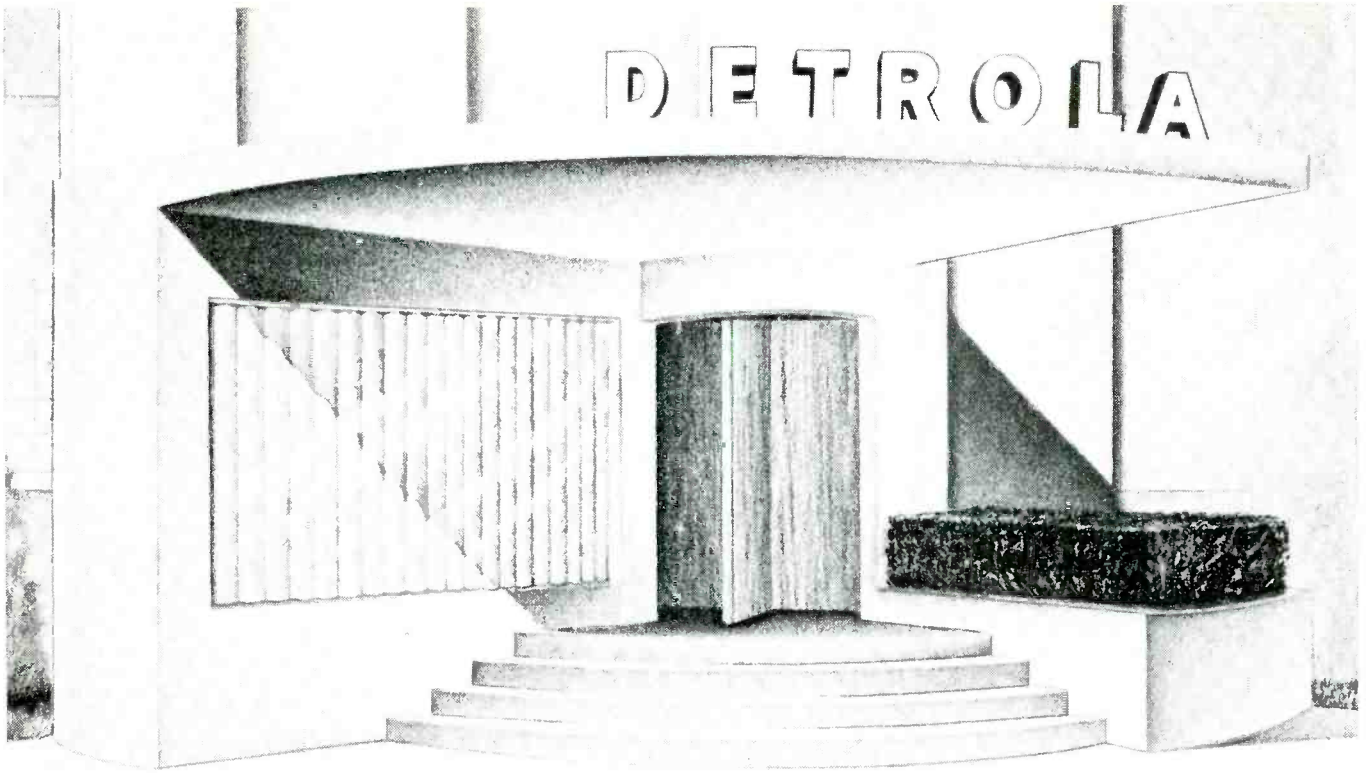
★ ★ ★

Laughing Through Our Tears

SELECTIVE SERVICE BOARDS in the District of Columbia complained to a House committee that "many men in high government places are being rejected by the Army as psycho-neurotic". Defined, this means that they are mentally disturbed or subject to nervous mental disorder or instability. Says a Mr. Fraser, member of one of the complaining boards, "It is difficult to understand how men can be employed in high government places in a psycho-neurotic state".

We subscribe to Mr. Fraser's

(Continued on page 26)



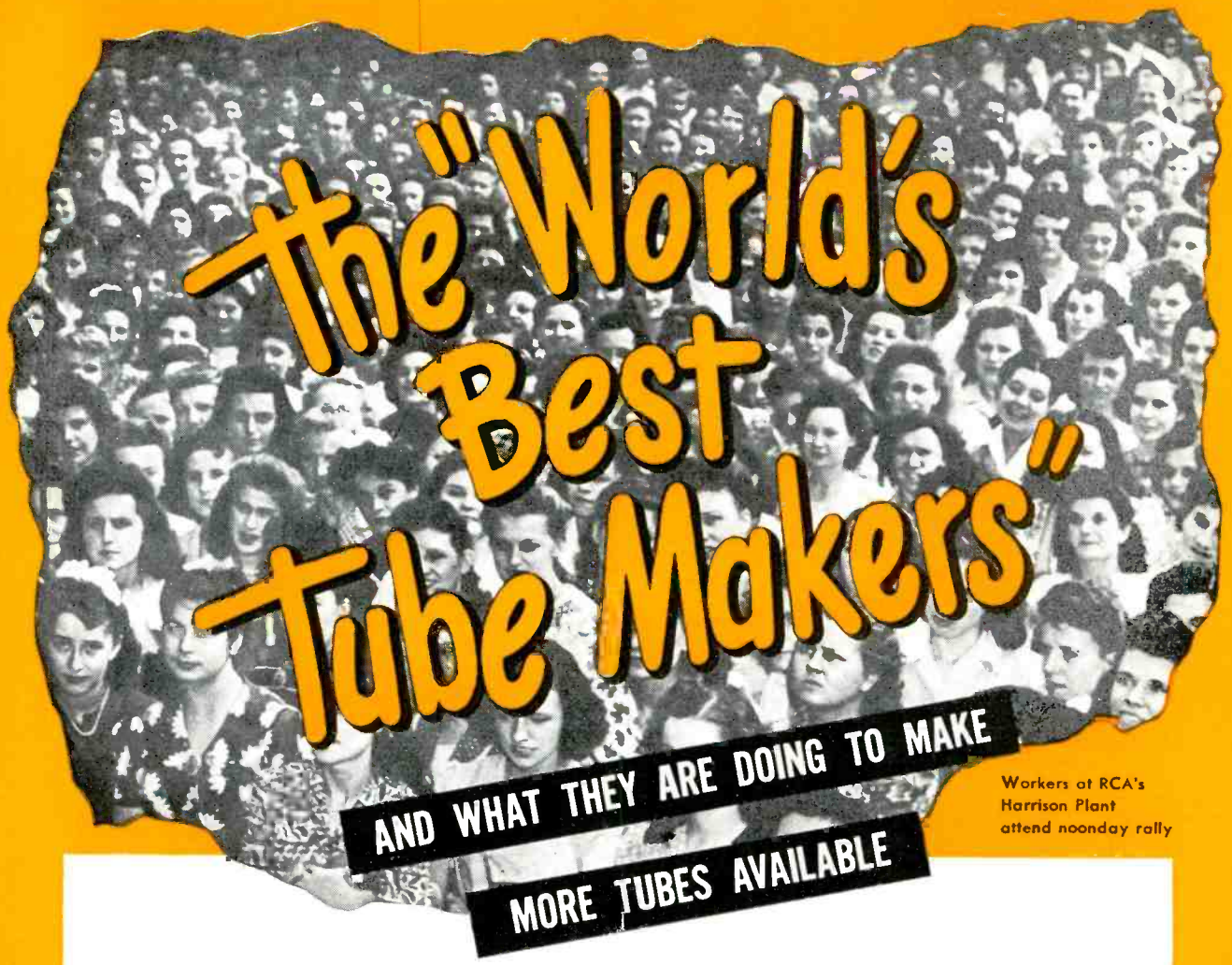
PORTAL to PRECISION for War and Peace

Shown here is the proposed new doorway to Detrola's offices and laboratories. It will soon be a part of the building—to serve not only as a practical and functionally beautiful entrance-way, but to stand as an outward symbol of the many changes that have brought the NEW DETROLA into being. Today this great radio-electronic plant is streamlined throughout—with new research and engineering talent, new production facilities and hundreds of highly trained workers. All of these are dedicated, now, to the manufacture of highest quality war equipment. After Victory, in combination with the experience gained in war, they will be dedicated to the production of highest quality electronic products for civilian use. *Help Secure Victory and Make Victory Secure—Buy War Bonds.*

DETROLA RADIO

DIVISION OF INTERNATIONAL DETROLA CORPORATION • BEARD AT CHATFIELD, DETROIT 9, MICH.

C. RUSSELL FELDMANN PRESIDENT



The "World's Best Tube Makers"

AND WHAT THEY ARE DOING TO MAKE MORE TUBES AVAILABLE

Workers at RCA's Harrison Plant attend noonday rally

IN August, 1943, the thousands of workers in RCA tube factories organized themselves, through their War Production Drive Committee, into the "World's Best Tube Makers."

They resolved to do their job better than it had ever been done before.

They began a drive to reduce tube "shrinkage" —tubes "lost" in the manufacturing process. Knowing that a poor tube takes just as much material, just as much time, just as much labor as a good tube, these "World's Best Tube Makers" set about making more of their tube production *good* production.

Now look at their record:

During the first month of their campaign *tens of thousands* of tubes were made available which formerly would have been scrapped. During the second month the *gain* had reached the hundred thousand mark. And this astounding performance is still going on.

To all of us, this means that war quotas are being filled faster and faster.

To those who sell RCA tubes, it means that because war needs are being filled faster, the day when civilian needs can be met may come sooner.

And in Peace, it will mean finer RCA tubes than ever.

That is why they pride themselves on being the "World's Best Tube Makers," these women and men of RCA. And that's why you, as an RCA tube and equipment sales outlet, can be proud, too!

RCA

BUY WAR BONDS

RADIO CORPORATION OF AMERICA

Camden, N. J.

In & Around the Trade

Being a condensed digest of some of the happenings in and around the radio trade as compiled by the Editors

WPB Nixes Civvy Bats

Increasing demand for batteries for the armed forces makes the possibility of increasing the supply of dry batteries for civilians in 1944 appear remote, the Consumers Durable Goods Division of the WPB announced today.

Production of some kinds of batteries used by civilians may even be lower than in 1943. The materials situation has improved, and the facilities of the industry have been greatly expanded, but the quantity of industrial and other essential civilian batteries will continue to be limited by the capacity of equipment that is not adaptable for production of military types of batteries.

Some farmers who live beyond electric power lines and depend on dry batteries to operate their radios may not have been able to buy batteries as often as desired, but this was due to increased usage of radios rather than to restrictions on production or distribution of batteries.

Manufacturers are endeavoring to guide the flow of batteries into normal pre-war channels. No priority is required for purchase of batteries, and no farmer is given any advantage over another in purchasing batteries for his radio.

Shipments of No. 6 (6-inch) type batteries, including multiple types, were almost exactly the same in 1943 as in 1940. These batteries are used to a large extent in rural areas for telephones, gas engine ignition, and electric fences. Large quantities are used also by railroad, telephone and telegraph companies, by the fishing industry, and for protective alarm systems.

More than 55,000,000 individual cells were produced for assembly into hearing aid batteries. Final figures show that production of assembled hearing aid "B" batteries reached a total of approximately 1,600,000.

Lantern battery shipments were 85 per cent higher than in 1940. Almost the entire amount produced went to railroads for use by trainmen.

Approximately half as many flashlight batteries were shipped in 1943 as in 1940, and many of these did not reach the retail market. War plants, public utilities, and other users, whose requirements had increased as a result of the war, received a much greater share than in 1940.

All military operations, on land and sea and in the air, require enormous quantities of dry batteries. If batteries are not immediately available for the family radio, it is because batteries are needed for walkie-talkies, bazookas, signal lights, or other war equipment.

Hallicrafters Old Timers Celebrate

The Old Timers' Club of the Hallicrafters Company celebrated the tenth anniversary of the company with a surprise dinner in honor of W. J. Halligan, president and founder. Employees, most of whom have been with the company since its inception, made the speeches.

Responding to the many toasts and tributes tendered him at the dinner, Mr. Halligan gave full credit to the part his employees had played in the success of the company. He said, "Radio has been my whole life and it has been a whole lot of the life of you folks. It is a satisfaction tonight to look back over our ten years of development and growth, and realize that we were prepared when the time came to serve our country."

Experts Mobilize Under CED for P-W Employment

Outstanding experts in manufacturing, marketing, sales, finance, management and engineering have organized to make available to American business during 1944 the latest practical knowledge needed to help them effect an expansion of postwar production and employment to unprecedented peacetime levels, it was announced by Marion B. Folsom, Chairman of the Field Development Division of the Committee for Economic Development. Eleven committees will make this knowledge available to all American businessmen in publications and by direct consultation through the 1100 community committees of CED now at work in all 48 states.

"The most pressing job of the CED in 1943," said C. Scott Fletcher, Director of the Field Development Division, "was to organize businessmen at the community level to study conditions in their own localities and in their own businesses and to take responsibility for devising bold plans for reducing postwar unemployment to the bedrock minimum.

"In 1944 the CED's most urgent task will be to make available to the nation's 2,000,000 business employers the best American managerial science, imagination and know-how, in such practical form that it can be applied effectively to their own postwar planning problems.

New Langevin Amplifier

The Langevin Company, Inc., of 37 West 65th Street, has just announced a new amplifier known as Langevin Type 101-A. Its outstanding virtue is excellent low-frequency wave form at high output levels, which makes it unique among commercial amplifiers. Volume range is excellent, inherent noise level being 68 db unweighted below full output of plus 47 VU at 2% RMS harmonic distortion. With the input impedance of 600 ohms, the gain is 60 db. Using bridging input, the gain is 46 db. Output impedance is adjustable 1 to 1000 ohms.

Garod Over the Top

The amazing total figure of $410,350.00 has been purchased by the Garod Radio Corporation of Brooklyn, N. Y. it was announced today, sending its quota for the Fourth War Loan drive far over the top.

In a whirlwind three-day campaign headed by Sales Manager Lou Silver and supported by the entire personnel of 250 this total of almost four times the amount raised for the previous drive was realized. This amount is in addition to a regular weekly payroll plan for war bond deductions of more than ten percent.

The money pledged will purchase a fully-equipped ambulance for $110,000.00, as well as a heavy bomber for $300,000.00. To be christened "Dorag" —Garod in reverse—they are the personal contribution of Garod's war workers to Victory in '44.

Rex Munger with Warwick

Rex Munger, long famous as a salesman and radio industry personality, is hanging his hat in the purchasing department of Warwick Manufacturing Corporation, well-known radio receiver firm with offices and plant in Chicago, Illinois.

Postwar Jobs in Electronics

Students, teachers, librarians, counselors, parents, war workers, returning soldiers, and others interested in postwar jobs will find helpful information in a six-page folder on Occupations in Electronics by Forrest H. Kirkpatrick of Bethany College, and John E. Crawford of the RCA, published by Occupational Index, Inc. at New York University, New York 3, N. Y.

This is one of a new series of leaflets describing opportunities in fields which are expected to expand when the war ends. Each covers the nature of the work, abilities and training required, earnings, methods of entrance and advancement, geographical distribution of employment, postwar prospects, and other advantages and disadvantages.

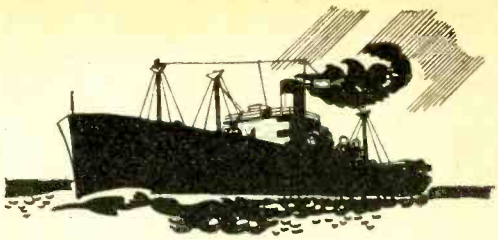
Belmont Employees Exceed Quota

By a margin of 20 per cent, employees of the Belmont Radio Corporation of Chicago exceeded their quota of War Bond purchases in the campaign completed last week. When the drive ended on February 15, the subscriptions totalled $149,575, as compared with the quota of $125,000 assigned to the plant. It was expected that pledges for E bonds, which will be accepted until the end of the month, would bring the grand total above the $150,000 mark.

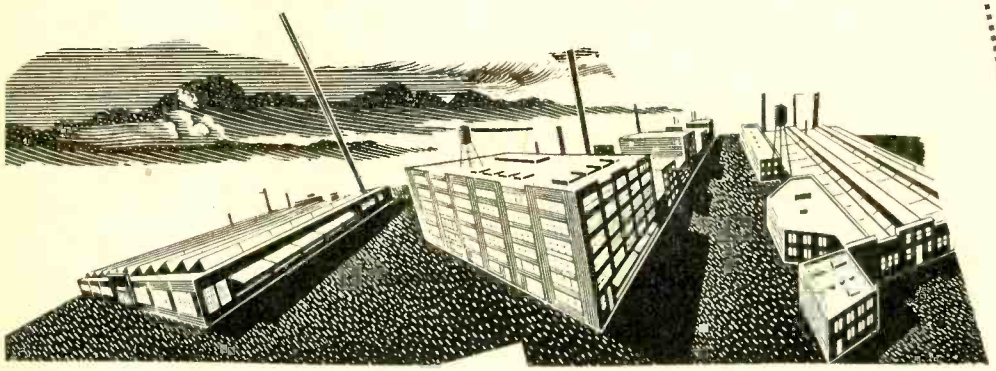
The two largest subscriptions were made by the Belmont Credit Union and the corporation. Each organization subscribed for $25,000 in bonds.

