

MAY

1941

Radio

SERVICE DEALER

This Month

A CHANCE TO SERVE
SOUND IN INDUSTRY
RSD WINDOW PLACARD
RECEIVER ALIGNMENT
SERVICING CHANGERS

PRICE

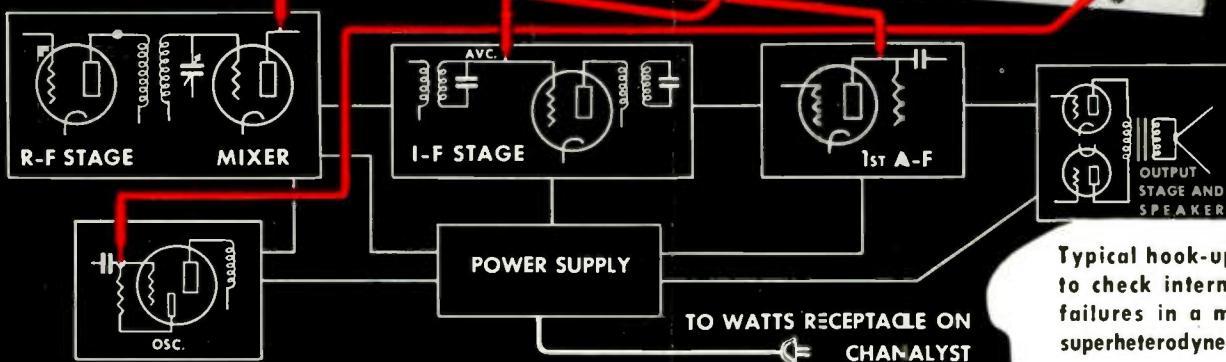
25¢



RCA Rider Chanalyst

\$107⁵⁰

Net Price Complete
Stock No. 162



PAYS FOR ITSELF BY TIME SAVED

Just a glance at the schematics here discloses how easy it is to use the RCA-Rider Chanalyst, and how reliably it will quickly disclose the source of the most baffling intermittent trouble. But forget technicalities for a moment and look at the RCA-Rider Chanalyst from a strictly dollars-and-cents business standpoint. Let's compare what you pay for it against what it stands to pay back to you.

At a recent meeting, a group of servicemen (who did not use the Chanalyst) admitted that they averaged somewhere between 3 and 5 "tough" repair jobs a week—sets that took them two hours or more to repair. Let's take the low figure, and do our calculating on the basis of only 3 of these "2 hour" jobs a week.

Careful tests with the Chanalyst show that an experienced operator can handle even the most difficult intermittent "short" or "open" jobs in 30 minutes. Again to be conservative, however, let's make it an hour—although,

actually, not one tough job in ten would take this long, once you had familiarized yourself with the tremendous time-saving possibilities of the Chanalyst.

Thus, a Chanalyst in your shop can mean a saving of at least a full hour on every one of those difficult "2 hour" jobs—or a total saving of 3 hours a week. That's 156 hours per year! At your normal rate for service . . . just figure how quickly the Chanalyst will pay for itself.

And remember, this only counts in the savings on difficult jobs. All that it saves you on the less complicated jobs is pure "gravy".

Small wonder, then, that more than 4,000 Chanalysts have been sold. Small wonder that it has proved the one absolutely indispensable piece of test equipment to so many leading service dealers. The Chanalyst not only helps them do better, more accurate work. It actually "puts more hours into their day"—hours for which a profitable service charge can be made!



Test Equipment



Radio

SERVICE-DEALER

SOUNDMAN AND JOBBER

Reg. U. S. Pat. Off.

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Cover Photo



★ Standard mikes, amplifier and speakers are combined to form a high-power intercommunication and call system in one of the du Pont plants at Arlington, N. J. This is just one of innumerable cases where sound equipment is making its contribution to the speed-up of industry — a field that offers the service-dealer and soundman unusual opportunities. See page 5

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VOL. 2 No. 5 ★ MAY, 1941

DEWALD 1941 Models

sold in lots of 1 or 3 (or more)

at exceptionally low **NET PRICES**
direct from **Distributor to YOU**



Model 565—AC-DC, Battery Superhet

Versatile, compact, 3-way portable. Streamlined luggage construction with completely concealed radio unit; easy slide disappearing lid cover; choice of 2 coverings—natural and alligator with contrasting simulated leather tuning panel.

Advanced super-het circuit; 5 low drain tubes; built-in Loopenna; AVC; beam power output; large PM speaker. Many other features.

Retail list price \$24.95

Your net price each \$16.75

YOUR NET PRICE

EACH LOTS OF 3

\$15.95



Model 670—3-Band AC-DC Superhet

Latest style tilt-top, easy vision slide-rule dial model in beautiful hand rubbed cabinet. Band spread tuning on two short wave bands; Tuned RF stage on all bands. Advanced superhet circuit; 6 low-drain single ended tubes; built-in Loopenna; large PM dynamic speaker; AVC; beam power output; variable tone control; built-in Wave Trap Code rejector.

Retail list price \$33.50

Your net price each \$20.95

YOUR NET PRICE

EACH LOTS OF 3

\$19.95

We are now prepared to supply every legitimate Radio Service Dealer with any type brand new 1941 factory cartoned DeWald receiver in any quantity desired.

Our policy is timely . . . geared to present day conditions. Every radio service dealer stocks, sells and rents Nationally Known Brands of receivers. There is no finer line than DeWald . . . and at the especially attractive **LOW NET PRICES** quoted here you can't go wrong. Hundreds of our local service dealer accounts will attest to that.

We sell at wholesale only, give factory guarantees, do not require a franchise or contract for a specified number of receivers. We have sufficient stocks on hand to meet your requirements . . . most important, all merchandise is shipped on the same day that order is received.

Send for literature describing the many new 1941 DeWald receivers not illustrated here. List prices range from \$9.95 to \$149.50 . . . net prices are much lower.

20% deposit required with order. All prices quoted here are **NET, F.O.B. Jamaica, New York. Save 2%, send check or M. O. with order.**



Model 410

Battery Miniature "COMPANIONETTE"

Streamlined 4 pound personalized model in beautiful simulated cowhide leather case with saddle stitching. One of the best sellers in the field. One of the best 4 tube superhet; PM dynamic speaker; AVC; iron core high gain IF transformer; self-contained Loopenna; uses 2 flashlight cells for "A" supply. Gives long battery use; has easy vision tuning dial. Tunes 1700 to 540 kc.

Retail list price \$19.95

Your net price each \$12.95

YOUR NET PRICE

EACH LOTS OF 3

\$12.45



Model 562 AC-DC "JEWEL" Series

Five rich jewel-like Catalin colored cabinets that emulate precious stones to choose from: Model 562-AI, Alabaster with Ivory trim—Model 562-AB, Alabaster-Blue trim—Model 562-OB, Onyx with Ivory trim—Model 562-MI, Maroon-Ivory trim. 5 new type high-efficiency single ended tubes; advanced superhet circuit; new tilt-top easy-vision slide rule dial; high ratio Vernier Tuning; AVC; beam power output; large dynamic speaker; built-in Loopenna; tuning range—General Broadcast and Extended State Police Bands.

Retail list price \$19.95

Your net price each \$12.95

YOUR NET PRICE

EACH LOTS OF 3

\$12.45

CHANROSE RADIO

[WHOLESALE ONLY]

170-16 JAMAICA AVENUE

JAMAICA, NEW YORK

TRANSIENTS

JUNE SHOW OF GREATER MOMENT than in previous years is the coming Radio Parts National Trade Show, to be held at the Stevens Hotel, Chicago, June 10th to 13th inclusive. Everyone in the trade who can possibly arrange it, should attend.

The importance of this annual gathering of the parts trade cannot be over-estimated. At that time the problems brought on by the national defense program will be discussed, and means developed for the carrying on of the commercial trade during the period of emergency. The future welfare of your business as a service-dealer or jobber may depend upon the decisions arrived at during the show.

SOUND BUSINESS "ELECTRONIC GADGETEERING"—a phrase coined by Austin C. Lescarboura and used by us to point up a class of work within the province of the serviceman, has become increasingly important in the past few months, and will be decidedly more important as time passes.

The status of the average serviceman in the guise of an Electronic Gadgeteer does not permit him to bid on large industrial jobs involving the use of such electronic installations as intercommunicators, paging systems, photoelectric controls, etc., but the production speed-up plan encompassing the use of small plants on a sub-contracting basis, now under consideration by the OPM, opens up real possibilities for servicemen in industrial communities.

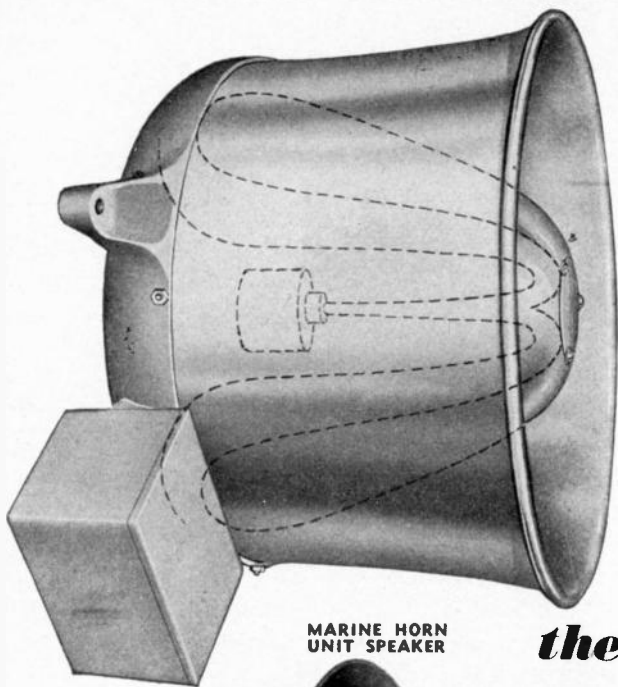
Various types of amplifying equipment alone can serve to speed up production in any plant, large or small. The units of a production line, which may occupy different floors or sections in one building, or even extend to other buildings, can be coordinated by means of continuous and instantaneous electrical communication between all units and the traffic handler. And amplifying equipment is but one phase of electronics as applied to mass-production methods.

RECORD CHANGERS WHERE IS THE serviceman who ever thought the time would come when he would have to think in terms of dogs, latch springs, clutches, eccentric cams and other gimcracks foreign to his fundamental training? Yet the modern automatic record changer has brought him to that; and face it he must, if only to keep his good name as a radio serviceman. If a record changer goes flooey, the serviceman has to fix it or the customer will know the reason why. And to fix the things, a serviceman has to understand them.

Believe us, we also get dizzy attempting to figure out why latch A releases dog B which in turn operates cam C so that the pickup will drop at just the right time, or something, but it's not so complex once you get the hang of it.

But, what counts most is practical experience with these mechanical marvels. One way to gain that experience is to lift the changers and bring them to the shop for cleaning and oiling, set them up on the bench and let them do their stuff for your benefit. Compare the step-by-step operation with the manufacturer's notes, and you'll soon get the hang of it.

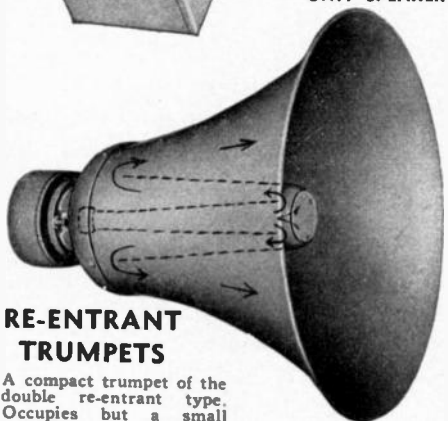
If you haven't got complete servicing notes on the various types of changers, make it a point to get them—and if you can't borrow changers from your customers on one pretext or another, go to a local dealer after hours and give yourself a few lessons in actual changer operation.