New Type Potentiometers

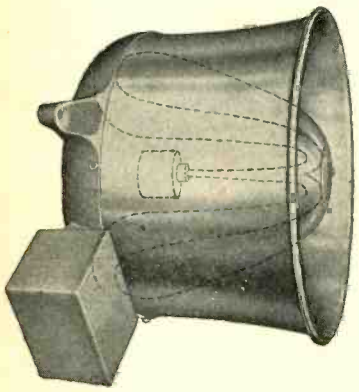
Precision potentiometers which can operate for 2,500,000 revolutions at 360° continuous rotation in both directions, for 24 hours a day are among the types brought forth by the DeJur-Amsco Corporation of Shelton, Conn., in its 1944 listing of units designed for a variety of electronic and industrial techniques. Outstanding feature of this group is the fact that extremely close tolerances are used, which require winding equipment built especially for the firm. On inspection after completing the 2,500,000 revolutions, they appear to need no adjustments.



W.P.B. Encourages Industrial Sound Installations In Feb. 28th Announcement



RACON endorses new policy 100%



Here is the RACON MARINE HORN Speaker used on many bombers and navy vessels. Approved by the U. S. Coast Guard, formerly the Bur. of Marine Inspection, Dept. of Commerce. Several sizes available, Stormproofed, of the reentrant type, suitable for indoor or outdoor use—may be used as both speaker and microphone.

RE-ENTRANT TRUMPET; available in 3½', 4½' and 6' sizes. Compact. Delivers highly concentrated sound with great efficiency over long distances.

Public address sound equipment for industrial plants engaged in war work contribute to speeding up production. Music relieves fatigue and stimulates workers. Paging systems quickly locate personnel and reduce use of jammed telephone lines. So, WPB will now accept applications for industrial sound installations when submitted on WPB Form 617.

Most of the best industrial p.a. installations in use are RACON speaker equipped. They are the finest speakers made and there is a type for every conceivable application. Our catalog is available without charge.

For Marine p.a. installations, too, RACON leads. Approved by the U. S. Coast Guard, RACON speakers are used aboard Army and Navy vessels. Only RACON can supply, when needed, patented Weatherproof, Stormproof Acoustic Material which is impervious to any weather condition and prevents resonant effects.

RACON ELECTRIC CO., 52 E. 19th St., N. Y.

RACON

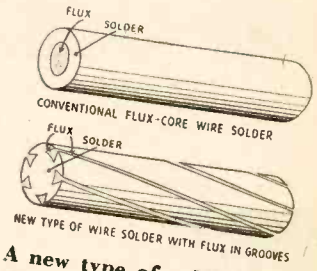
What's News in Pictures

Left to right: *C. L. (Muggs) Pugh*, recently appointed representative for *Utah* in Ohio, W. Va., and western Pa.; *Abby Burwell*, whose husband is in the Army, carries on his rep work for *Solar*; *Ray L. Hoefler*, recently appointed general manager for *Zenith Radio Distributing Co.* of Chicago; *D. W. May*, who formed his own *G.E.* distributing organization, and *J. H. Clippinger*, recently placed in charge of Sales for the newly expanded *Admiral Corp.*

Nazi Aircraft Radio, as captured by our men, shows old-time construction

A "solder pencil", developed by GE keeps the solder free from dirt and handling by the worker

Neat store layout of Dickinson's Radio of N. Sacramento, Cal. Service bench is enclosed



A new type of solder with flux running on the outside is said to be better

Real high power! Putting the finishing touches on a transformer which is to deliver 60,000 volts at 0.05 amps

This "lance" radio set is carried by our cavalry on horses

Your 1944 radio receiver! The Automatic Electric Company of Chicago has been manufacturing these ships intercoms. One reason for no civvy radios

Letters to the Editor

DOESN'T WANT FORMULAE

Editor:

Congratulations! For the past few months you have finally realized that we servicemen are not interested in formulas which tell us what goes on inside of transformers, antenna net-works, or attenuators, and the like. What we are interested in, is how to keep going in these times, and how the other fellow is doing it together with stories of what is going on in the trade, etc. Keep up the good work!

John J. Giles
Pennsylvania

WANTS MORE FORMULAE

Editor:

What has happened to the formulas we used to see in this magazine? Where are they? I think every serviceman should know exactly what makes the sets tick, and how things are made. While I am not interested in doing actual design work, still I like to see how the engineers arrived at their conclusions. Let's have more formulas!

Peter R. Maple
Connecticut

There it is, Gentlemen! The editorial offices have been rocking with this argument for the past three months. One man says you should give formulas; the other says that the serviceman is not interested. Frankly, we don't know exactly how the majority of our readers feel about this. So why not write in your vote and views. As the majority goes . . . so will this magazine. The customer is always right!

LEARNS FROM OTHERS

Editor:

Sure was interested to read about how that firm sells so many records. Have put in some of their schemes, and have already gotten some results! Keep up telling us how the other fellow does it. We can learn from him if we will but take the time to read his way. Then we can change it to meet our personal requirements, and *presto,* we have more business. Thanks for the tips!

Daniel F. Fogarty
Utah

For the orchid, many thanks! We plan to keep that type of material going in future issues.

NO BED OF ROSES!

Editor:

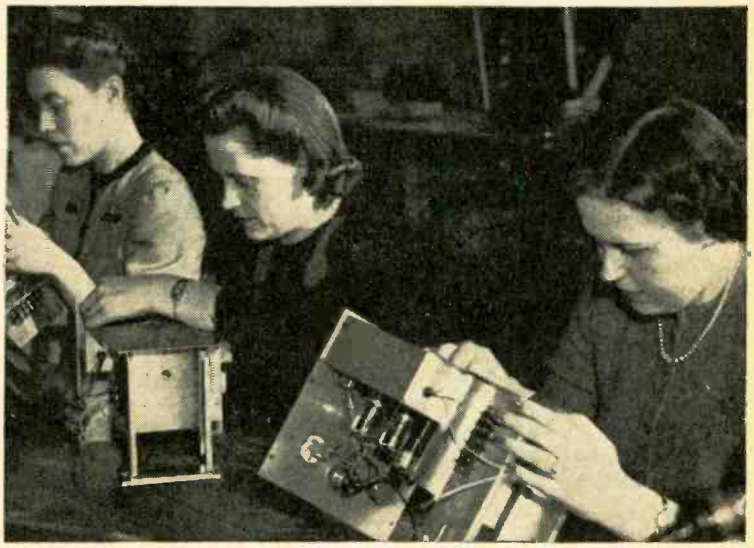
We see and hear about the *W.P.B.* releasing tubes for civilian use but we don't see the tubes! For example I have orders in for tubes such as 35L6, 50L6, 5Y6 and many others too numerous to mention. One order for 18 tubes of different types has been in since May 1st of last year to my regular jobber and several orders have been placed since then all for tubes necessary for replacement in radios now in my shop. At the present time, I have a total of 20 radios in for service that lack only one or two new tubes to put them back in operation; and in 15 cases the cus-

ALL EYES ON MT. CARMEL!

On Guard! Symbol of watchfulness at the Meissner plant is this alert, keen-eyed sentinel. All prying eyes are kept at a safe distance, but there's no hiding the fact that great things are in the making here.

Testing: These two men pack a world of electronics knowledge behind youthful faces. They literally "grew up" in the business — thanks to the fact that there are more electronics technicians per thousand population in Mt. Carmel than in any other city.

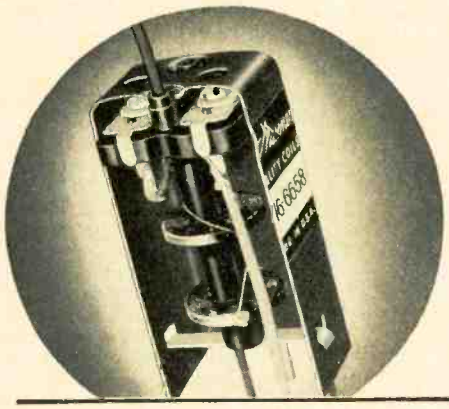
Meissner's "Precision-El": Long experience, plus "home town" enthusiasm for the job, have so astonished visitors that they refer to Meissner's personnel as "precision-el." And Meissner's "precision-built" products prove the case!



What New Marvels these girls have seen! They're on the inspecting line at the Meissner plant in Mt. Carmel, Illinois, source of numerous major war departments in the electronics field.

ILLINOIS ELECTRONICS CENTER HUMS WITH FUTURE PROMISE

Nearly everywhere you look these days — in America's newspapers or magazines — you're apt to find a glowing reference to Mt. Carmel, or to the Meissner Manufacturing Company. That's because the little Illinois city and its largest industry are both in the forefront of important postwar thinking. Hub of much of this activity is the Meissner laboratory, which occupies an entire floor of the main office building. There are so many closely guarded secrets here, in fact, that no photographer dares set tripod inside!



Wide Range, High Gain

Here are the famous "big four" benefits of Meissner "Plastic" I. F. Transformers: (1) wide range; (2) high gain; (3) remarkable stability; (4) double tuning. They're particularly suitable for use in small receivers, where space is at a premium, yet superior performance is required. Only 1¼" square x 2½", yet are not affected by temperature, humidity or vibration. Complete with specially served Litz wire and one-piece molded plastic coil-form and trimmer base. Now ready for delivery, but order promptly.

MEISSNER

MANUFACTURING COMPANY · MT. CARMEL, ILL.

ADVANCED ELECTRONIC RESEARCH AND MANUFACTURE

SPEAKER REPAIRS

Many speakers which are being discarded, could be repaired by following these simple methods

★ Many old speaker cones lying around service shops can be successfully salvaged and put back into use. Care in cutting and fitting must be exercised. Cones from magnetic speakers are most easily used, as they have an apex point.

Cones that are too large in diameter, or too deep, may be brought to usable size if one studies the problem, and method of procedure, carefully. When cutting a cone to the correct diameter, be sure to allow

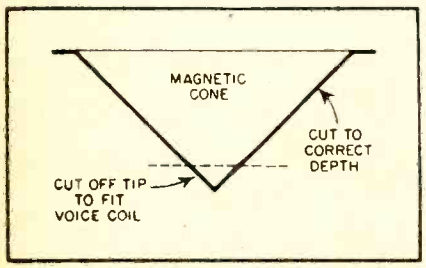


Fig. 1. Method of cutting magnetic cone to proper size. The apex should be cut and the voice coil fitted to it before trimming the cone to size required.

¼- to ⅜-inch extra for flange cementing. See *Fig. 1.*

If the cone is of the pointed type, and the voice coil on the speaker to be repaired is okay, the first step is to cut the tip end from the cone to be used. Be certain that the diameter of the opening left by cutting is small enough to fit flush and inside of the voice coil to be used. Having done this, cement the voice coil in its proper place, but take great care that it is set in a perfectly straight line. See *Fig. 2.*

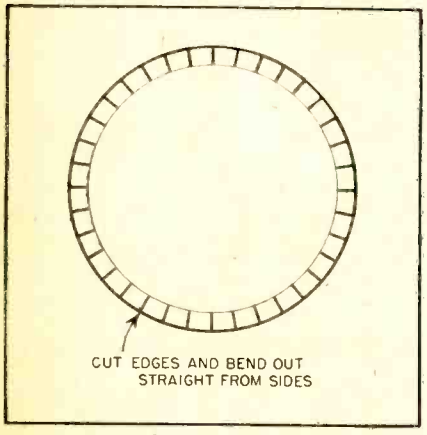


Fig. 2. After cone is cut to correct depth, the edges should be cut in as shown, then bent straight out to form the flange for cementing.

Cones from dynamic speakers are not so easily adapted to different speakers, but frequently can be used.

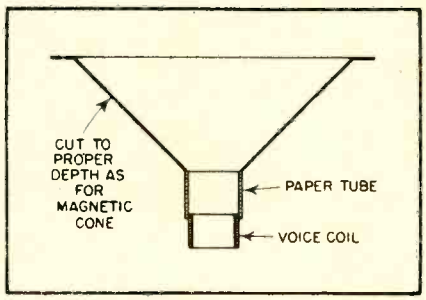


Fig. 3. When the cone from a dynamic speaker is too short, it can be "built-up" by adding a length of paper tubing, connected between it and the voice coil, as shown.

If the cone is too shallow to allow the voice coil to reach the proper "rest" position, it will be necessary to cement a short piece of paper tubing to the cone and then to this will be cemented the voice coil, properly positioned to allow it to set at the correct "rest" position. A graphic description of the extension method is shown as *Fig. 3.*

«««« »»»»

Talking Science Library for High Schools

A "talking library" of science, which covers subjects ranging from little-known facts about your refrigerator and electric iron to the latest discoveries in the world of electronics, has been made available for loan to high school classes throughout the nation.

The library is made up of recordings of thirty programs selected from "Adventures in Research," a weekly radio feature produced by the Westinghouse Research Laboratories and designed to bring the world of science to both the high school student and the man-on-the-street. Typical programs include "Why Smash Atoms," "Today's Ben Franklin," "Virus—Enemy of Life" and "Science As A Career."

Transcription are now supplied free of charge to the Federal Radio Education Committee of the U. S. Office of Education. High Schools throughout the nation may borrow recordings of the program through the Committee's headquarters in Washington, D. C. In the meantime, the F. R. E. C. is planning to set up 25 loan centers in various parts of the country to supply the needs of schools in those areas.

MORE LETTERS

(*Continued from page 10*)

tomer has no other radio to use. Consequently, he or they are jumping on my neck; and I can tell you it is taking some diplomacy to keep them quiet. Out of the total number of tubes I have on back-order since May 1st amounting to about 100 tubes, all-told I have received just 3 tubes!

The radio servicing business is sure no bed of roses that many people seem to think it is!

D. J. Hemingway
Massachusetts

No business is a bed of roses, Mr. Hemingway! But in some businesses there is no *W.P.B.* to make promises which it promptly breaks. It's that not knowing what is what, or where one stands, that is so trying on the mind and on the *morale.* We have taken the matter up with the *W.P.B.*, but have not been able to get any decent sort of answer. If we do, we'll be Johnny-on-the-spot to advise our readers.

WANTS LICENSING LAW

Editor:

At this time, may I compliment you on your work as of the past. I think it is a very good magazine for both serviceman and retailer. More power to you in the future.

A suggestion I would like to make, which I believe is along the lines of present day conditions, is a National Licensing Law. This, to apply to shop owners or operators, something along the lines of a Fair Trade Practice Act, which could not be harmful to the operator who wishes to carry on his business in a fair manner, but which would have a definite trend to force the crooked operator to stay on the straight path if he intended to stay in business. . . . On the average, I would say that about 90% of shop owners are clean operators, but the goodwill that they set up is completely overbalanced by the rotten unethical practices of the minority, who are taking advantage of the money-mad buying public and the material shortage to the extent of demanding the list price for hard-to-get articles, and a three to four hundred per cent profit in the form of a tip, thereby openly and brazenly defying even the O.P.A. These practices and others smell to high heaven, and surely will bounce back into the lap of the service industry when things go back to normal.

Possibly, you can enlighten me on another subject which is not helping service conditions around this territory, and that is Gas Rationing. Our local boards insist that Radio Service is definitely non-essential and place a serviceman on a limit of 480 miles per month, while beer coil cleaning, juke box service, and peanut and cigarette vending machine servicing rates as essential. True, we would prefer that customers bring in their sets, but how about the large consoles and combinations or service for those who do not know how to remove a chassis?

J. A. Cole
Michigan

There have been many attempts towards regulations such as you suggest, Mr. Cole. Of course, any illegal actions should be brought to the attention of the authorities who will in-

(*Continued from page 35*)

SPRAGUE TRADING POST

A FREE Buy-Exchange-Sell Service for Radio Men

Important Notice!

We discourage offers to buy or sell anything beyond the O.P.A. ceiling prices, and will not knowingly accept such ads for the Sprague Trading Post. Buyers and sellers please cooperate by reporting infringements.

WILL TRADE RCP #307 tube tester (just modernized) and a Motorola (4 mos. old) #451 auto radio in A-1 condition for Hallicrafters SX-24 Sky Rider Defiant, or S-20R Sky Champion, or will buy receiver for cash. Clinton Wheeler, Box 117, Hill, N. H.

FOR TRADE—3 motor generator converters in A-1 condition, built-in filters: Westinghouse 110V-16V @ 750 watts; Janette 110 a.c., 110 d.c.; Esco 110 a.c.-32 d.c. Want band or circular saw, signal generator or what have you? Also have brand new Clough-Brengle CRA 3" for sale. Leo's Radio Service, 715-19 Hopkinson Ave., Brooklyn 12, N. Y.

WANTED—A-C operated signal generator in good condition with operating instructions. Must be std. make. Mrs. E. B. Orr, 152 Matta Ave., Youngstown, Ohio.

WANTED — Million "Signalyzer" model SY. Describe fully. Walter Harper, 245 W. State St., Phillipsburg, Kans.

WANTED TO BORROW — Radio service data sheet or any other information for a Clinton Radio #555R No. 19855. John Compel, 1165 Oak St., Warren, Ohio.

FOR SALE — 2 Thordarson A.F. transformers type 300; 2 F.M.C.—A.F. transformers, ratio 5-1; 1 All-American A.F. trans. ratio 10-1; 1 Silver-Marshall A.F. trans. #256; 2 Hammarlund 85 millihenry R.F. chokes. Peters Radio Service, Box 431, Woodside Ave., Edgely, Pa.

TUBES TO SWAP OR SELL—Have some of the following types: OZ4; 1CL; 1G6GT/G; 6L6G; 1S5; XXFM. S. Salsberg, 261 Main St., Hackensack, N. J.

WANTED—Model P G.T.C. power pack to operate 6 volts on 110 A.C. New or used. C. Loomis, Bainbridge, N. Y.

TEST EQUIPMENT WANTED — State make, model, condition, and price. Also need 25A6; 25Z6; 25Z5; 6SA7; 6SK7; 6SQ7; 1LA6; 1LC6; 117Z6 tubes. The Radio Hospital, 505 North Broad, Fremont, Nebr.

NEW TUBES FOR SALE—7—6L6; 7-24A; 3-5Y4; 2-34; 2-76; 1-19; 1-5Y3; 1-27; 1-35; 1-1F1. Wm. C. Walder, P.O. Box 221, Perry, Ga.

WANTED—New or used Discriminator transformer for Motorola model 10Y. Leaky coil no objection. Bryon Waite, Canton, Ill.

FOR SALE—Complete set of 15 new tubes for Hallicrafters SX-28 receiver, $8. W. O. Brewster, 3101 Main St., Parsons, Kans.

TUBES WANTED — 12A7; 117L7; 117P7; and 70L7. Cash. Hal Wray, 801 Cordrey, Orange, Texas.

WANTED URGENTLY—Audak magnetic pickup. Microdyne model D31E in perfect cond. Will swap even a Seeburg 2A3 amplier, perfect, complete with tubes, but less speaker. Have other items—write for list. Also need a good sig. generator. Jos. D. Copeland, 66 Clark St., Portland 4, Me.

URGENTLY NEEDED — Communications receiver in good condition, by serviceman now in army. T/S Hanrahan, Co. B, 328 Eng. C Bn., A.P.O. 470, Camp Howze, Texas.

WILL TRADE — G.H.Q. miniature gas engine, new, worth $20 and motorcycle battery, used very little, and charger for automatic record phono motor. Geo. Wiertel, 126 Second, Wyoming, Pa.

FOR SALE — Cornell-Dubilier BF50 capacitor analyzer in good condition with instructions, but without leakage test tube 6E5. Theodore M. Bouchard, 121-11th Ave., Sault Ste. Marie, Mich.

WANTED—Echophone EC-1 or National SW-3 new or used. Cash. S/Sgt. Paul Haggard, 448th Qm. Tr. T. Co., A.P.O. 184, c/o Postmaster, Los Angeles, Calif.

FOR SALE—Disposing of complete shop. Have Supreme Audolyzer and Signal Generator #581; Hickok Jumbo meter #4922; Triplett Vibrator tester #1670, and many resistors, condensers, vol. controls, vibrators, manuals, etc. Write for list. J. F. Hunter, Helper, Utah.

FOR SALE—75 new Motorola #302 speakers, $1 ea.; 50 new #3333 vibrators, $1 ea.; 75 new vibrator transformers, 25c ea.; 7F7 tubes, 50% off. B. F. Goggan, Goggan Radio Service, Henderson, Texas.

FOR SALE—62 used radio chassis, less cabinets & tubes, Majestic, Philco, A-K, S-C, etc.; 6 power units, 20 speakers less cones; 9 Majestic power packs. Good for salvage parts —some can be made into sets with little expense. $120 cash, job lot F.O.B. Smith Music Shoppe, 16 E. North St., Danville, Ill.

URGENTLY NEEDED—Good sig. generator, late tube tester, Rider's manuals 9, 10, 11, 12, 13. Raymond Duckworth, North Ave., Skowhegan, Me.

FOR SALE—Radio tubes, parts, etc. slightly used, also 6-tube receiver, magnetic jig saw. Want code oscillator and comm. receiver. Richard Price, 1737 Summerdale, Chicago, Ill.

WANTED — Rider's manuals 1-13 incl., multimeter, tube tester, and condenser tester. Harry E. O. Bianchini, 818 Foothill Blvd., Oakland, Calif.

FOR SALE — RCA-Victor portable recorder 78 r.p.m., aerodynamic mike, cutting head and playback. Model MI-12701, A-1 condition. $100. Louis C. Bush, 421 Commercial St., Atchison, Kans.

WANTED URGENTLY — A good V-O-M and condenser tester. Describe fully. L. Ovalle, 5605 Ave. K, Galveston, Texas.

WANTED FOR CASH—A complete used Nilson Radio School's master course in Radio Communications. Carl Verona, 175 Orient St., Bayonne, N. J.

WANTED—Following tubes, new or used: 41, 75, 78, 6A7, 5Z4 or 5Y3, 50L6, 80, 6B7, 6A7, 12A8, 12SK7, 70L7GT; 35Z5; 12K7; 12Q7; 12SQ7; 25Z5; 12A7; 24, 42, CX-380. Also want used tube tester. Cash. Wilkinson Radio Repair, 1922 E. 14th St., Des Moines 16, Iowa.

URGENTLY NEEDED — good used multitester, sig. generator, and modern tube tester — preferably inexpensive models. Lester H. Garber, R.R. #1, Box 52, Eureka, Ill.

FOR SALE—Clough-Brengle Dynatest tube tester #125-A. What do you offer? Want Rider's Manuals 6 to 13 in 1st class condition. Donald L. Chase, Box 7, Prospect, Ore.

WANTED FOR CASH—Rider chanalyst, sig. generator, tube checker, Rider's manuals. Describe fully. Sgt. Roy Addis, 12th H.B. Proc. Hq., Lincoln Air Base, Lincoln, Nebr.

FOR SALE—Triplett signal generator #1232, AC operated, $19 cash or will swap for enlarging lens 3½" or photo eqpt. Wm. Miller, 693 Union Ave., Providence, R. I.

WANTED — the following tubes: 12SQ7GT; 12A8GT; 12SA7GT; 12SK7GT; 35Z5GT; 35L6GT; 80-GT; 5Y3GT; 50L6GT; and 70L6GT. Name price & quantity available. Francis J. LeBlanc, 28 Oakland St., Fitchburg, Mass.

WANTED — New serviceman needs equipment of all types. What do you offer for $100 or less? Robert Clements, R. #2., Howell, Mich.

WANTED—1937 RCA Service Notes book; also 2" panel-mtg. AC meter 0-10 amps. full scale. Pedro Martinez, 2918 Beach St., West Tampa Sta., Tampa 7, Fla.

WANTED FOR CASH — Supreme 582A, Supreme 561, Hickok 188X, Jackson 420, or RCA 150 signal generator. John Pokrifcak, 4122 Todd Ave., East Chicago, Ind.

WANTED — Hallicrafters S-29 receiver, new or used. Cash. Geo. M. Welborn, 304 Johnston St., Pickens, South Carolina.

YOUR AD RUN FREE

Send us your Sprague Trading Post advertisement today. We'll be glad to run it free as part of our special wartime advertising service to the radio profession. WRITE CAREFULLY OR PRINT. Hold it to 50 words or less. "Equipment for Sale" and "Wanted" advertisements of an emergency nature will receive first attention. Different Trading Post ads appear regularly in RADIO RETAILING—TODAY, RADIO SERVICE-DEALER, SERVICE, RADIO NEWS and RADIO-CRAFT. Please do not specify any particular magazine for your ad. We'll run it in the first available issue that is going to press. Sprague, of course, reserves the right to reject ads which, in our opinion, do not fit in with the spirit of this service. Due to the large number of ads received, there may be a delay of several months before yours can be run. Should this prove to be the case, your patience and cooperation will be appreciated.

Obviously, Sprague cannot assume any responsibility, or guarantee goods, services, etc., which might be exchanged through the above advertisements

Profitable Customer Relationships

by Burton Browne

Even though the dealer has more business than he can want in these days, he must build a good reputation for post-war time

THE old adage has it that you "Build a better mouse-trap, and the world will make a beaten path to your door!" Strictly, nothing could be further from the truth. In the first place, there must be a demand for mouse-traps in general, and yours in particular. Next, the world must be appraised of the fact that you are building a better mouse-trap. And last, but not least, you must be sufficient of a salesman to sell the trap to the customers.

None of these three things alone, by itself, will enable you to become the millionaire which the old saying seems to imply. All three must be present at the same time. Thus if you have the merchandise and there is a demand for it, *you must, nevertheless, still be a salesman!*

It is on the matter of salesmanship that most of the radio salesmen and even servicemen fall down. Today there is no longer any question of demand. That is here and in great quantities. What with the cessation of manufacture of radio sets and the practical stoppage of replacement parts, more radios are available for repair than there are parts or personnel to fix them with. And in manpower there is such a shortage, that were there many more parts readily on the market, there still would not be more radios or appliances repaired for lack of men to work on the units. While it would seem that in this unusual situation, there is scant need for anything that remotely approaches salesmanship, it will be well to remember that the war cannot last for ever, and that purchasers will be returning to those shops where they have been exposed to the better class of customer relationship.

To build now for the future is smart; to blame it all on the war when the dealer cannot repair a radio, or when he cannot furnish some appliance, is not only hoarding a lot of ill-will, but giving the customer the roughest type of treatment. He will resent it, and when everything returns to normalcy, will give vent to his resentment by suddenly buying from "that other shop around the corner."

Customer relationships are founded on simple, easy-to-follow policies. They do not just "happen." A salesman is made—not born, in spite of all that is said to the contrary.

To be a good salesman, is to start with the person itself. All too often the dealer is also his own repairman. This is only natural with the present man-shortage. But is it also necessary that the owner-dealer greet his customers in his working outfit? Everyone knows that coal-heaving is dirty business, yet the man who takes your coal order is pin-neat, dressed in a nice-looking business suit. Neither does he complain about his shortages except in the most perfunctory way. You meet him beaming with confidence and good-will. He makes you feel that it is a special treat for him to have had you call on him. He makes you feel that he appreciates your patronage. It would not be bad for you to copy this man. He was selling coal

Breathe confidence, good appearance

Untidy looks now: no customers later!

A neat window attracts customers!

long before radio ever appeared. He has sold it through several wars and depressions. He has had bitter as well as keen competition and he has survived.

So the first axiom of good customer relationship is to have a bearing that fairly breathes confidence and good-will. Even if there is nothing that you can do for your customer, do not let that "get you down." Do not permit it to make your countenance unhappy; do not permit it to allow you to be slip-shod in your appearance. A *successful-looking* man is generally a *successful* one. When you must do your own repairing, it is *OK* to get into working clothes, even wear a "smock" or "coveralls." But make it a habit not to meet your customers in the same garb. They will appreciate it, and they will be more than ever likely to stick with you even if you cannot make delivery of that set or tube.

Women have become very common-place in shops and factories. You may have hired one or more to replace the men that are *Fighting It Out*. Be careful in your choice. Remember that the tone of your establishment is directly dependent on the impression it makes. While the glamour-girl is much sought after and has her place in many forms of entertainment, and while the business woman is the butt of many jokes—it will probably pay to have a neat, business-like woman be the person who "fronts" your store or shop. One with a well-modulated, medium low voice is better liked than one with a shrill, loud mouth. Remember the women-folk of your customers are the ones that have the greatest influence on where their men trade. Do not estrange these women by employing the "floozie" type of girl. Get yourself a trim, dependable girl who has a business career on her mind. She will be an asset to you. Incidentally, do not overlook the high-schools in your search for just such a person. There are many young ladies there who are training themselves for a business career, and who will be more than happy to work in your store, meeting people and getting their "feet wet" in the world of business. If you do happen to employ a woman radio repairer, see to it that she has adequate clothing for her work. It will be better for *you* to buy a simple cover-all or work-apron, than to have her try to fit in with some makeshift. As has been found out in the many war plants, women like work uniforms. Get your shop-worker one.

A business-like woman brings results!

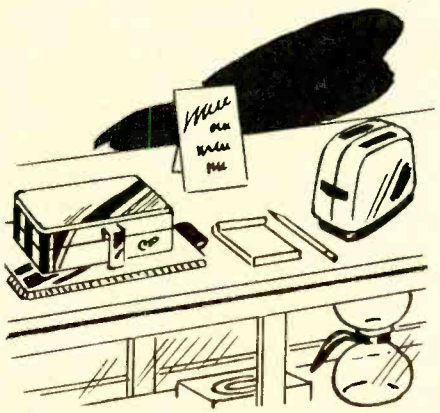
A "Floozy" is no credit to your shop!

Everyone agrees that the dealer of today is merely a service-man or at best a trader in second-hand repaired radio sets and appliances. That is no reason, however, to clutter either your shop window or your counter with the odds and ends of such a business. In the first place, the helter-skelter appearance of such a window or counter leads to the impression that the dealer is now in the second-hand business. This will react later against him when he tries to get over to his clients that he *was* in the second-hand business only for the duration and not for any other reason. The transition from the messy, dirty window to that which displays the latest post-war radios will not act, by itself, to disperse the opinion that the dealer is still in the repaired radio business. So place on your counter and in your window only a few, well-chosen pieces of equipment. Use plenty of space in and around each article. Let the article itself look as near like new as you can get it. Dust your window every day, and keep the glass spotlessly clean, and free from pasted-up sheets and "eye-catches." These small things are the foundations of profitable customer relationships.

It will be neater to have your counter uncluttered with anything except the best that you can put out. And let that be a very few units. The same will apply to your showcases. There is no need to give the

(Continued on page 34)

Messy, jumbled windows sell nothing!



A neat counter invites good business

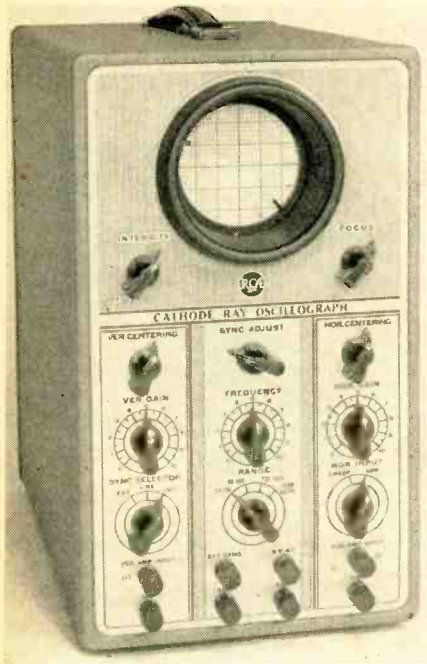
A "rats' nest" discourages purchases

Servicing with a 'Scope

by
john h. potts

The most useful and versatile instrument in the serviceman's hands today is the cathode ray oscillograph. All should know how to make good use of it

PART 1



Serviceman's commercial oscillograph

FOR many years it has been generally realized that the cathode-ray oscillograph is the most useful single instrument for testing and adjusting operating circuits that has yet been devised. This is primarily due to the fact that it may be used to examine the signal as it passes through circuits, and because it presents a "picture" which reveals at once the effects of circuit components on the signal waveform. If the signal has been amplified, then the resulting image on the cathode ray tube screen will be proportionately larger than that obtained from the original signal. If a circuit is out of adjustment, the image traced out on the screen will be altered. If the signal becomes distorted, so likewise does the resulting image. Hum, electrical noise, regeneration, stray pickup—all affect the tracing on the tube screen. These changes from the normal are instantly recognizable and aid greatly in saving time in localizing troubles in complex receiver circuits.

While the operation of the cathode ray oscillograph is described in detail in instruction books, a brief review of the fundamentals of its operation may be of interest. A simplified version of a cathode-ray tube is shown in Figure 1. When proper voltages are applied to the various tube elements, a beam of electrons is emitted by the cathode. When no voltages are applied to the deflecting plates, this beam moves in a direct line and strikes the screen at a single spot. The screen is coated with a substance which glows when struck by the electron beam. The tube voltages may be adjusted so that the beam forms a small, glowing spot in the center of the screen, as illustrated in *Figure 1A. Caution:* This spot should never be left glowing at full brilliancy because it may cause the fluorescent material on the screen to flake off, leaving a small, uncoated hole. In normal operation, this cannot happen because when either a sweep or signal voltage is applied to the deflecting plates, the spot moves and does not remain in any minute area long enough to cause trouble.

When an alternating voltage is applied to a pair of the deflecting plates, shown as P1 and P2 in *Figure 1B*, the spot is deflected by each plate in turn at a rate determined by the frequency of the alternating voltage. Ordinarily this frequency is so rapid that the back-and-forth movement of the spot forms a line between points *a* and *b*. (1) Note that this is a horizontal line. Because the plates P1 and P2 produce this horizontal movement of the spot, they are called the horizontal deflecting plates, although they are actually placed vertically within the tube.

If a signal voltage is applied to plates P3 and P4 *(Figure 1C)*, a similar line is traced on the screen, but vertically, instead of horizontally. These plates are accordingly termed the vertical deflecting plates. It is customary to feed the signal voltage to the vertical plates.