MARINE HORN
UNIT SPEAKER

Graduate to Q-U-A-L-I-T-Y and that means R-A-C-O-N

the biggest season soundmen ever had is just starting



RE-ENTRANT
TRUMPETS

A compact trumpet of the double re-entrant type. Occupies but a small space, nevertheless has a long air column enabling it to deliver highly concentrated sound of the greatest efficiency over long distances. Base and inside cone arm made of aluminum castings, outside bell of heavy gauge aluminum spinning, center section of RACON ACOUSTIC material to prevent resonant effects. Available in 6', 4½', 3½', and 3' air column units.

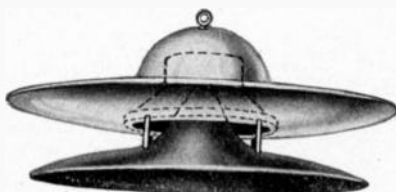
During the next few months thousands of public address systems will be sold, some for industrial applications, others for sporting events or military preparedness maneuvers. They'll take a beating from hard usage, inclement weather, overloading and rough handling.

Every sound installation and p-a system employing RACON Products will bring the seller or renter higher fees and better profits because the element of failure has been eliminated and customer satisfaction assured.

RACON alone supplies unbreakable, storm-proof, weather-proof horns, speakers and trumpets. RACON speakers deliver the maximum output and response obtainable for the size of speaker used. There is a RACON reproducer for every purpose — it is the only complete line made. Leading soundmen specify, insist on and use RACON products exclusively—they know it pays.

Illustrated here are just a few RACON PRODUCTS. Complete data and literature sent on request.

Several new RACON speakers will be introduced at the Radio Trade Show. See them at Booth 406.



RADIAL CONE SPEAKERS

Types for high fidelity, giving even intensity sound projection over a circumference of 360° radially. Upper deflector made of heavy gauge aluminum, cone covering of steel, and lower deflector of RACON ACOUSTIC material storm-proofed for all weather conditions. Models for 5"—6"—10"—12" cone speakers.



UNBREAKABLE TRUMPETS

The last word in trumpet design and particularly adaptable where high quality and high efficiency is required, with the ability to withstand the roughest handling without breakage. Made of RACON ACOUSTIC STORMPROOF MATERIAL. Demountable. Available in 3½' and 4½' and 6' sizes.

Super Giant P. M. Horn Unit

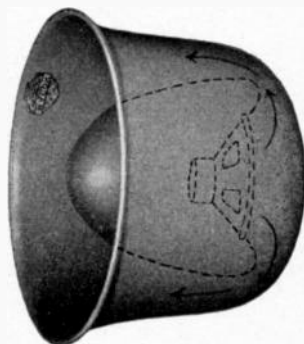
Operating capacity 12-15 watts, peak 25 watts. Other P.M. Units available, from "baby unit" of 5 watts to "bull unit" with an operating capacity of 50 watts. Efficiencies of the highest order obtainable with the finest magnetic material and steel utilized.



THE OLDEST, LARGEST AND FOREMOST MANUFACTURERS OF AIR COLUMN SPEAKERS IN THE WORLD.

MARINE
CONE
UNIT
SPEAKERS

Re-entrant type speakers of the marine type using cone type driving units for indoor and outdoor applications. Bell made of heavy aluminum cone mounting made of aluminum casting, and center bullet of RACON ACOUSTIC material to prevent resonant effects. Material stormproofed for all weather conditions. Baby size for 2" or 3", miniature for 5", regular for 8", and giant for 12" speakers.



SOUND AIDS EXPANDING INDUSTRY

IF OPPORTUNITY was ever handed to the service-dealer and soundman it is being handed to him now through the tremendously increased industrial activity brought about by the war and our own augmented defense program.

Industrial plants offer a distinctly important market for sound systems. True they have not been among the largest buyers of such installations in the past. Today this condition has changed. Not only are these plants humming and new ones springing up on all hands, but there is an imperative demand for greater efficiency, with the money to spend in attaining it.

These conditions have laid the foundation for a tremendous potential volume of sound equipment sales, awaiting only some concentrated study and selling effort on your part. But it's going to require effort to sell the market! Owners of these industrial plants haven't let increased business go to their heads. They are besieged on all sides by people with something to sell and are wary buyers. If you can show such an owner where sound equipment will pay its way in increased efficiency you will find a receptive audience.

Sound equipment can do just this. Call systems, powerful intercommunication systems, employee entertainment systems and amplifier equipment for use in connection with the control of manufacturing processes are all possibilities for practical industrial applications. The last of these falls pretty definitely into the specialty class but the others are straight p-a applications which are right down the sound specialist's alley.

The employee entertainment system has demonstrated its ability to actually increase production in a number of cases where workers were engaged in routine operations—operations involving repetitious handwork with little admixture of grey matter. Lively music tends to step up the tempo of the work. Other types of programs help to avoid boredom, and in general there is a reduction in distracting conversation. Because these advantages are often difficult to evaluate in dollars and cents, sound systems for this use are harder to sell and

Harry Paro

Chief Sound Engineer, Lafayette Radio Corp.

are certainly nothing to start on for the sound man who is just entering the industrial field.

"POWER" CALL SYSTEMS

Call systems are something else again! A system which permits every foreman, boss, executive or member of the maintenance crew to be reached instantly, no matter where he may be in the plant, has obvious advantages. It saves the time wasted in running around a plant looking for desired individuals and it saves the time of the person, inside or outside the plant, who makes the call.

Going even further than this is the power intercommunication system by means of which individuals can be located and communication carried on directly between departments with a minimum of lost time.