In order to trace out on the screen a replica of the applied signal voltage, it is necessary to apply a sweep voltage, as shown in *Figure 1D*. When the signal voltage is fed to the vertical plates and a sweep voltage of the same frequency to the horizontal defecting plates, a duplicate of the signal waveform is formed on the screen.

Because the use of the oscillograph provides the simplest and most direct method of aligning complex receiver circuits, it has become most widely used for this job. While simple tuned circuits may be readily adjusted by other means, the triple-tuned or over-coupled transformers employed in high-fidelity i-f amplifiers are difficult to align by any other method. And, in *f-m* receivers, the high frequencis employed in both the r-f and i-f sections make alignment by other means far more time-consuming and uncertain. Furthermore, many manufacturers make it a common practice to include in their service notes representative response curves showing just what sort of image should appear on the screen when all circuits have been precisely aligned. Thus an unfamiliar receiver may be properly adjusted by tuning the circuits until the traced image on the screen duplicates that given in the service notes.

While the oscillograph may be used for alignment purposes with any type of signal generator, unless a special oscillator which furnishes a frequency-modulated signal is employed the desired overall response curve of the circuits being adjusted is not obtained. The response curves shown in this article are representative of those which result when a frequency-modulated, or "wobbulated" signal is used for alignment purposes. This signal is fed to the circuit or amplifier to be aligned, and the oscillograph is connected to the amplifier output. The sweep frequency of the oscillograph is adjusted to correspond with the frequency at which the test oscillator signal is "wobbled," generally 60

[(1) Actually the line is formed by the persistence of the material with which the tube end is coated to remain in a state of glow when struck by the electron beam. In other words, the line is the locus traved by the beam as it moves across the end of the tube. Editor.]

cycles. Because the test oscillator "wobble" frequently may not stay constant, and because that of the oscillograph sweep frequency may also vary slightly, it is customary to feed a portion of the input "wobble" frequency to the oscillograph. This synchronizes the two voltages and produces a stationary image on the screen, whereas otherwise constant readjustment of the sweep frequency might be necessary to make the image stop moving. A block diagram of the setup is shown in *Figure 2*.

To obtain the full response curve of the circuits to be aligned, the amount of frequency modulation of the test oscillator signal should be somewhat greater than the response curve of the circuits. Ordinarily the bandwidth required will be from 40 to 80 kc, though for F-M receiver circuits it will have to be much greater. The bandwidth of the frequency-modulated signal should be adjusted until the base of the response curve flattens out, as is shown on the screen of the oscillograph in the typical setup for overall alignment of an i-f amplifier, *Figure 3*.

To align an i-f amplifier by this method, the frequency-modulated test signal is first adjusted to the specified intermediate frequency. The test signal is fed to the grid of the last i-f tube, using a blocking condenser of .01 to .05 mfd in the "hot" lead to avoid grounding out the grid bias voltage. After the last i-f transformer circuits have been adjusted to produce a smooth overall response curve, similar to that shown on the screen of the tube in *Figure 3* (for simple i-f transformers), the test oscillator lead is connected to the grid of the next preceding stage and the process is repeated with the primary and secondary circuits of the i-f transformer tuning that stage. This process is repeated until all i-f stages are tuned. The first i-f transformer is adjusted by feeding the test oscillator signal (still adjusted to the intermediate frequency) to the grid of the mixer tube. For best results, the gang condenser should be turned to the low-frequency end of the tuning range when the test signal is fed to the mixer grid. This is especially important with F-M receivers.

The r-f stages are similarly aligned. The test oscillator frequency is adjusted to the same frequency as that to which the receiver is tuned, which should be an alignment point as specified in the service notes. The mixer should first be aligned. This is quite conveniently done by simply retuning the test oscillator to the r-f signal frequency immediately after the last step in i-f alignment has been completed. The low-frequency alignment point is then adjusted, tuning both the set and the test oscillator to the proper alignment frequency. The padder may be adjusted without the usual "rocking" of the gang condenser, necessary in other alignment methods.

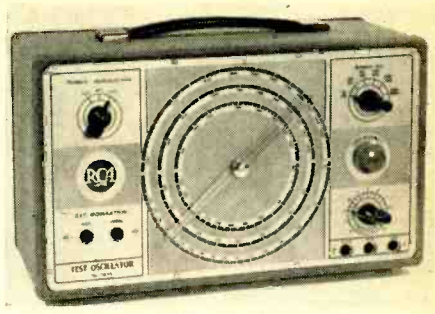
This applies to the standard broadcast band only; for short-wave bands, it is better to use a conventional 400-cycle modulated signal, also available from the test oscillator, and employ the oscillograph as a simple output meter, since there are no broad-band r-f stages which require a response curve. This eliminates any confusion which otherwise may arise due to spurious beats which sometimes result when using a typical frequency-modulated oscillator of the beat-frequency type, due to harmonics generated on short wave bands.

Response curves of i-f amplifier stages at various conditions of adjustment are shown in *Figure 4*. Proper alignment is obtained when the waveform shown in *(a)* is secured. In *(b)*, the bases of the response curves coincide, which is an essential condition, but the peaks do not. Accordingly, the tuned circuits require readjustment. In *(c)* the peaks coincide, but not the bases. Further adjustment is required. In *(d)* the broken line in the image and the fuzzy peak indicate regeneration; precautions should be taken to make certain no wires have been moved out of position, thus causing feedback.

The response curves shown in *Figure 4* are those which are obtained from an oscillograph providing a double image. Some oscillographs suppress the return sweep, so that only a single image is obtained. In others, a folded image is secured. In any event, the final result will be substantially the same, no matter what system is employed, but the intermediate steps in tuning will not produce the same types of images shown. This is covered in detail in the instructions accompanying each instrument.

Particular care should be taken that the "hot" lead from the oscillograph is shielded right up to the point of connection to the "high" side of the second detector diode load, which is the proper point for all superheterodynes of the conventional type, except where F-M sets are concerned. Otherwise some of the strong signal voltage which appears at the point to which the oscillograph connects may be fed back to the input stages of the i-f amplifier, causing regeneration or oscillation and making proper alignment impossible. The same applies, in lesser degree, to the test oscillator "hot" lead; it should likewise be shielded. And any exposed portions, where the blocking condenser is inserted, should be kept short and well away from the grids of amplifying tubes operating at the same frequency.

The alignment of F-M receivers, together with other applications of the oscillograph, will be taken up in the next article of this series, to appear soon.



Commercial signal generator

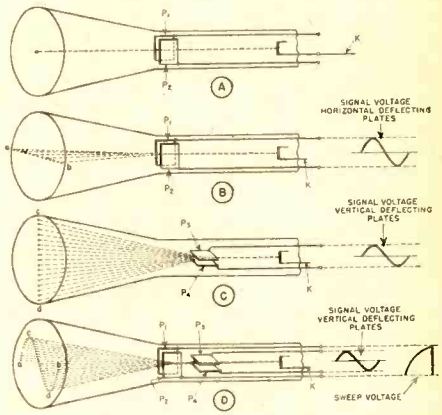


Figure 1

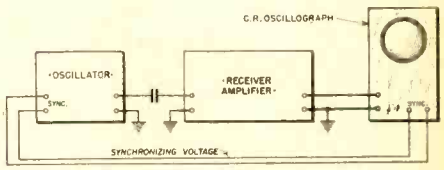


Figure 2

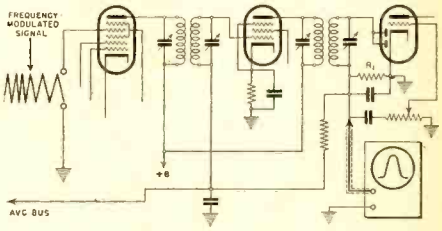


Figure 3

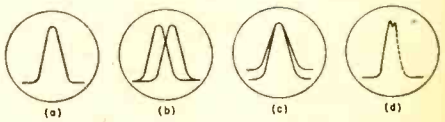


Figure 4

BUY MORE BONDS!

Technical Service Portfolio

SECTION XXXVII

The hooking up of plural speakers and the matching of proper impedances is this month's subject

IT IS frequently found necessary in many installations either to locate the set speaker at some point remote from the receiver, or to use more than one speaker with a single receiver. The latter situation is becoming more and more prevalent as the war goes on because, in homes where two or more sets are usually in service, one receiver may have to do double or triple duty when breakdowns and the shortage of replacement parts make it impossible to maintain all receivers. In public address work, centralized sound distribution systems, and movie theatre installations, multiple speakers are commonly employed. And in each and every case problems arise as to the proper method of coupling the loudspeakers to the output of the amplifier.

One of the simple cases is where a single speaker must be located at some distance from the amplifier. We find this situation in home installations where a separate, high-fidelity speaker with a special baffle is used externally to the receiver, or when the speaker is connected to an amplifier and a phonograph turntable used solely for record reproduction and in small p.a. installations, such as are used in restaurants to call orders from the counter to the kitchen. [*Just why any restaurant should use such a setup, we wouldn't know; most of the waitresses we've noticed have well-developed chests, internally and externally, and seem perfectly able to make their orders intelligible without the aid of a p. a. system; but there are many in use. Ed.*]

Three methods of hooking up the speaker under these conditions are illustrated in *Figures 1 to 3*, inclusive. If the speaker is quite some distance from the amplifier (over 25 or more feet), it is best to use a standard transmission line, as shown in *Figure 1*. Here the output transformer, T1, at the amplifier has a 200 or 500-ohm secondary which feeds the speaker coupling transformer, T2, the primary impedance of which is designed to match the secondary impedance of T1. The secondary impedance of T2 should, of course, match the speaker voice-coil impedance.

Whether the transmission line is connected to 200 or 500-ohm terminations is not particularly important. For very long lines (several hundred feet), and where heavy wire cannot be used in the transmission line, the resistance of the copper itself may be sufficient to cause losses which are perceptible. Such losses will be less when a 500-ohm, in place of a 200-ohm line is employed. On the other hand, where the output power is considerable or where there is a possibility of hum pickup due to proximity to power lines, the stray field from the 500-ohm line and its susceptibility to hum pickup will be greater than that of a 200-ohm line. Ordinarily, where neither of these conditions is present, a twisted pair (unshielded) is sufficient. For a single speaker and a 500-ohm transmission line of 100 feet, No. 18 or 20 B&S gauge wire is generally adequate for power outputs of up to 10 watts. The wire size should be increased proportionately when greater power is involved or a lower resistance line is used.

A much simpler method of hooking up the speaker is shown in *Figure 2*. The leads to the speaker voice coil have been lengthened, thus eliminating additional transformers or other accessories. For short distances, when the speaker voice-coil impedance is 10 ohms or more, this system is perfectly satisfactory. But, with a 2-ohm coil or less, lengths of 25 feet or more in the transmission line are likely to cause some trouble, from attenuation due to line losses, and to mismatch which results when the impedance load on the output transformer secondary is increased due to the resistance of the transmission line. Actually, the line impedance must be added to that of the speaker voice-coil in determining the resulting impedance load on the transformer secondary. Practically, this is not too serious, and it will be found that the impedance may thus be increased by 200 to 300 per cent without noticeable distortion, though the power output will be reduced. It is more serious to use a load impedance which is too low, rather than one which is too high, insofar as the effect on speaker fidelity performance is concerned. And this trouble cannot ordinarily arise from this method of extending the speaker leads.

Still a third method, adaptable to home installations where relatively short lines are required and where the wiring should not be conspicuous is shown in *Figure 3*. Here a parallel-feed system to the output transformer is used. The choke may be any filter choke capable of handling the current of the power tube. The coupling condensers, C1 and C2, should preferably be of the order of *1 mfd* or more. If low-capacity condensers are used, there will be a "falling off" of low-frequency response. For push-pull circuits, two chokes of similar characteristics should be employed.

Where the amplifier must be fed to two or more speakers of similar

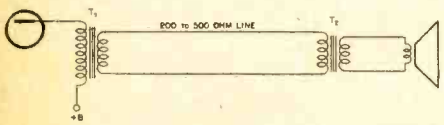


Figure 1

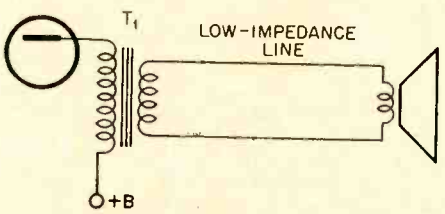


Figure 2

Figure 3

characteristics, the circuit shown in *Figure 4* may be employed. A standard 200-ohm transmission line is used, similar to that shown in *Figure 1*. The line terminates in the transformers T2 and T3, which are connected in parallel. In order to bring the line loading to the proper value, the primary windings of these transformers should be 400 each. In parallel these would form an effective 200-ohm load, matching that for which secondary of output transformer T2 is designed.

However, a 400-ohm transformer is not a "standard " value. But, a 500-ohm type can be substituted without noticeable difference in results, or, better still, the line can be "made" 250 ohms by employing an output transformer designed to work into a 250-ohm load.

Note that a switch and a load resistor, R1, are provided in the output circuit of each transformer. The resistor R1 is made equal to the rated voice-coil impedance and is switched into the circuit when it is desired to "kill" the speaker with which it is associated. Switch S1 is so set that its associated speaker is cut from the circuit, while that of switch S2 is operating. By using these resistors, a constant load is kept on the line so there is no change in volume level when a speaker is taken off. Further, if the switch S1 were just "opened" when the speaker was not in use, the reflected impedance back into the primary circuit would increase greatly, unbalancing the line.

Only two speakers are shown in *Figure 4*, and two separate transformers are employed. In this way, it is possible to use loudspeakers with different voice-coil impedances, since each will work out of its own, properly matched transformer. Where speakers of identical characteristics are employed, it is possible to get along with but a single speaker transformer. This is done by paralleling the secondary circuits, instead of the primaries. The associated switches and load resistors must still be used, and the transformer must be designed to handle the power required for both speakers. The secondary winding should be engineered to be loaded with one-half the rated voice-coil impedance, when the speakers are connected in parallel.

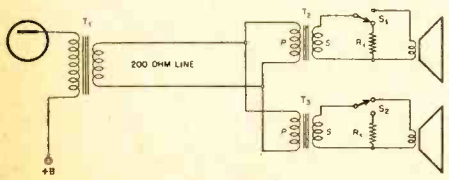


Figure 4

When the voice-coil impedances are identical, it is also possible to connect two speakers in series. More may be so connected for that matter, provided that the impedance is increased proportionately. Thus, two 10-ohm voice coils in parallel would result in a 5-ohm impedance, and should be connected to a secondary winding having such an impedance. In series, the two voice coils would provide a 20-ohm load, and should connect to a secondary of such rating.

Series-parallel connections may be used, when many speakers are involved, so that proper impedance matching may be obtained. Thus, for four 10-ohm speakers, each two may be connected in series to form a 20-ohm load; then the two pairs thus formed may be connected in parallel, reducing the load to 10 ohms. In this way the same load impedance can be gotten out of four units connected in series-parallel as from a single unit. And this principle may be expanded to embrace a large number of loudspeakers.

Many output transformers are tapped for various output loads. Some servicemen think that, in connecting two speakers of different voice coil impedance ratings, each should be connected to the output impedance as marked on the tapped transformer secondary. This is not true. If, for example, a 10-ohm speaker is connected to the 10-ohm tap, another 5-ohm speaker cannot be connected to the 5-ohm tap and operate correctly. When one speaker is connected to the transformer, the transformer is loaded, and the readings of other taps no longer hold true. This is self-evident in the case of a tapped transformer, because it is obvious that the secondary current for each speaker must flow through at least a portion of the same winding. When separate windings are employed for each altered, because the load reflected

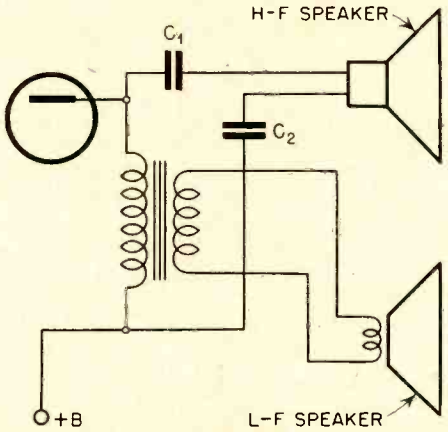


Figure 5

speaker, the situation is still not back into the primary circuit is changed accordingly. It is assumed, of course, that the transformer under consideration is designed to feed but a single speaker. It is possible to calculate just what the effect is when additional speakers are added across windings, but is really too complex a problem to be dealt with here. Especially since there are other, and simpler, ways of solving the problem, not the least of which is that of trying out various taps and noting the results.