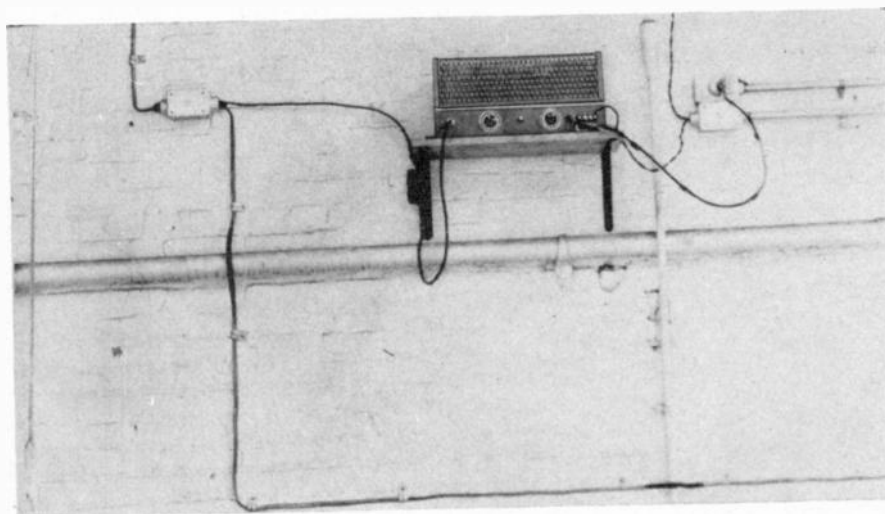
From the standpoint of the sound specialist this latter form of installation is perhaps the one that provides the widest opportunity. Like the call system it can be sold on hard-headed merit. But it has the further advantage that such a system, although made up entirely of standard components, is more in

the nature of a custom-built installation, tailored to meet the requirements of the individual plant. It requires more thought in planning and usually employs a number of microphones, both of which help, legitimately, to increase the unit sale value.

To illustrate something of the variety which such a system can afford, an installation in one of the buildings of the Plastics Department of the E. I. du Pont de Nemours & Co. at Arlington, N. J., is described here.

This system, using standard Lafayette equipment throughout, employs eight microphones, eleven loudspeakers and a 50-watt amplifier, with the circuit arrangement shown in Fig. 1. Fundamentally it is an intercommunication system, but it also serves the purposes of a call system as well, as will be explained later.

The product manufactured in this building is the transparent plastic which, sandwiched between two thicknesses of glass, results in the laminated safety glass employed in automobiles, etc. The entire process, from the raw chemicals to the finished product is carried on in this



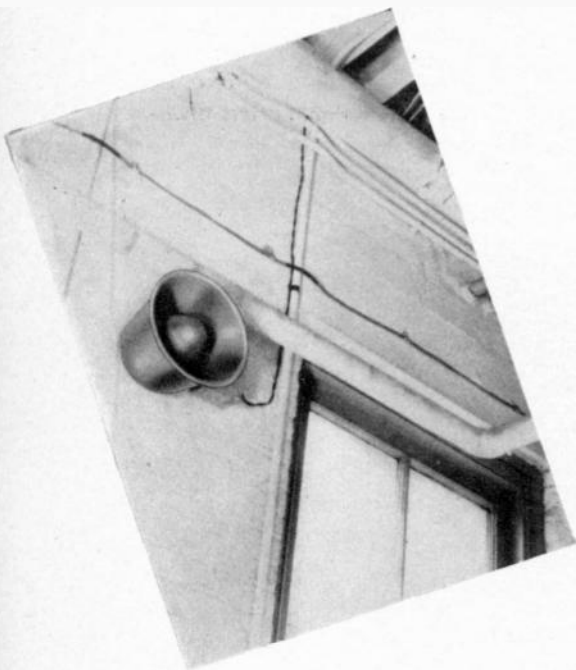
The amplifier is mounted up near the ceiling to protect it from spray. The rigid-conduit wiring system of a previous signal system is used for speaker connections.

one building. Although the manufacture is carried on in several departments it is a single continuous process. In one of the earlier stages the material is formed into continuous sheets and from that point on feeds continuously from one department to another like a giant ribbon, each department contributing its share of the processing until this ribbon comes out of the last department in great rolls, ready for shipment.

Because the process is continuous, there must be the closest coordination all along the line and it is in this connection that the intercommunication system serves one of its important purposes. Any change at one of the processing stages in the production line may necessitate immediate adjustment at one or all of the following production stages. By means of the system described here all such information is transmitted directly by one department to the next without dependence on messengers, telephone lines (which might be busy) etc. The fact that the system affords two-way communication between any two departments permits instructions and information to be acknowledged or even repeated by the receiver as a check on accuracy.

SYSTEM'S FLEXIBILITY

As a call system this same equipment serves to call individuals to



Marine-type loudspeakers find wide industrial application where moisture, spray, grease and fumes are likely to be encountered.

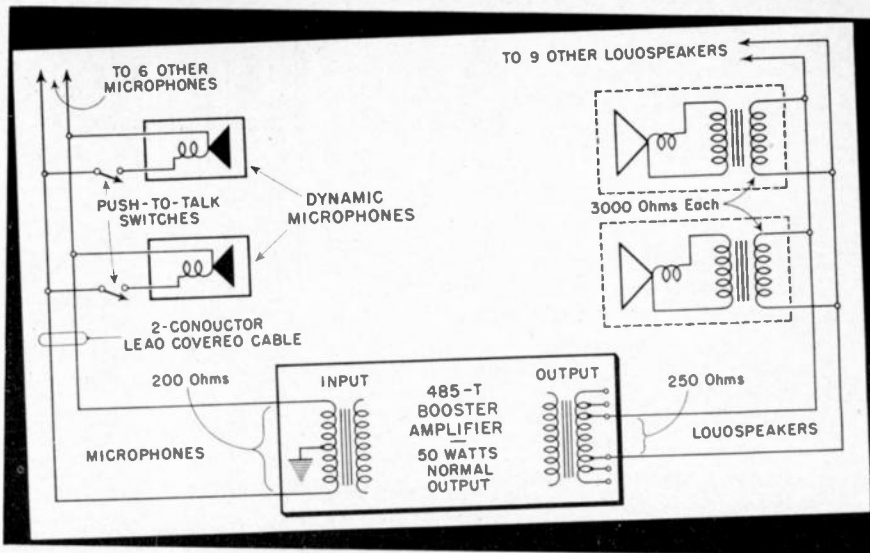


Fig. 1. Eight dynamic mikes are bridged across a 200-ohm line through push-to-talk switches. The 250-ohm output feeds eleven 3000-ohm speakers, in circuit at all times.

the phone, front office, etc. This phone system is unusual in that while each department has a phone, they are all lumped on a single line with no provision for switching and without bells. This single line is, however, connected to the company's main switchboard in order that incoming calls from outside the building can be received and outgoing calls made. Only one of them has a bell. This is one located at a point where there is always a worker present. He receives all incoming calls, pages the required individual over the speaker system and this individual takes the call at the nearest extension.