In many home-radio installations, tweeters have been added to improve

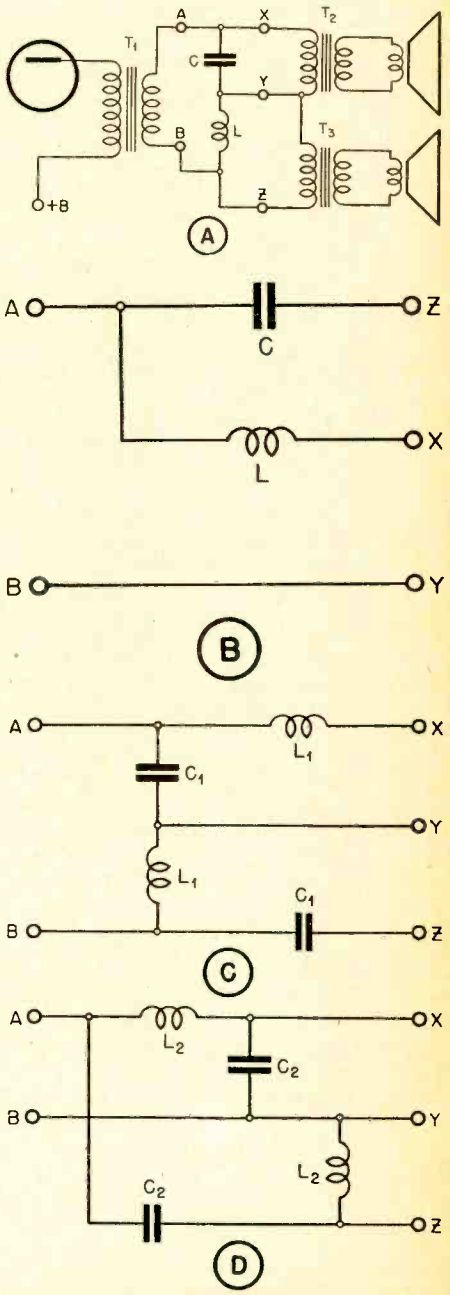


Figure 6

the high-frequency reproduction. The results are usually greatly admired by those who have been accustomed to good reproduction. Good f-m transmission provides high-frequency reproduction without noise. One reason why some high-frequency fidelity systems are noisy is due to the occasionally poorly-engineered coupling systems employed in home-made receivers.

One of the simplest, though perhaps the least satisfactory, methods of coupling a high-frequency speaker to a standard audio output circuit is illustrated in *Figure 5*. The tweeter is shunted across the output transformer primary, blocking condensers C1 and C2 (about .001 *mfd* each) being employed to keep the d.c. out of the speaker circuit.

To operate properly the tweeter should be fed a large proportion of the high-frequency energy and little of the low. The low-frequency speaker should receive most of the low-frequency energy and little of the high. In the circuit of *Figure 5*, both high and low frequencies *are fed equally to the low-frequency* speaker. And, if the tweeter is of the crystal type, which is essentially a capacity, the same condition applies to it. As a result the tweeter is likely to become overloaded with low frequencies and its response becomes raspy. The low-frequency speaker is not as badly affected, but still functions at reduced efficiency because it is obliged to take over part of the job which should be handled by the tweeter.

With a moving-coil type of tweeter, this circuit works somewhat better, and the improved results are immediately apparent. The coupling condensers then attenuate the low frequencies to a degree almost directly proportional to their frequency, and the matter of low-frequency overload becomes unimportant. However, the attenuation is not sharp enough, even under these circumstances, to provide good results. And the low-frequency speaker situation remains the same as before.

Some greatly improved coupling circuits are shown in *Figure 6*. These circuits are adapted to arrangements where the product of the impedances across points XY and YZ in each of the diagrams is equal to the square of the input impedance, AB. In *Figure 6A*, the coupling circuit input AB connects directly to the secondary of the output transformer, while the high and low frequency output circuits feed into the speaker coupling transformers, T2 and T3. These latter transformers may be eliminated provided that the value of the voice coil impedance connected across XY, multiplied by that of the voice-coil connected across YZ, is equal to the square of the secondary impedance of the output transformer, to which the terminal AB are to be connected.

As a practical example, if each speaker voice coil has an impedance of 10 ohms then, using this network, the filter input circuit should be connected to the 10-ohm winding of the output transformer. The speaker voice-coils need not have the same impedance, though. If a 20-ohm and a 5-ohm voice coil were similarly connected across the output terminals of this unit, proper matching would also result when the input is connected to the 10-ohm tap. For multiplying either 10 by 10 or 5 by 20, the result is still 100, which is equal to the square of 10. And, of course, there are many other possible combinations which will yield the same result.

To meet those conditions where the voice-coil impedances, when multiplied together, do not equal the square of the output transformer secondary impedance, the transformers T2 and T3 may be used. These will ordinarily be required only in replacement work, because in original installations, the circuits are generally so designed that these transformers may be eliminated. But, for example, if a defective speaker must be replaced, and it has a 10-ohm voice-coil, with another which has a 2-ohm voice coil, a coupling transformer with a 10-ohm primary and a 2-ohm secondary would be required to effect a proper match. If both speakers have to be replaced, then both transformers would be required. Because such coupling transformers are difficult to obtain, it is far better to make certain that the speaker voice-coil is of the proper impedance, rather than to add additional transformers.

The values of inductance and capacity required in each of the speaker filter circuits shown in *Figure 6* are specified in the service notes for each installation. They may be calculated, but since most servicemen have no facilities for measuring the values of inductance involved, they are not here presented.

The circuits of *Figure 6* are known as constant-resistance dividing networks, and represent the simplest type used in high-grade sound work. They serve to deliver more low-frequency power to the low-frequency speaker, while reducing the low frequencies fed to the tweeter, and conversely, to provide a greater proportion of the high-frequency energy to the tweeter. The frequency division is not as

(*Continued on page 30*)

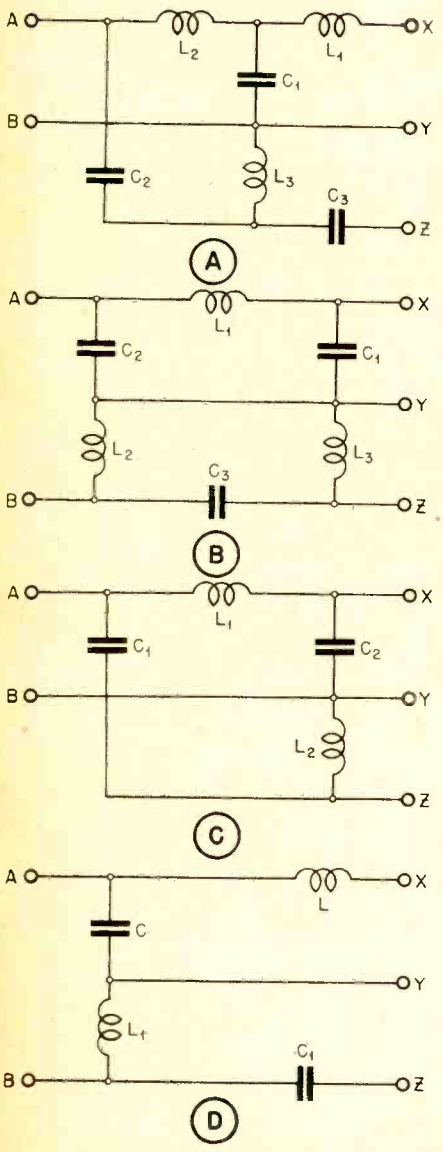


Figure 7

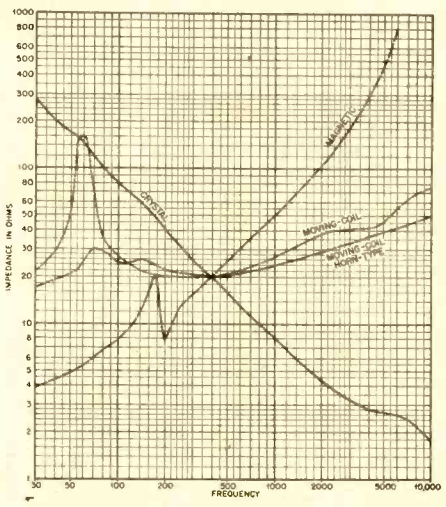


Figure 8

ELECTRICAL APPLIANCE Retailing

Registered U. S. Patent Office

SPOT NEWS

Sylvania's Warren Plant to be Enlarged

Construction of a new one-story brick building which will add 20,000 square feet of office and manufacturing space to the Warren, Pa., plant of Sylvania Electric Products, Inc., is to begin immediately, it was announced today simultaneously with announcement that Arthur L. Chapman has been named manager of this Weld and Wire Products Plant.

Post-War Refrigerators

THE first refrigerators to reach the consumer when production is resumed will not be radical or revolutionary in design, it is predicted by W. Paul Jones, Vice-president in charge of refrigeration for Philco Corporation, in a message to the Company's dealers.

"This prediction is based on the premise that manufacturers, distributors, and dealers will be anxious to get back into civilian business quickly," Mr. Jones said. "Immediate production and transportation of materials will offer plenty of problems in the early months after the war, even without the complications of radical design changes and tooling up for new models. At the same time costly experience in other industries has proved that the buying public reacts slowly and cautiously to radical design changes and a period of transition between the pre-war and real post-war models should be desirable from many angles."

Many designers and pseudo-designers indulging in the famous indoor sport of post-war speculation on the shape of products to come, picture the post-war refrigerator as a fantastic piece of equipment, Mr. Jones pointed out. Some of these refrigerators have revolving shelves, or transparent cabinets, or with a chute on the side for ice cubes. Some picture doors that open automatically with an electric eye, doors that raise, doors that drop and many other dream features.

"Obviously a middle track is necessary to produce a practical piece of household equipment," Mr. Jones believes. "One thing is sure—there must be ample space for Frozen Food in the post-war refrigerator. The trend toward frozen foods is definitely here. Philco recognized it as early as 1939 and its 1940 models astonished the industry with a real Frozen Food compartment.

"Of course the post-war refrigerator should have a humid area for the preservation of moist foods, cooked foods and left-overs. The ideal post-war refrigerator would be one that limits regimentation to an absolute minimum. In other words, a refrigerator that doesn't force the housewife to put certain foods in certain places and into certain kinds of containers. A point should be found where regimentation stops and real convenience begins. This is not going to be a simple problem because Mrs. Housewife is going to want more frozen food space and more humid space. She certainly can't do with less general space, yet she doesn't want a larger, bulkier box overall. If anything, she would like the outside dimensions of her refrigerator smaller.

Frank Wolcott of Silex Dies

Funeral services for Frank Wolcott, president of the Silex Manufacturing Co., were held February 15 at Hartford, Conn.

Mr. Wolcott died at his summer home in Granville, Mass., after a brief illness. He was born in Corning, N. Y., and was graduated from the Bliss Electrical School. He was employed as a salesman at the Franklin Electrical Co., Hartford, from 1907 to 1909 and was assistant sales manager of the company from 1909 to 1914 and vice-president from 1914 to 1918.

Mr. Wolcott was founder of the Mermaid Dishwasher Co. in 1919, selling out in 1921, and from 1922 to 1928 was owner of the Frank E. Wolcott Manufacturing Co. manufacturers of glass coffee makers, and its subsidiary of the Hartford Products Corp. He had been president-treasurer and director of both corporations since 1930. He also was president, treasurer and director of the Silex Co., Ltd., of Ste. Therese, Quebec, Canada.

He married the late Jane Sayre of Elmira, N. Y., in 1911, and in 1928 the late Alice Jeter of Hartford. Mr. Wolcott leaves three sons and a daughter.

N.E.W.A.'s Appliance Committee Announces Plan for Wholesalers' Membership

The Committee of the National Electrical Wholesalers Association charged with the responsibility of creating a special plan for inviting and admitting to membership in N.E.W.A. wholesalers who distribute for resale—Refrigerators and other Electrical Refrigeration Equipment—Electric Heating and Cooking Units—all Socket Appliances, including Radios and Phonographs, etc. —and all Electric Farm Equipment—announces a special plan of interest to all Appliance and Radio Wholesalers.

Such prospective members will be admitted for the present as "Special Members." The idea is to get as many such members as possible to join now —and before April 19-22, 1944, which are the dates of N.E.W.A.'s Thirty-sixth Annual Convention and Second War Conference to be held at The Stevens, Chicago, Illinois—so that they may be represented there in force and attend the special meetings with special programs arranged just for them. One very important item on the agenda for the Chicago Convention will be the creation of a special Electrical Appliance Distributors Division, which will deal with problems peculiar to that branch of the Electrical Wholesaling Industry. It is planned that representation on the Executive Committee of N.E.W.A. will come from the Appliance Division as well.

Special members' dues are very moderate.

Every Electrical Appliance Retailer can recognize how the membership of his distributor-suppliers in N.E.W.A. will indirectly aid him as well, because such wholesalers will be in a position to be of greater service to retailers, due to a better exchange of information and greater contact with industry conditions.

Interested Electrical Appliance Distributors—Chas. G. Pyle, Managing Director, advises—are urged to get in touch with him at N.E.W.A.'s headquarters, 500 Fifth Avenue, New York 18, New York.

Post-War Cost Control Vital

Control of costs will be one of the most important problems with which

(*Continued on page 32*)

"Hello, Appliance Store? Can you send a man up right away! I've just blown my fuze!"

Toaster Maintenance

Nos. 1430, 1440, 1441-C, 1443, 1444
Instructions for Adjusting Toasters

All *Proctor* automatic toasters are thermostatic and operate from the surface temperature of the bread where it lies against the thermostatic strip. Whether the toaster will make light or dark toast depends upon how far the end of the thermostatic strip has to move before it presses apart the switch points. The typical construction is shown in Figure 1. Proctor Toasters are set at the factory so that they make a slice of medium toast at 4 or 5 dial setting. If toaster is out of adjustment, proceed as follows:

To Adjust Toaster:

1st. Remove bottom cover.

2nd. Slightly loosen the hex head clamping screw that clamps the switch point supporting member to the crank shaft as indicated in *Figure 1.*

3rd. To make toast darker at any adjustment setting, slip the switch point support member on the crank shaft very slightly in a direction to cause the switch points to move away from the thermostatic strip.

4th. Then tighten clamping screw again to lock the support to the shaft.

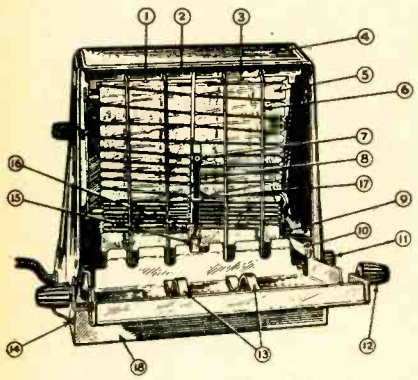


Figure 2

Semi-automatic Toaster

1. Element Retainer Lock
2. Element Retainer
3. Element Retainer
4. Shell
5. Element
6. One of 4 grill wires
7. Eyelet
8. Thermostrip
9. Door Spring
10. Door Link
11. Adjusting Knob
12. Door Handle
13. Pressure Bars
14. Shell Rivet (One in each corner
15. Switch Adjusting Tab
16. Switch Point Assembly
17. Thermostatic Frame
18. Base

5th. Set adjusting knob at 4 or 5, let toaster heat till bell rings, and then test with bread. It is probable that one thirty-second inch movement of the switch points in the proper direction will reset toaster satisfactorily.

To Set Switch Off Position

The switch should be open when the adjusting knob is turned toward off, and arrives at the No. 1 setting or thereabouts. When the toaster is cold, to establish the switch off at this position, bend the tab which acts as a forward guard for the switch points and the thermostat end, so that switch off will occur when the adjuster is about No. 1.

If Toaster Does Not Heat
1430, 1440, 1441-C, 1443, 1444

Try snapping switch points apart, using a splinter, match or toothpick. This is done by pressing back on the insulating bushing carried on one of the switch points, and releasing it quickly so it will snap forward and the two switch contacts will snap together.

This preferably done without the toaster being connected, although, it may be done with the toaster connected, if care is used. The toaster must be set at dark. The object is to dislodge any crumbs that may be lodged on the contacts, and which is probably holding them apart. This procedure is usually effective in restoring the toaster to normal operation.

If it is certain that switch points are making contact, and checking prods show there is voltage across them or there is excess sparking between the contacts, it will be necessary to remove the switch assembly and carefully run a magnetic file between the contacts to remove anything that may be burned onto their surface.

If Toaster Works But Bell Does Not Ring
1430, 1440, 1441-C, 1443, 1444

Try shaking toaster in all directions, and positions, holding it in two hands. This is to dislodge any dirt that may be in the bell mechanism, and preventing the steel ball that causes the bell to ring, from rolling freely up against the bell.

#1445 Semi-Automatic Toaster Service Instructions
Theory of Operation

All Proctor semi-automatic toasters are thermostatic and operate from the surface temperature of the bread where it lies against the thermostatic strip. *(Figure 2 No. 8)* Whether the toaster will make light or dark toast depends upon how far the end of the thermostatic strip has to move before it presses apart the switch points. *(Figure 2 No. 16)*

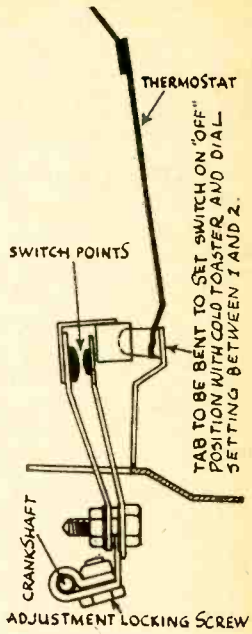


Figure 1

The adjustment of this type toaster is set at the factory to make medium toast when the adjusting knob *(Figure 2 No. 11)* is placed on 3 or 4, if dial is numbered, or between off and medium if dial is not numbered.