The advantage of this arrangement lies in the saving of time. There is no chasing around within a department (or even outside a department) to locate an individual who is wanted on the phone. Nor is there need for a telephone operator and switchboard, because one man can readily handle received calls and paging as an incident of his regular job. Above all, this method makes every individual in the building subject to direct call at all times, without loss of time or effort.

Because incoming phone calls may involve information which must be obtained from another department, and because of the occasional necessity for transferring a call from one department to another, the telephone and microphone for the sound system are placed together in each department (See front cover photo). An individual on a phone can thus contact another department over the sound system without moving away from the phone.

So far as the sound system is

concerned, economy and practical utility combine to dictate the circuit shown in Fig. 1. Because two mikes could never be used at the same time anyway, all were bridged across a single 200-ohm line with push-to-talk switches so that a mike is in the circuit only when its associated push-button is pressed. It was deemed unnecessary to resort to selective switching of speakers, so the circuit was arranged to leave all of them in at all times.

BOOSTER AMPLIFIER

This meant that an amplifier with single input and output channels would serve the purpose. Under these circumstances a conventional amplifier with multiple input channels and other such refinements would represent a definite extravagance. The Lafayette type 485-T "booster" was selected. This is capable of 50 watts normal output and is very inexpensive as compared with the more conventional types capable of this same output. Normally a "booster" type amplifier does not provide adequate gain for direct operation from low-level microphones but this model is supplied with a built-in pre-amplifier stage on special order and this enables it to meet the requirements of this and similar installations.

The microphones are the Amperite PG, close-talking dynamics. This type was selected as the one best suited for continuous duty under conditions involving moisture-saturated atmosphere, chemical fumes and dust encountered in the various departments. This choice has since been justified by the complete freedom from microphone

(Continued on page 24)

OUR CHANCE TO SERVE AMERICA

AS these views are dictated, America is working on a virtual war-time basis. Technically we call it a Rearmament and Defense Program. The future of every man in the radio industry will be vitally affected by the new order—particularly those of us in the radio servicing profession.

For years service-dealers have been the step-children of the radio industry. A few set and parts manufacturers have recognized their important status, but some have merely ignored their existence and welfare. Now, figuratively speaking, the shoe is on the other foot and service-dealers are beginning to command the most serious attention and respect of every radio-equipment manufacturer. Let me tell you why!

There is a serious shortage of certain types of raw and semi-fabricated materials necessary for the manufacture of radio and communications equipment. The government's present rationing system gives priority to plants engaged in producing equipment for defense use and has contracted for many hundreds of thousands of radio devices which require in their manufacture a vast quantity of component parts which ordinarily would suffice for the assembly of four or five million home-type radio receivers. Component parts manufacturers have increased their production to capacity, but due to a shortage in some materials they simply cannot meet the demands being made upon them.

Several leading radio set manufacturers have already announced the following of a pattern laid down by automobile manufacturers: "We have designed our 1941-1942 line; this line, standardized and consisting of a limited number of models is to be 'frozen' for the duration of the defense period," to quote one of them. Several of our best informed authorities tell me that there will not be a sufficient quantity of component parts available and thus home-type radio receiver production this year, for the 1941-1942 season, cannot exceed five million sets instead of twelve million as originally anticipated. These well informed men go further—they predict that set production for the following year may be drastically curtailed further, possibly to a limit of one or two million new units.

Of course the price range of all radio equipment must go up considerably. Materials cost more, wages are higher, and when vast volume production schedules cannot be maintained production costs increase correspondingly to add to the selling price of a receiver. That is not important, for some people will always be able to buy what their hearts' desire. The important thing is this—radio is undoubtedly this nation's greatest and most vital means of communi-

cation, daily newspapers not excepted. Many citizens residing in this nation's vast rural areas cannot be reached quickly by newspaper or any means of communication other than radio . . . and the executive branch of our government fully appreciates that it cannot permit the communications system of this country to fall apart. Over fifty-five million radio sets now in operating condition in 30 million American homes must and will be kept in good operating condition, come what may. The burden will rest entirely upon the shoulders of this nation's radio service-dealers and they, of course, must in turn depend upon their jobbers, component parts manufacturers and test equipment makers for their source of supply.

IN the past two years, while 20 million new sets were being sold and only 45 million old receivers were being "maintained," component parts manufacturers sold \$50,000,000 worth of replacement parts each year to service-dealers. Now these component parts manufacturers realize that they will probably have to provide double or treble their usual output for replacement and maintenance purposes, because older sets will get harder usage and break down more often. I have been assured by the leading reputable component parts manufacturers that they will lay aside a reasonable percentage of their output so that an ample supply of parts will be available for replacement use by service-dealers.

Summarized briefly, our nation's top-ranking radio service-dealers, whom I am proud to acknowledge as being readers of RADIO SERVICE-DEALER, face what will be their most lucrative and busy period since radio's inception. Service-dealers must plan now for the critical period which so obviously lies ahead. I know they will be conscientious in their work and efforts, maintain fair and honest price schedules, and consider themselves as members of the Home Front—the defenders of this country's line of communications during the emergency period. I know we will all grasp this opportunity to serve our country faithfully and as honorable men, not as mere opportunists.

Service-dealers:—Keep the communications open!
Manufacturers:—Provide them the tools with which to do the job!
Jobbers:—Deliver the tools so urgently needed!

Sanford R. Cowan

PUBLISHER

Serviceman's Diary

J. P. Hollister

SATURDAY—I got in early and was sitting at the desk, waiting for Jerry, when I suddenly realized there was someone at the counter. I didn't hear anyone come in. Maybe because the door was open and she wore sneakers; maybe because hot weather always makes me sleepy when it comes so early in the season. And I might have dozed off. (No doubt about it, Jerry said afterward, and the weather didn't have to be hot and it didn't have to be early in the season—but you know Jerry!) Anyhow, there she was, sitting on the counter, just like any fellow would have done. But not making a sound, just looking at me and patiently waiting to be noticed. And, boy, was she lovely! Real blonde hair, in long curls just like a child's, gathered under a blue sort of handkerchief tied around her head. She was slender, but not too slender in the right places. All done up in blue slacks which looked like overalls, but a whole lot better.

"So!" she laughed, when I jumped up. "At last you've come to life!"

"Sorry," I mumbled. "You see, I—"

"Forget it," she interrupted, "I haven't been here long and I feel kind of lazy too. Now, let's see," and she glanced at a slip of paper, "I need an air-cell battery for our Atwater-Kent—you know, one of those big batteries that you put water in. And a couple of B batteries. You see, we're getting the boat ready for the season and the first thing father insists on having ready is the radio. He says the fish bite better when the radio's playing. I like it for dancing. Do you like dancing?"

It was fun, I told her, when you had a good partner. But I wouldn't know how it would be on one of the yachts. Most of them were so small I didn't see how you could dance unless you were a tight-rope walker and could ooze along the brass rail. She said they had a brass rail on the yacht but you were only supposed to put one foot on it, because up above it there was a counter just like the one she was sitting on now, only they put drinks on it and not batteries. Or was

I going to put any batteries on it?

I'd be glad, I assured her, to put the batteries in the car instead of on the counter. Especially since the counter was now a little crowded, and very pleasantly so, and she needn't move. But she hopped down.

"I wonder," she said while I was wrapping up the batteries in two packages, "if you could fix the binnacle light on the boat. It seems that there is a short circuit in the socket. It's kind of hard to get at; you've got to crawl under the forward deck to get at the wiring, and father hates the idea of doing it himself because he's getting so heavy. Would you care to come along with me and look at it?"

Well, what do you suppose I did? Do you think I would stick around a shop on a dull day when there was a chance of making some money by stepping out? Of course not; neither would you. So I wrote out a sign for the door "Back in Five Minutes" and went along with her.

At the yacht harbor there is a long pier with a big horn on the end. You work the bellows of the horn and it goes "Harh-Harh—" but very much louder than an auto horn. Then the bird in the Club launch is supposed to come over, pick you up, and deliver you to the proper yacht.

But I worked the horn and no launch came. Instead a fellow wearing a naval officer's cap walked briskly up and told the girl that he was sorry but the launch motor was giving trouble and could she wait until the afternoon. If not, of course there was the rowboat, but her yacht was so far out and—

Certainly she could wait until after lunch. And she and her guest (meaning me) would have lunch at the Club. And would he see that a table was reserved, and that I was provided with a bathing suit as we intended to take a dip in the meantime.

Fifteen minutes later I met her on the beach. She looked even better in a bathing suit. And she could swim—better than I, in fact—but she didn't try to show me up.

The sun was warm and we lay on the beach.



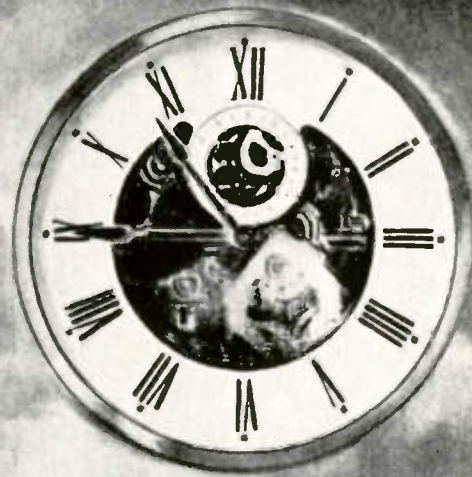
EDGAR ALLEN, JR.

Later I met her on the beach. She looked even better in a bathing suit.

(Continued on page 23)

RAYTHEON TUBES' EXTRA ADVANTAGES

make WESTERN UNION clocks the nation's accepted standard of time...



There is no compromise with the perfect time. WESTERN UNION time must be absolutely correct! Keeping accurate time for a nation is a precision task, one that requires each part to function perfectly on the split second. That is why RAYTHEON Tubes were selected to perform this important duty.

Each hour of the day and night an impulse is sent out from the master clock in New York through rectifiers powered exclusively by RAYTHEON Tubes to the district master clocks where the impulse is synchronized with over 120,000 standard Western Union clocks throughout the nation. THUS A STANDARDIZED TIME BASIS IS FURNISHED FOR THE INDUSTRIAL, COMMERCIAL AND SOCIAL LIFE OF OUR COUNTRY.

It is not unusual for RAYTHEONS to be selected when there is an important job to be done—RAYTHEONS are built for consistent accuracy and dependability in performance. That is why radio engineers, servicemen and dealers depend upon RAYTHEON RADIO TUBES no matter what the requirement—and remember, you pay no more for RAYTHEON'S extra quality.

Insist on RAYTHEONS for your next tube order.

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San Francisco · Atlanta*



RAYTHEON
MAKES THEM ALL

A Western Union
Master Clock

WORLD'S LARGEST EXCLUSIVE RADIO TUBE MANUFACTURERS

NOISE IS A BLOT



On Your Favorite Program

WHY NOT ENJOY CLEAR RECEPTION?

Man-made noise need not be tolerated. Clear, noise-free reception is attainable in most every locality, and the absence of a background of racket makes a big difference in program appreciation.

HOME RADIOS

● Noise in your home radio may be due to a faulty or an inadequate antenna, poor electrical connections in the house wiring, faulty parts in the receiver itself, or interference created by household appliances, oil burners, etc. Whatever the cause may be, your serviceman can locate it and put matters to rights—and possibly save you expensive repair bills later on.