Toast Too Light or Too Dark

This requires the bending of the cam shaft bearing arm *(Figure 3 No. 4)* which will in turn move the switch point assembly to or away from the thermostatic strip. *(Figure 2 No. 16)* A thirty-second of an inch movement of the switch point assembly in either direction will in most cases produce the desired results.

To Make Toast Darker

1. Remove bottom plate.

(*Continued on page 35*)

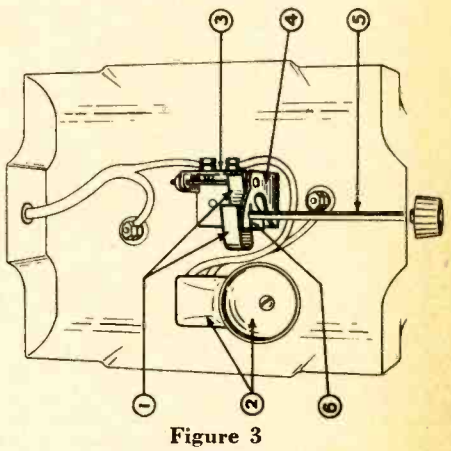


Figure 3

1. Spring Piece
2. Bell Assembly
3. Switch Assembly
4. Cam Shaft Bearing Arm
5. Adjusting Shaft
6. Slot in Bearing Arm

More Refrigerator Repair Hints

Testing the Compressor

To test the compressor, install a *compound gauge* and start the compressor. Shut off the suction line by turning the valve stem to the right until it seats. Care must be exercised at this point because in the event that oil is pumped, a pounding sound will be heard at the compressor. This noise indicates that a large amount of oil is being pumped. Oil in itself is non-compressible and the fact that the oil is being forced through the valves is the cause of this disturbance. Due to the construction of the head valves in this compressor, there will be no harm done to the mechanical parts of the compressor, however, if an excessive amount of oil is pumped into the condenser and finally into the receiver tank, sufficient oil will not remain in the crankcase to lubricate the compressor. When the slightest irregularity is noticed in the operation of the compressor, the motor should be shut off for a short period of time, after which the operation may be repeated until the compressor will run quietly. The gauge should be carefully watched and, if the compressor will pump a 24″ to 26″ vacuum, or more, it is functioning properly in this respect. If and when this mark is reached, the motor should be shut off and the compound gauge carefully watched. In the event that the loss of vacuum is pronounced, that is the back pressure readings advance to a pressure within a short period of time, it is a very good indication of a leaky valve.

A quick test that will indicate discharge valve leaks is to allow the unit to cycle or shut off. When the unit has shut off the ear should be placed very close to the body of the compressor and if a hissing sound is heard it will indicate a leaky discharge valve. This test, however, is not as accurate as the pump down test mentioned above. A third and quite acurate test is to attach the pressure gauge to the discharge service valve, after which the service valve should be closed, shutting off the condenser line. With this line shut off the unit should be operated until a pressure of 100 pounds is built up in the head of the compressor and in the gauge. Then shut off the unit. Any drop in pressure other than a normal drop due to the cooling of the compressor head will indicate leaky discharge valves. When using this method extreme care must be exercised to prevent oil slugging as an oil slugging condition set up at this time will ordinarily ruin the gauge.

NOTE: *Repeat the above tests to verify the conclusion.*

If the compressor does not pump the proper amount of vacuum or if the compressor valves leak back while the compressor- is standing idle, the valve plate should be replaced. This replacement will of course correct any irregularities in either the intake or discharge valve, both valves being built into one plate.

Sample Charts Showing Ideal Operating Conditions

FIGURES 1, 2 and 3 show charts taken from the test clocks of a factory inspection line. These charts were taken on 4, 5 and 7 cubic foot refrigerators in a 90° room and with controls set at Number 1 and Number 9 or Fast Freeze positions. These charts show the normal operating pressures of refrigerators upon which the doors had not been opened for the duration of the test. The charts will give the serviceman a very good idea of the normal operating pressures of the refrigerator at the various settings on the temperature controls. However, when comparing these pressures with the pressures of a refrigerator that is in service, several factors must be kept in mind; first, that allowances must be made for variation in temperature control settings as was mentioned in the information given on temperature controls.

There is a tolerance of 1½ degrees plus or minus; therefore, the refrigerator that is in service may have a control setting that is possibly two degrees warmer or two degrees colder than the refrigerators that were charted. The second and very important consideration is the gauge or gauges that the serviceman is using when making his test. The recording clocks that are used to make the charts are accurately tested periodically with a standard monometer, which means that they are decidedly more accurate than the ordinary gauge.

There are other factors such as the freedom of air to circulate and the amount of dirt on the condenser, etc., that may alter the results; therefore, when making comparisons, allowances should be made for the possible discrepancies mentioned above. As a result, the variation of 5 to 10 pounds in the discharge pressure or a variation of 2 inches or 2 pounds on the low side or suction pressures should be attributed to the various factors mentioned above.

Checking the Refrigerant Supply

A simple method for quickly approximating the amount of refrigerant in the system is to feel the liquid level in the liquid receiver. This can be accomplished by covering the inside (fan side) of the condenser with a sheet of paper. Then start the unit and allow it to run about ten or fifteen minutes. The upper portion of the receiver will feel warm and a distinct point will be found where the tank feels cool, indicating the liquid level.

If the liquid level is one or two inches above the outlet, the machine should operate correctly.

Checking the Thermostatic Expansion Valve

The valve is completely sealed and cannot be adjusted or repaired in the field. It contains a strainer at the inlet connection. This strainer is merely for the purpose of catching particles of dirt that may enter the tubing when a new valve is in-

(*Continued on page 36*)

Reprinted Courtesy Philco Radio & Telev. Corp.

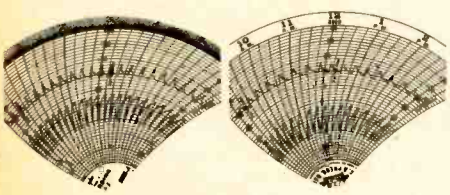


Figure 1

No. 1 Setting, left: Fast freeze, right Model E-7 unit in 85° to 90 ° room

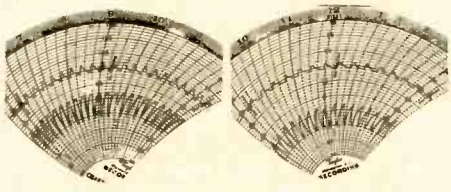


Figure 2

No. 1 Setting, left: Fast freeze, right Model EL-5 unit in 90° room

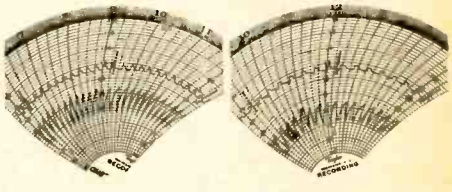


Figure 3

No. 1 Setting, left: Fast freeze, right Model EX-4 in 90° room

KEEPING THEM PLAYING!

by

willard moody

New Housings for Old

Many sets were made with plastic cases. They look good, and a lot of people like them, but the writer prefers a good, solid wood cabinet which can stand much more abuse. The problem of getting a new plastic case is often difficult. Along this line you may consult one of the manuals available from tube manufacturers which lists the various manufacturers, giving names and addresses. You can write to the maker of the receiver to obtain a new case.

If one is unobtainable the set can often be put in some other cabinet of a similar type or may be saved for use in a custom building job. Such chassis can be installed in artificial fireplaces, for example, and old Grandfather clocks of the upright type. In fact, some years ago G. E. came out with a radio set which was built into such a type cabinet, and claims made for the tonal quality seemed to be substantiated by personal experience of the writer.

Many owners of dilapidated radio receivers which are finally "conking out" (becoming completely inoperative) find that they retain an old and undying love of the cabinet because "it is such a beautiful piece of furniture", even though they don't care much about the "works". To the nontechnical man there is little beauty in a mass of wires, resistors and sockets. But let him know that you can take a new or different set chassis and put it in his precious cabinet, for a fee, and he will eat it up. This work requires skill and in many cases it doesn't pay—so pick your spots. Look the job over carefully, and if it appears that it is going to be a long drawn out affair, stay away from it *unless* you figure you will have plenty of time in which to do it and can "work it in" with other, more rush jobs.

Replacing Batteries in "Portables"

Next on the line of problems is what to do about "powering" receivers of the portable type which have no batteries. Some of these sets have built-in rectifiers and operate without difficulty from the a.c. or d.c. line at 110-120 volts. Others are designed to work only from batteries, and suitable power supplies having good filtering must be built to supply the necessary potentials.

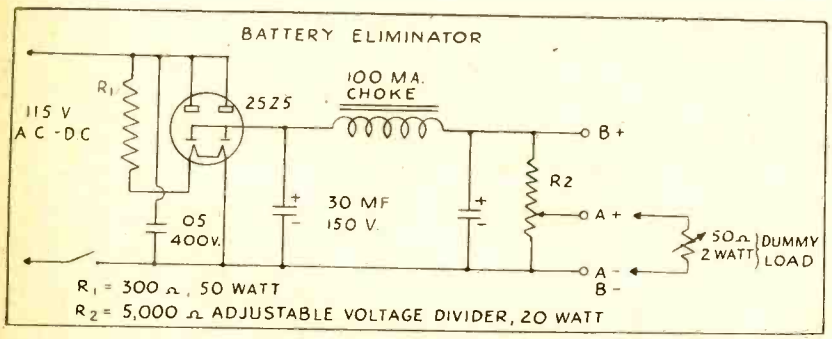
A typical unit is shown in *Fig. 2*. The exact design will be dependent on the nature of the radio receiver but the circuit shown will serve for the majority of "portables" that have been placed upon the market. It should be realized, of course, that one side of the power line goes to the chassis, and therefore, there is danger of shock or of burning-out the fuse, possibly also damaging the radio set, unless proper precautions are taken and the owner is advised concerning the use of the receiver. A ground connection, for example, must under NO circumstances be connected directly to the chassis.

It would be perfectly feasible to use a full-wave rectifier arrangement and to ground the chassis, since then the power supply would be isolated from the power line by the transformer. Portability would not be obtained, but then, you can't have everything, particularly when there is a war going on, and the customer should *courteously* be so advised. (Also, servicemen-dealers, in particular, should keep constantly in mind and before the mind of the public, that in these days of global blitz warfare, there should be *at least one perfectly-functioning radio receiver in every home throughout the land.*

The Vibrator Problem

The vibrator is another headache. Normally, one of the best ways of checking a vibrator is to install a new one and see what happens when you do it. A hit-and-miss procedure, of course, but these days vibrators are not easy to get and it is even advisable to try repairing them. This is a ticklish job, although some men have been known to become quite proficient at it. Usually they have the patience of Saints and the skilled fingers of jewelers. The first requirement is a good set of tools, small files, thin-tip long-nose pliers, and a soldering iron that is not too big and clumsy to get into fine places. The type used by telephone switchboard men is particularly useful.

A check on the action of the vibrator can be made by using the oscilloscope. The 'scope may be connected through a blocking condenser to B+ and B—, and the wave shape observed. Various adjustments can be carried out until the waveform is good. An indication of what to expect can be obtained by making a



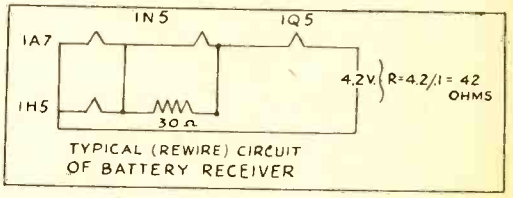


Figure 2. Showing the typical battery eliminator circuit and the rewired one. This can be used with many farm radios

Many service problems are solely new because of conditions. They have been met by a group of resourceful repairmen. Here are a few of their better methods.

number of experimental checks on new receivers or ones that are in good condition. This is one application where the 'scope really proves useful and you might just as well start dusting it off right now—use it for something else besides an output meter or for picking up stray fields to impress the customers. About four out of five servicemen start out with good intentions and then never really learn how to use the instrument. Study the instruction manual, read books on the cathode-ray tube and the oscilloscope, *know your equipment.*

Replacing Meter Rectifiers

One of the most common problems confronting servicemen is the replacement of the rectifier in a.c. meters of the high-sensitivity type. The filament voltages in a receiver and even the plate voltages on rectifiers may be checked quite accurately with the ordinary a.c. voltmeter of the moving-vane type, but the greater sensitivity of the copper-oxide-rectifier type of meter is necessary on alignment jobs when the meter serves as an output indicator.

One of the easiest solutions to this problem is to use an 0-1 milliampere meter in a circuit such as that of *Fig. 1.* The meter may be calibrated against one of the old-style, low-sensitivity types by using a potentiometer and Lionel-type train transformer for obtaining various voltages, or a heavy-duty receiver power transformer may also be used for the same purpose.

Another mode of attack is to use an "eye" tube in a simple circuit which will permit operation of the tube as an output indicator. It also can be used for checking a.v.c. voltages approximately — provided you are fortunate enough to have some of these tubes on hand or can get them from stored-up stock, for they are not being made for civilian consumption any more.

Inasmuch as absolute indications are not necessary on the output meter—all we are interested in is relative intensity and also high sensitivity so that sharp alignment can be made—another alternative (not quite as satisfactory as tuning by ear) is to use a small neon lamp connected to the secondary of a transformer whose primary is connected to the receiver's loudspeaker voice coil terminals. When several men are working together on the same bench, and the noise of one receiver is interfering with the tuning by ear of another, such an output indicator is a necessity.

Tube Alternatives

Another problem that frequently confronts the radio man today is the obtaining of an alternate for some type of tube that should never have been made in the first place. Under such conditions it is well worth a try to write to the manufacturer of the receiver, giving the make and model number of the set, and preferably also the serial number of the chassis, requesting a tube of the type which is unobtainable through your regular distributor. Take this step only after making every effort to get the tube through the regular channels.

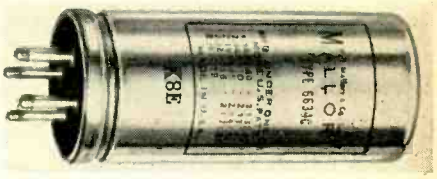
Whenever possible use a replacement type. For example, the type 35L6 can easily be "swapped" for the 50L6 by adding a 100-ohm, 5-watt series resistor in the filament circuit; and, a 35Z4 can be used in place of the 35Z5 by making minor changes. Consult a tube manual and study the various characteristics. It's getting so a serviceman these days must develop a little practical engineering ability, not advanced mathematics and kindred knowledge, but real down-to-earth stuff involving circuit changes, and there's where the importance of fundamental knowledge comes in and where the few extra hours in book study pay off.

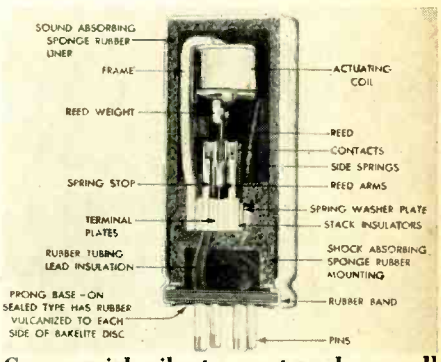
Some of the receiving tube, transformer, coil and other manuals of commercial houses, and the Amateur (A.R.R.L.) Handbook contain a considerable amount of the necessary information which, if really studied, will enable the technician to go far toward solving problems.

«««««« »»»»»»

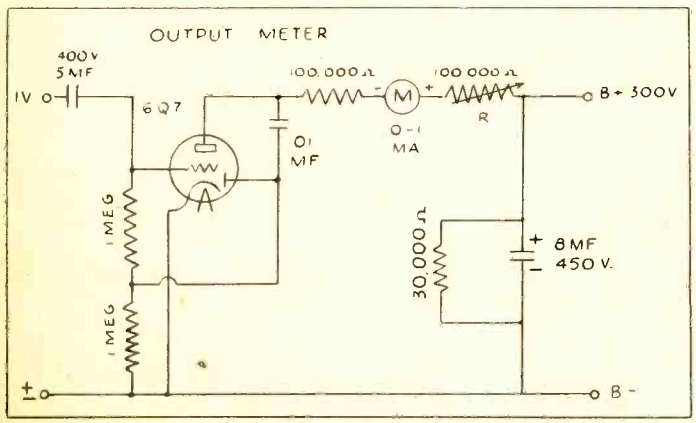
Kemp is Warwick Sales Director

John S. Holmes, President of Warwick Manufacturing Corporation, producer of Clarion radios and electronic equipment, announces the appointment of Reau Kemp as Sales Director.





Commercial vibrator, external as well as internal view. These are repairable



Output meter hook-up to replace one with burned out rectifier

WITH THE EDITOR

(Continued from page 4)

wonderment. For a long time we have questioned the mental state of certain government officials, particularly those on gasoline rationing boards, even though they serve without remuneration. Also, regarding the men on the Office of War Information's public relations staff, who release to the press publicity about tube deliveries that were made authough the tubes referred to were never produced.