PORTABLES

● A portable radio can also be noisy, due to many causes. Here, again, the trouble may be due to a faulty part in the receiver, a poor antenna, or simply to operating the set in the vicinity of noise-generating equipment. Weak batteries will tend to aggravate the condition. Have them checked periodically by your serviceman, and let him replace them with fresh ones.

AUTO RADIOS

● The elimination of noise interference in an auto radio calls for the services of an expert. Bad cases of noise can be caused by such odd things as "wheel static," poor ignition insulation, dome lights, the ammeter on the dashboard, poor car ground connections, and so on. Your serviceman has the trouble-shooting equipment with which to track down the difficulty in short order.

CONSULT YOUR SERVICEMAN NOW—AND GET THE BEST FROM YOUR RADIO

TECHNICAL SERVICE PORTFOLIO

SECTION XI

MODERN ALIGNMENT METHODS

WHEN WE examine the alignment procedures specified in service notes for receivers of similar design but of different manufacture, it becomes immediately evident that there is no standardization in the methods or equipment recommended. Usually one method is just about as good as another and, by and large, this is pretty generally realized in the field. The experienced serviceman has reached the point where he pays but little attention to the step-by-step procedures so carefully worked out in the service notes; he simply checks the chassis layout to locate the trimmers for each circuit, notes the aligning frequencies, and plunges in. If the receiver is of conventional design and the trimmer twisting is done along approved lines, the results are pretty generally satisfactory to all concerned.

But, with many of the newer receivers, such liberties cannot be taken without disastrous results. This is particularly the case with f-m receivers, battery portables and some of the loop-operated jobs. Not that it is necessary in every case to follow rigidly the specifications set forth by the manufacturer, but it is important to know just what departures can be made without causing incorrect alignment and, when it is necessary to use other accessories than those specified, just what alterations in the procedure will be required to produce proper alignment. Even in conventional receivers we shall see that it is often more convenient to alter the aligning procedure

in certain instances. So let us take up such cases first.

CONVENTIONAL SUPERS

The circuit of Fig. 1 may be considered representative of a conventional superheterodyne encountered very frequently in the field. As shown, a 6SA7 pentagrid converter is followed by a single 6SK7 i-f amplifier, a 6SQ7 diode detector, avc, and high-gain a-f amplifier, and terminates in a single 6K6 power output stage. The intermediate frequency is 455 kc. The circuit is simplified but the various trimmers and padders are identified.

While only one output meter will ordinarily be employed in aligning, several of various types are shown with the recommended form of connection for each type of meter. In most receivers it is possible to employ interchangeably any of the types of output meters shown. Later we shall take up those special cases where the choice of output meter is limited. We are omitting cathode-ray alignment methods from this discussion in order that they may be considered at length in a future issue.

In the normal course of events the i-f amplifier is aligned first. This is done by tuning a test oscil-

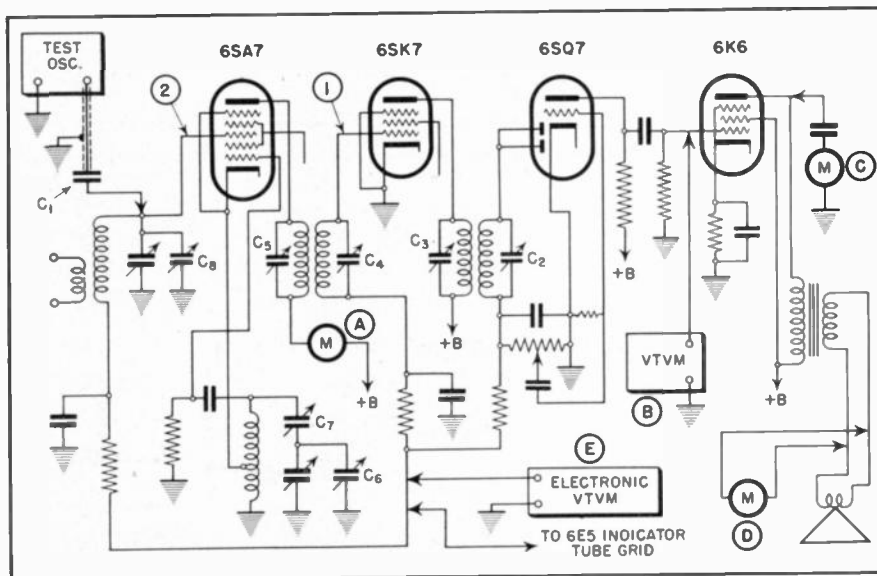


Fig. 1. Conventional superhet circuit, showing test positions.

lator to the desired intermediate frequency and injecting the signal into either the i-f stage grid circuit (point 1), or into the converter grid (point 2). If the latter point is specified in the service notes, then each of the i-f trimmers, C2, C3, C4, and C5 is adjusted until a maximum indication is obtained on the output meter.

The fact that adjustment until a maximum indication is obtained is specified implies that some indication must be obtained to start off with. This may not be the case. If the i-f amplifier is badly out of line, the signal may not be able to pass through all four tuned circuits comprising the two i-f transformers. In such an event, regardless of the service notes, the signal should be fed to point 1. Here a strong signal need pass through but two tuned circuits and it is therefore relatively easier to drive the signal through, even when the circuits are badly detuned.

If necessary, it may be found desirable to swing the test oscillator tuning dial around the desired frequency until the frequency is reached at which maximum response is obtained. From this frequency it is possible to determine whether it is necessary to raise or lower the frequency to reach the required i.f. and consequently we can tell whether the trimmers should be loosened or tightened. Once we have "found the way," adjustment becomes easy. This procedure is particularly desirable when an i-f transformer has been replaced. For simply "touching up" the alignment of a receiver which is already in fairly presentable condition, the signal may be fed to point 2 and each of the trimmers peaked in turn.