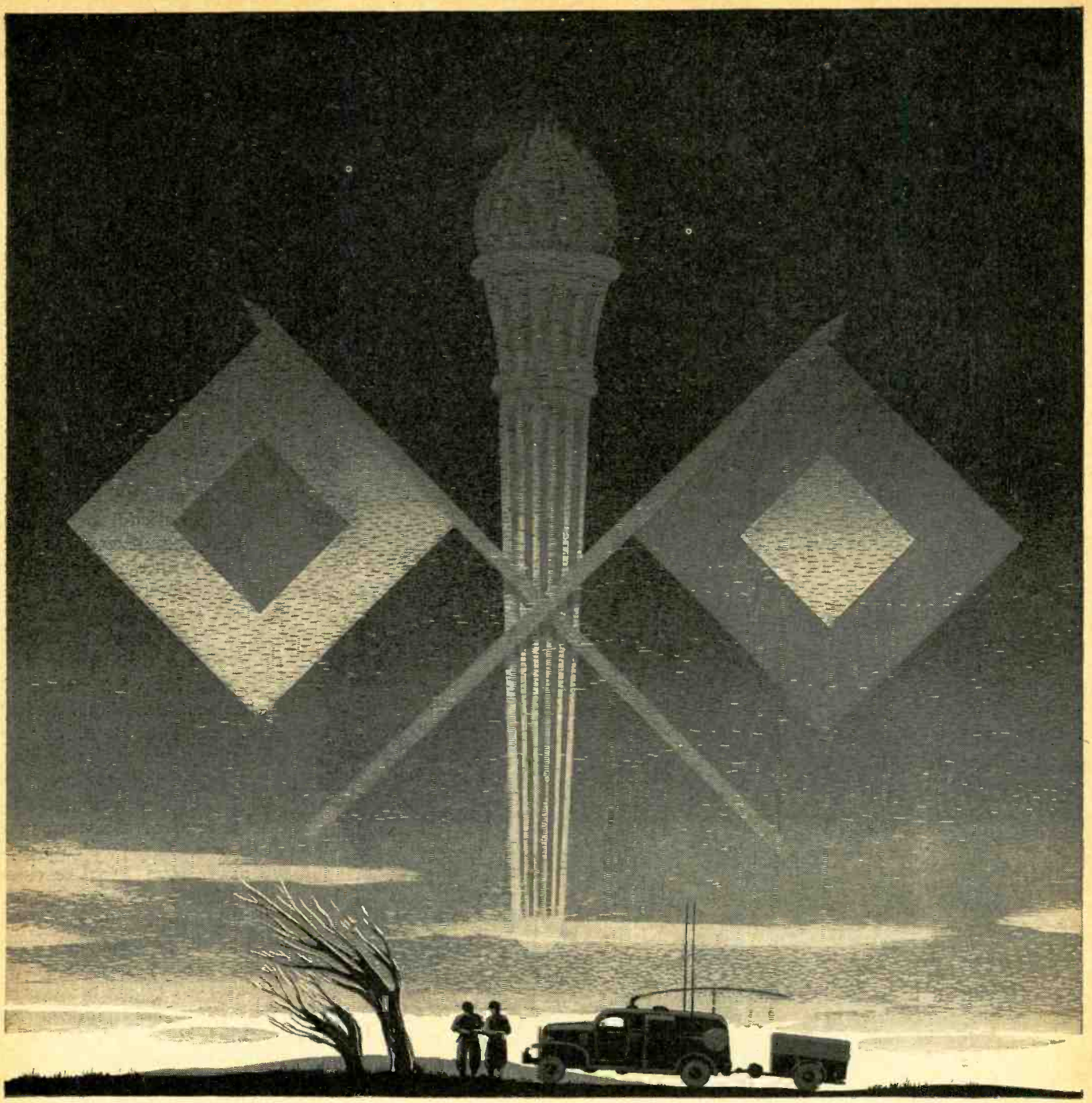
Judge for yourself the mental state of gas rationing boards who rule that radio and electrical appliance repairmen, being engaged in repairing "entertainment and luxury devices", are not eligible for supplementary gas ration allotments. But at the same time these very same ration boards grant extra gas allotments to men who claim they repair juke boxes and motion picture theater equipment. As we have contended that home radio sets and appliances perform a greater service to the war effort than juke boxes in jive-joints and saloons, we can readily understand why a psychoneurotic would not have the same opinion. And just now the thought occurred to us that motion picture theaters can hand out passes to "friends" while set-owners cannot be so hospitable nor can they invite friends to hear a non-playing radio.

Post-War Free Enterprise Endangered

WPB HAS PROPOSED that when civilian goods production can be resumed the output should be governed for at least two years by a quota system. Under this system an applicant would receive sufficient materials to enable him to produce the same amount of a given product which he turned out in a base period, probably 1939 or 1940, according

WE'RE SORRY

On page 25 of the February issue we ran into a typesetter's snag. The amplifier shown in the lower right hand corner is a *Lafayette* and the response is, of course, 30—*14,000* c.p.s. For this error, we apologize. The Editors.



A TRIBUTE to the members of the Signal Corps, United States Army, for their great achievements in the field of military communications. On every front, from the development laboratory to the most remote outpost, they are doing their job superbly well.

Hallicrafters employees are proud of the part they are privileged to take in the design and production of radio equipment for the Signal Corps.

BUY MORE BONDS! **hallicrafters RADIO**

THE HALLICRAFTERS CO., MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT, CHICAGO 16, U. S. A.

to C. E. Egan in a special communication carried by the *N. Y. Times*.

By using a quota system and base period, it was said, the problem of timing the return to production of companies in a given industry would be met. Office of Civilian Requirements has already assembled figures on the 1939-1940 sales of a wide variety of items. This plan, if put into effect in the radio and electrical appliance fields, could be most dangerous. It borders on restraint of trade. But, if handled properly, it does have some basis of merit and effectiveness.

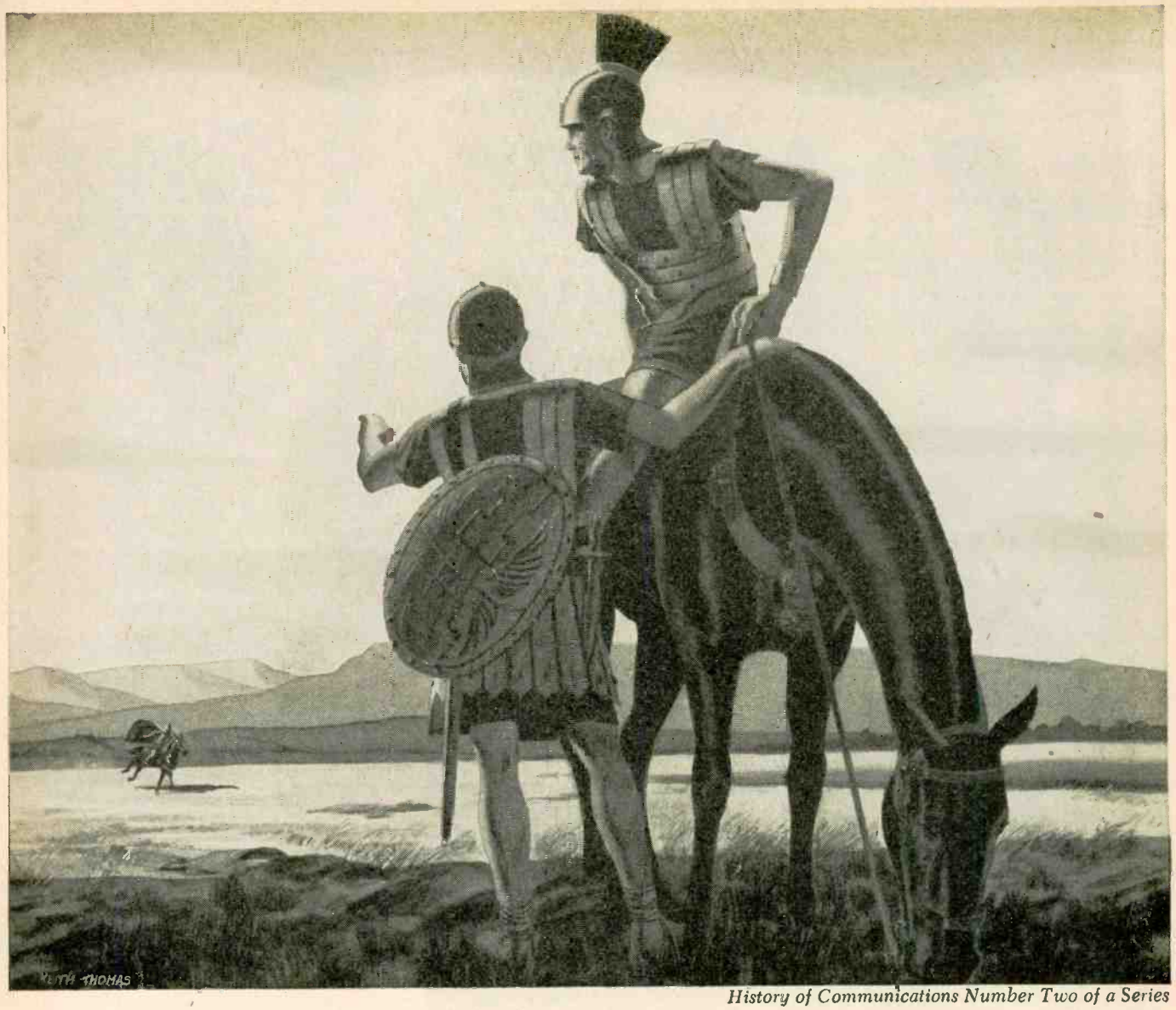
One must realize that many firms which were small before the war are now big concerns, capable of giving the big, old-timers stiff competition on an ethical basis. And many big, old firms have decided to abandon some of their pre-war markets. What would happen to their quotas? Would same be allotted and then put up for sale at auction? Free enterprise must not be restrained. It is the basis upon which America has become what it is.

Instead of mere pre-war quotas, ways and means must be found whereby fair and equitable distribution and allocation of all available materials must be achieved — and in order to accomplish this — pre-war production quotas are not nearly as important as anti-inflation measures. Given free enterprise, a good concern can grow on its merits alone provided all things are equal. Price ceilings are factors, otherwise big firms with large cash resources could outbid lesser firms of equal merit and less financial backing for needed materials and man-power. Lush days are ahead for all civilian goods manufacturers and dealers. But we must win the war first and leave our post-war regulations to the post-war period.

Fortune Magazine listed the first twelve most frequently mentioned items wanted by the public in the post-war days. Refrigerators, washers, radios and phonograph combinations stand high amongst the twelve. According to that survey, during the first year after the war manufacturers will have waiting customers as follows: for refrigerators 4,120,000 customers who will pay $150 per average unit for a total of $468,000,000 worth of units; washer customers, 1,076,250 who will pay an average of $80 per unit for a dollar volume totaling $141,000,000; radio set buyers to the tune of 1,200,000 who will buy $36,000,000 worth of $30 sets and 250,000 phonograph combination buyers who will spend an average of $80 for $20,000,000 worth of units. Now, as one recalls that in 1941 the set business totalled over 10,000,000 units having a $540,000,-

$1.00 PAID FOR SHOP NOTES

Write up any "kinks" or "tricks-of-the-trade" in radio servicing that you have discovered. We will pay $1 in Defense Stamps for such previously unpublished "SHOP NOTES" found acceptable. Send your data to "Shop Notes Editor," RADIO & ELECTRICAL APPLIANCE SERVICE-DEALER, 342 Madison Ave., New York 17, N. Y. Unused manuscripts cannot be returned unless accompanied by stamped and addressed return envelope.



History of Communications Number Two of a Series

COMMUNICATIONS BY ROMAN POST RIDERS

In the early days of the Romans and Phoenicians the fastest means of communication was the post riders, who carried news and War dispatches from the battle front. As fleet as their horses might have been, their speed does not begin to compare with electronic voice communication. The twist of a dial and the pressing of a button—in the flash of a second the message comes through. Clear cut speech transmission with Universal microphones reduces error and expedites the delivery of the message.

Today Universal microphones and voice communication components are being used throughout the world on every battle front filling a vital need and "getting the message through."

< Model 1700-UB, illustrated at left, is but one of several military type microphones now available to priority users through local radio jobbers.

UNIVERSAL MICROPHONE CO., LTD
INGLEWOOD, CALIFORNIA

FOREIGN DIVISION: 301 CLAY STREET, SAN FRANCISCO 11, CALIFORNIA - CANADIAN DIVISION: 560 KING STREET WEST, TORONTO 1, ONTARIO, CANADA

000 valuation, it is easy to appreciate that appliance and radio dealers already have a huge waiting list of customers all primed for the go-signal.

S. R. Lowan

DISCUSSION

(*Continued from page 2*)

trade (and *not* to the consumer) journals, the chances would be that the dealers would have access to one or another of such reviews. These should be limited to a sentence or two, contain the necessary information as to who stars, and the number of the platter.

On behalf of R&EASD, we would be happy to devote much more space to that type of material than to the trade notes we are now receiving . . . though we are very grateful even for those.

The Editors

Odds 'n Ends by KAK

From Capitol: Paul Weston has been named recording director. . . . *Freddie Slack,* with a freshly inked medical discharge from the Navy in his hand, returns to record a series of releases. . . . *Paul Whiteman,* when not recording for *Capitol* or doing his Chief-ing for *Blue Network* music, raises Hampshire Hogs. He has 375 of them. Gosh, what a lot of hogwash that must take! . . . *Johnnie (Scat) Davis* is now an "act" with *Charlie Foy's* band in California. . . . *Dennis (Yes, please) Day* has been signed to do two pix at *RKO,* per year. . . . *Les Paul,* git-box ace of *P.W.* was drafted. . . . *Helen Ward,* warbler with *Harry James* is reported about to wed with *Martin Barrett.* . . . Her boss, is going into the Services. . . . *Nappy LaMare,* former gitman with *Bob Crosby* may take over *Eddie Miller's* band with the whole works. . . . *Betty Hutton,* blonde keg-o-dynamite has been signed by *Capitol.* . . . *Johnny Mercer* becomes *Capitol's* prexy. . . . *CPO Artie Shaw* has tropical fever and dropped his band. . . . *Wingy Manone* will get a big band according to reports. . . .

From Columbia: Al Dexter, of Pistol Packin' fame has waxed two tunes on *Okeh* 6718. They are SO LONG PAL, and TOO LATE TO WORRY. Demand orders are high. . . .

From RCA-Victor: King Sisters have recorded that zany MAIRZY DOATS. . . . *Perry Como* supplies *Stan MacGovern* with many gags for the comic strip *Silly Milly* for N. Y.'s *Evening Post.* . . . *Capt. Glenn Miller* hit the jack pot in his first Broadway appearance since he got into khaki. It was at a War Bond Rally. . . . *Dinah Shore,* sure walked off with honors in the latest *Billboard* poll of Radio Editors. . . . (Aside to Carol Weatherly, p.a. of *RCA-Victor* records: Who ever heard of a Radio Editor knowing what he was talking about. Hadn't you heard? You don't have to be crazy to be a Radio Editor . . . but it helps!!!). . . . *Tommy Dorsey* became a cop in Philly. An honorary one of the *P.B.A.* . . . *Charlie Spivak* has become his own son's right hand man in the matter of model planes. That's nothing, when our son was 3 weeks old, we bought *him* a set of electric trains!! . . . The *Nilsson Twins* are testing for *Paramount.* They're with *Spike Jones.* . . . *Tony Pastor* has been bedded with a sore throat. He'll recover. . . .

From Decca: Decca has been petitioned by the Teachers not to release one of their latest, "LEAVE US FACE IT" on the grounds that the title is bad English. Wait until the venerable pedagogues get a glimpse of the label which reads, "Lyrics, Words and Malady Wrote by *Archie* of *Duffy's Tavern.* Aided and indebted by *Abe Burrows* and *Frank Loesser.*" Decca is sure that the Teachers are not serious, and explain it all by saying that "LEAVE US" is *Archie's* own particular brand of "Brooklynese." . . . (Heck, we know of some *real* Brooklyn-ers who talk like that!) . . .

PORTFOLIO

(*Continued from page 20*)

sharp as is desirable. Beyond the cross-over point, (the frequency at which the amount of energy delivered to each speaker is the same), the power delivered to the low-frequency speaker at double the filter cutoff frequency is only 6*db* less than that at the cross-over point. And, for the high-frequency speaker, the attenuation at one-half its cutoff frequency is the same.

The best speaker frequency-dividing networks are shown in *Figure 7.* These are slightly more complicated than those of *Figure 6,* but provide from 12 to 18 *db* attenuation for each octave beyond the filter cutoff frequency. These filters are more likely to be encountered by servicemen who have taken over theater sound servicing. If they are

Keep an electric eye on your radio future

by don herold

The present has plenty of irritations for any radio service man.

There are such pains in the neck as shortages of help, shortages of parts, shortages of things to sell ...and a surplus of impatient customers.

But no business in America has a brighter future than radio.

Just try to keep your electric eye on the future.

There may not be the miracles that some folks expect in radio. Some people think radio will bring them pretty girls on toast for breakfast every morning, robots to do all the housework, and electronic relief for hangovers. Well, radio's future is not that bright —but it is bright.

Even now, the radio industry has enough practical advancements on tap to make most families want new receiving sets when peace arrives. Television is pretty sure to come down to within reach of millions of pocketbooks. And there'll be important doctoring to do even on the old sets that live on.

Why not begin now to build lists of prospective customers in your territory? When you do a job, write down names of customers and makes and condition of sets they own. And reach out for other names. Be ready to spring when Victory comes and, with it, Opportunity.

Make a note of it

Include International Resistance units in your plans. As a radio user, I'll say that it bucks up my confidence in a service shop to know that it uses top parts in servicing my sets.

No. 2 in a series of special messages prepared by America's famous business writer, humorist and cartoonist, Don Herold.... In sponsoring these Don Herold "broadcasts," IRC pays tribute to the thousands of Radio Service Men who, whenever possible, specify and use IRC resistance units in their work.

PREFERRED FOR PERFORMANCE
IRC
FIXED & VARIABLE RESISTORS

INTERNATIONAL RESISTANCE CO.

401 N. Broad St. • Philadelphia 8, Pa.

IRC makes more types of resistance units, in more shapes, for more applications than any other manufacturer in the world.

examined separately, it is evident that they represent a combination of low and high-pass filter circuits.

The low-pass circuit shown in *Figure 7B* is composed of condensers C1, C2 and inductance L1. This is nothing more or less than an ordinary condenser-input power-supply filter insofar as its design is concerned, though the values of inductance and capacity are, of course, different. The high-pass filter in the same diagram, represented by inductances L2, L3 and condenser C3, is similar, except that the condensers and chokes are interchanged in their circuit positions and the values are different. In *Figure 7A*, the low-frequency section is readily recognized as the same type of filter used in power supplies where choke input is employed; while, as in *Figure 7B*, the elements of the high-frequency filter are similar in layout, but with the chokes replaced by condensers, and the condenser occupying the same circuit position as the condenser C1 in the low-frequency section.

In *Figures 7C* and *7D*, the design is similar, but there are only two elements in each filter circuit. Consequently, the filter sections, and the resulting division of frequencies between the low and high-frequency speakers, are not as effective as those of *Figure 7A* and *7B*. Actually, the latter provide an attenuation of about 18 *db* for the first octave beyond the cross-over frequency, while the former give about 12 *db* attenuation for the same conditions. These are very effective arrangements and will undoubtedly be employed to some degree in high-fidelity post-war receivers in the top price class, though at present they are in general use only in movie sound work.

Throughout this article the values of voice-coil impedance given are those at 400 cycles, which is the frequency at which they are rated in design work and in catalogs. It is not generally realized that the voice-coil impedance may vary greatly over the speaker response range. Just how much this impedance varies for various types of speakers may be seen from an examination of the curves shown in *Figure 8*. The curve for a dynamic speaker which has a peak, due to mechanical resonance, at 60 cycles represents that which is obtained when the speaker is mounted on an infinite baffle. Many speakers have a resonant peak at a somewhat higher frequency, particularly those which are used in ac-dc sets, where a 60-cycle peak would exaggerate the response to him. The horn-type speaker has a very uniform response, but is unfortunately impractical for home radios because of its space requirements and appearance. But it is frequently employed in p.a. and theater installations.

BUY MORE BONDS

SPOT NEWS

(*Continued from page 21*)

manufacturers will be faced when the time comes to get back into civilian production.

Time, quality and cost are three of the most important factors to be considered in the production of both war goods and of products for civilian use. Their relative importance, however, varies greatly in the above types of production.

Quality should be a dominant factor in the production of civilian goods; it must be considered first in the manufacture of war products, upon whose accuracy and reliability the lives of American fighting men may depend.

Relative importance, however, of the other two factors of time and cost vary sometimes very appreciably, in the making of war products and of civilian articles.

Time must often be considered first when armament and munitions are urgently needed on the fighting fronts and cost must be a secondary consideration. Excessive cost, however, is avoided through renegotiation of war contracts.

In the case of civilian production, the situation is reversed. While time is important, the factor of cost is the governing one from the competitive angle and manufacturers, looking toward post-war conditions, will have to begin to look at their operations again from a different view-point.

Much thought will have to be given to the question of greater peace-time manufacturing efficiency, the elimination of waste and greater productivity in order to arrive at lower costs. Obviously, a plant well-managed, with streamlined production methods, can operate at lower cost than plants less efficiently operated. In peace-time, while higher quantities tend to reduce unit cost, also there is time in which to develop better tooling methods for streamlining production. Production and manufacturing costs will be forced down in peace-time, by competition, which will compel manufacturers to adopt the latest and most efficient methods of production.

While costs must be controlled in a post-war competitive economy, the recently-advanced theory that distribution costs can be reduced appreciably below pre-war levels is very largely a fallacious one.

The American public has learned to expect displays of merchandise where they can be readily seen. It expects to purchase these items on deferred payments. It expects these products to be guaranteed and expects good service to be rendered. It expects immediate attention from qualified people when they have the slightest trouble with the products. When products are abused or neglected, it expects parts to be forthcoming almost immediately to replace those broken or damaged.

The consumer expects to read in his newspapers and publications a complete description of the product and what it will do. He reserves the right to shop around among many outlets to assure himself that what he is buying is exactly what he wants. He wants delivery of the product immediately after he makes up his mind that he wants it, even if it has been a year or more that he has been shopping. Now these

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services, and many more that could be mentioned, cost money. Every large manufacturing and distributing organization is building its dealer organization to be more efficient and more economical. The dealers' cost of business is not high when all of the services he performs are considered.

Distributors must warehouse products; they must purchase in carloads to save on freight, packing, and other charges, and to enable production costs to be reduced to a minimum; they must carry large inventories of replacement parts; they are the ones who must train the retailer and the retailer's salesman.

In peace-time manufacturers strain and try all of the time to sell more products, and we know that our retail prices, to a large degree, determine the volume of business that we can secure.

This system of distribution has been developed over the years by the same means that all of our competitive industry has developed; the same principle that has made this country great; that has made it possible for us to outproduce the rest of the world.

In order to get goods to the consumer at reasonable prices after the war, it is my opinion that the greatest economy will come through increased manufacturing efficiency rather than through reduced cost of distribution.

R. C. COSGROVE
Vice-Pres. Mfg. Div.
The Crosley Corp.
Cincinnati, Ohio.

CUSTOMER RELATIONSHIPS

(*Continued from page 15*)

impression that you are *struggling*, that there are *no parts*, that tubes are hard to get, and that "just-as-good" will have to do. Let your store or shop breathe confidence that everything is going as well as conditions permit. Since there is no restriction on soap, elbow-grease and brains,—use them all to your advantage.

Now in your direct relationships with your customers follow along routes that have been mileposts to success for years before radio ever was heard of. *Never* tell a customer your competitor stinks! In fact, *never* tell your customer anything derogatory about the store just up the street which has been giving you all that trouble. Some shop-keepers are cooperative and refer customers to each other. If they do, that is fine; do your share. Now and then you meet with a store-owner who does not want to refer his customers to you. That need not stop you from referring yours to him. It makes a good impression on your clients, and will get you *more* than it will lose. Speak well of that pesky competitor, also. Nothing gives a customer a better impression that you are firmly established, than to talk well of your competition. It is only natural for people to believe that if you do this, you are not afraid of it, and that you run a fine store in which to trade.

Do not go around with a long face! There are men dying on bloody battle fields. You have only business troubles. You live at home and not in a fox-hole being beset by Japs or Nazis. Your life is not in danger. The only thing that bothers you is the inability to deliver the merchandise. It is not a catastrophe! It is a small inconvenience in relation to the war. Let your customers know that you would do better for them if you could—but do it cheerfully. Many a client will spend double what he would have ordinarily just to have you re-wire his set to employ a substitute tube, if you will explain it all to him carefully, cheerfully and in easy terms that even he can understand. The same applies to your inability to make immediate delivery of a repair.

Never lie to, or fool your customers. One customer who has been "stung" can do you more harm than a dozen who are merely disappointed in slow delivery and the usual delay in getting that tube for their last operating set. If the reputation for being "cute" and "sharp" or for lying and cheating gets around, your shop will suffer more than it will by the shortages either of parts or repairmen.

Make only such repairs as are normally needed. Sell at prices that are fair and which give you a decent margin of profit. Do not have but one price for an article. Nothing destroys confidence more than to make extensive repairs to a set which are not needed. Rather fix a minimum fee for repairs which will make it profitable for you to handle *every* repair, no matter how small, than to look for lots of extra work which might not be totally indicated. Having several prices for any one article leads not only to distrust, but to spending long hours uselessly haggling with customers who are convinced that they can get you to go still lower in price. Also should two purchasers compare their costs at your shop it will readily be apparent that one has paid more than the other, if the prices are not fixed. Get a reputation for a "*One Price Store.*" It will pay you handsomely now, and even more after the war.

Lastly, remember that a customer is entitled to his opinion. One of the privileges for which we are fighting and on which this country was founded, was the right of everyone to express his or her opinion! No matter how you may disagree with him, your customer is entitled to his thought in any one thing, no matter

whether that be right or wrong, and no matter whether he knows what he is talking about or not. If the argument affects your store *policies* then *show* him rather than tell him where he is wrong. If it is about politics, religion, or family—shun it alone like you would a curse. For a smart man never argues with his customers, remembering that "A man convinced against his will, is of the same opinion still."

These are but the merest outlines of profiable customer relationships. There are many, many more. To those who follow these simple ones as a start, others will suggest themselves, readily. And believe it or not, *the results will become apparent at once* by increased income.

TOASTER MAINTENANCE

(*Continued from page 22*)

2. Hold toaster upside down with cord next to body.
3. Bend cam shaft bearing arm *(Figure 3 No. 4)* clockwise so as to move switch point assembly away from the thermostatic strip.

To Make Toast Lighter

1. Remove bottom plate.
2. Hold toaster upside down.
3. Bend cam shaft bearing arm counter-clockwise so as to move switch point assembly nearer thermostatic strip.

The toaster should then be bread tested to make certain that the adjustment is correct.

To Adjust Switch-off Position

The switch should be open when the adjusting knob *(Figure 2 No. 11)* is turned toward off, and arrives at the No. 1 setting or thereabouts. When the toaster is cold, test through a circuit lamp for off position.

If circuit is broken before adjusting knob reaches position one, bend the switch adjusting tab *(Figure 2 No. 15)* away from the switch point assembly till the switch-off occurs when the adjuster is at about No. 1. If circuit fails to break regardless of adjusting knob position, bend tab toward switch point assembly so that the switch-off will occur when the adjuster is at about No. 1.

If circuit fails to break regardless of adjusting knob position, bend tab toward switch point assembly so that the switch-off will occur when the adjuster is at about No. 1.

Toaster Will Not Heat

This may be caused by some foreign matter getting between the switch contacts. If such is the case, try snapping switch points apart, using a splinter, match stick, or tooth-pick. This is done by pressing back on the insulating bushing *(Figure 2 No. 16)* which is carried on one of the switch points, and releasing it quickly so it will snap forward and the two switch contacts will snap together.

This procedure is preferably done without the toaster being connected, although it may be done with the toaster connected, if care is used. The toaster must be set at dark; the object being to dislodge any crumbs that may be lodged on the contacts which may hold them apart.

If it is certain that the switch points are making contact, and checking prods show there is voltage across them or there is excess sparking between the contacts, it will be necessary to remove the switch assembly. A magneto file should then be run carefully over the contact surface to remove any foreign matter.

To Replace Element

1. Remove bottom plate.
2. Disconnect cord.
3. Spread switch point assembly bracket apart *(Figure 3 No. 6)* in order to release adjusting knob.
4. Remove the four rivets which hold legs and toaster body to base *(Figure 2 No. 14)*.
5. Remove door spring.
6. Spread element retainer locks *(Figure 2 Nos. 1 & 3) Caution:* Do not spread element retainer any more than is necessary to replace element, as there is a chance of its breaking.
7. Remove toaster body and door assembly by holding base and lifting up on body.
8. The element is not exposed and can be very easily replaced.

Signal Bell Does Not Ring

Take toaster in both hands and shake in all directions. This is to dislodge any crumbs that may be jamming the steel ball and preventing it from rolling freely up against the gong. *(Figure 3 No. 2)* The gong should be as close as possible to the entrance of the ball-bearing raceway, in order to prevent the ball from lodging at this gap.

If the signal bell should still not ring, after the above has been done, the assembly should be replaced.

Miscellaneous

1. The thermostrip *(Figure 2 No. 8)* should move freely on frame *(Figure 2 No. 17)*.
2. Grill wires *(Figure 2 No. 6)* should be in back of thermostrip *(Figure 2 No. 8)* so strip may come into contact with surface of bread.
3. The spring piece *(Figure 3 No. 1)* operates on the adjusting cam. There should be no play between these parts as such will cause very erratic operation.
4. Pressure bars. *(Figure 2 No. 13)* should hold bread evenly against thermostrip *(Figure 2 No. 8)*.

LETTERS

(*Continued from page 12*)

dubitably deal with the wrongdoers. One of the best ways to treat the subject of *almost-illegality* is to strengthen the dealers and servicemen's organizations which are actively even now trying to combat just such conditions you mention. Join one of them and help!

There is no way in which the authority of the local OPA boards can be questioned other than by appeal in legal manner. Sorry, but the fight for additional gas for the serviceman has not met with much success.

REFRIGERATOR REPAIRS

(*Continued from page 23*)

stalled. This strainer is removable so that it may be cleaned if it should become plugged, or it may be replaced.

When servicing a machine, remember that the sole function of the thermostatic valve is to keep the coil completely filled with refrigerant. Always check for a shortage of refrigerant before removing the expansion valve. Furthermore, if the machine runs too long, it may be that one of the compressor valves is not functioning properly rather than trouble with the expansion valve. If there is sufficient refrigerant in the system and the evaporator is cooled from beginning to end without permitting the liquid to enter the suction line (frost back) it indicates that the valve is working properly. To insure proper operation of the thermostatic expansion valve, it is essential that the feeler tube make perfect contact with and be tightly clamped to the suction line. A loose or poorly clamped feeler tube will lead to erratic operation of the expansion valve and in extreme cases will permit the liquid to enter the suction line causing frost back. If the temperatures are too warm, check to see that the temperature control is functioning properly.

«««« »»»»

OPA Radio Price Committee Meets

The proposed dollars-and-cents maximum price regulation on wholesale and retail sales of radio receiving tubes has been discussed by members of the industry advisory committee representing radio tube distributors and jobbers in a meeting with Office of Price Administration officials in Washington, OPA announced today.

Since this meeting was the first of the group, organization steps were taken, with Aaron Lippman, President of the Aaron Lippman Company of Newark, N. J., elected chairman.

Several OPA regional offices will soon hold meetings with radio tube retailers, to discuss the retailer's problems. A revised draft of the amendment, incorporating such recommendations of the distributors' and jobbers' committee as were acceptable, is now being prepared by OPA, and will be available for discussion at the proposed regional meetings.

Members of the distributors' and jobbers' industry advisory committee who attended the January 21 meeting were:

Aaron Lippman, Aaron Lippman Company, Newark; A. D. Davis, Allied Radio Corporation, Chicago; Albert Spears, Philco Distributors, Inc., New York City; Milton Deutschmann, Radio Shack, Boston; H. M. Carpenter, Thurow Radio, Tampa; and Maurice S. Despres, Admiral Radio and Television Company, New York City.

Other members, who were unable to attend the meeting, include: Albert J. Slap, Raymond Rosen Company, Philadelphia; Harold King, Electronic Supply Company, Pontiac, Mich.; and R. W. Walker, Walker-Jimieson Company, Chicago.

AD INDEX

Motorola Radio

"HANDIE-TALKIE" *fights with* CARLSON'S RAIDERS *in* GUNG HO!

The great story of Lt. Col. Evans Carlson and his Marine Corps raid on Jap-held Makin Island can now be seen in Walter Wanger's exciting Universal war movie. It's a four-star picture!

You'll see Motorola Radio's famous Handie-Talkie at work in battles against the Jap that add greater glory to our fighting leathernecks. The picture takes its title from the Marine battle cry, "GUNG HO," which in Chinese means "work together". That's a good slogan for everyone on the home front too!

"HANDIE-TALKIE" IS ANOTHER *Motorola Radio* "FIRST"

Motorola RADIO FOR HOME & CAR

GALVIN MFG. CORPORATION · CHICAGO

ARMY E NAVY

the FUTURE is being made NOW!

Long before America declared war, RAYTHEON electronic tubes were serving with distinction in our Army and Navy. Since Pearl Harbor, production has increased 1,000% or more—but the same "Plus-Extra" performance qualities are built into every tube made by RAYTHEON.

Taking over territory from the Axis does not end the need for communications equipment—and RAYTHEON will be on the job with the garrison forces as well as in the front lines, because wherever extra dependability is needed RAYTHEON usually gets the call.

Even before all our soldiers and sailors are home again, RAYTHEON—through the nationwide network of jobbers, dealers and servicemen—will be supplying civilian needs for quality electronic tubes for the many applications in the coming era of electronics.

Raytheon Production Corporation • Newton, Massachusetts; Los Angeles, New York, Chicago, Atlanta

DEVOTED TO RESEARCH AND THE MANUFACTURE OF TUBES FOR THE NEW ERA OF ELECTRONICS

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