DUMMY ANTENNAS

The size of the required blocking condenser C1 puzzles many, and

well it may. For in service notes you will find that the range of capacity value for this condenser may vary all the way from .0002 mfd to 0.5 mfd. And it doesn't matter in the slightest. Either value, or any in between, will function equally well, when the signal is fed to any portion of the circuit other than the antenna coil. In the latter case, the condenser serves as a dummy antenna and should be approximately 200 mmfd for the broadcast band, except in the case of auto receivers, when the value specified by the manufacturer should be carefully followed. Usually this is of the order of 40 mmfd. For short-wave work, a 400-ohm resistor may be substituted for the dummy antenna condenser, or the standard IRE dummy antenna, shown in Fig. 2, may be employed for all ranges. For aligning the antenna stage of f-m receivers, a 100-ohm resistor should be employed as the dummy antenna.

In any event, remember that a dummy is just exactly that and no more; if you want proper alignment of the antenna stage, you must make this alignment with the actual antenna with which the set is to be used. Nothing else will duplicate the results. So don't worry too much over the dummy antenna problem. Just make the final adjustment in the customer's home, on a broadcast signal, and you've done the best which can be done.

The purpose of the blocking condenser, when feeding the signal to an i-f grid, is to avoid grounding out the avc. This would result if the grid returned to ground through the test oscillator attenuator rather than through the avc bus. It may not be altogether clear why it is necessary to avoid grounding out the avc, when the notes frequently specify that the signal be kept sufficiently weak so that the avc does not operate.

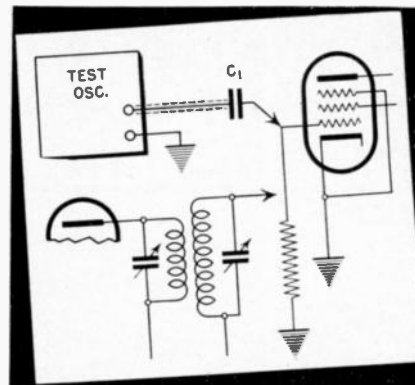


Fig. 3. The i-f transformer secondary is disconnected to prevent loading of oscillator output.

The point is that, with a direct ground, the i-f amplifier may oscillate or, at least, become somewhat regenerative, so that incorrect alignment results.

LOADING EFFECTS

In feeding the signal to an i-f grid, when the i-f tube has a top cap, the tuned circuit is commonly disconnected and the circuit is completed by means of a 1/2-meg. (or thereabouts) resistor to ground, as shown in Fig. 3. The purpose of this arrangement is to reduce the load on the test oscillator output circuit which may limit its output so that insufficient signal is obtained. This is usually unnecessary. When the i-f transformer secondary remains in the circuit, as in Fig. 1, its impedance, even when detuned, will ordinarily be much higher than that of the test oscillator output circuit so that its load will not appreciably reduce the signal strength. However, for those few test oscillators which have a rather high output impedance when adjusted for maximum output, this arrangement will be of value. This is particularly true when feeding the signal to the converter grid of f-m receivers. In such cases the input circuit of the converter is normally tuned to around 46 mc while the i-f signal, to which the test oscillator is tuned, is of the order of 3 to 11 mc. Since the signal frequency is thus far different from that to which the converter input circuit is tuned, its impedance becomes very low at the i-f signal frequency and the loading effect on the test oscillator attenuator circuit is very heavy. If a strong signal is required, it may be necessary in such cases to use the method of connec-

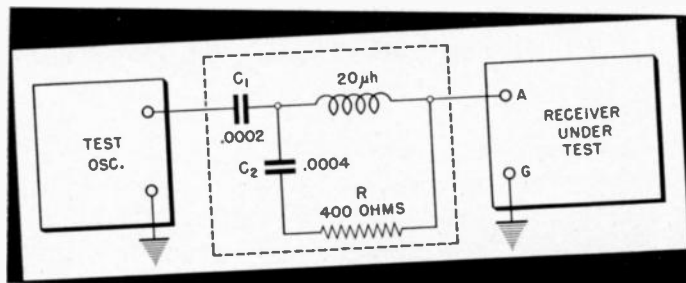


Fig. 2. Standard IRE dummy antenna which may be employed for alignment on all wave ranges.

tion shown in Fig. 3 to obtain sufficient signal strength.

ALIGNMENT INDICATORS

In many cases the alignment procedure is affected by the type of output meter used. For instance, if the receiver employs avc and a modulated signal is used for alignment, with the output meter connected in the a-f system, it is customary to keep the signal level sufficiently low so that avc action will not affect the aligning. If, however, the output meter is connected in the avc network, it is of course necessary that a much stronger signal be used so that the avc action will indicate resonance.

Connection points for output meters in the a-f system are indicated at B, C, and D, in Fig. 1. The type of output meter most commonly used in the a-f system is the copper-oxide rectifier meter, though more recently, the audio channel in signal-tracing instruments has come into use. For the copper-oxide type of meter, the best point of connection is at point C, the connection being made through the blocking condenser to keep the high d-c potential off the rectifier. Here the signal level will be a maximum and consequently the lowest possible aligning signal may be employed.

The signal level is much lower at point D, across the speaker voice coil, but often this point is more readily accessible. When the output meter is sufficiently sensitive, it does not matter which point is employed, the choice being based solely on the convenience with which the connection may be made.

A vacuum-tube voltmeter is shown as the output meter at point B; it may likewise be connected at point C, or for that matter, at point D. Here again the choice is based on the sensitivity of the instrument and the convenience and accessibility of the point to which the connection is to be made, regardless of the point specified in the service notes. Remember, the manufacturer does not know what equipment you have on hand, and even though point B happens to be the most accessible spot in the chassis for an output meter connection, it would not be a suitable place to connect the ordinary 1000 ohms-per-volt meter, to which so many servicemen are limited.

Recently more and more manu-

facturers are specifying that the output meter be of a type suitable to be actuated by the avc voltage. Such instruments are commonly called electronic voltmeters and are characterized by very high input resistances so that the loading effect on the high impedance avc network is negligible. They are capable of measuring voltages as low as 0.2 volt and the ohms-per-volt rating is of the order of 2,000,000 or more. Such a device is shown connected to point E (Fig. 1). Maximum signal at the diode rectifier, resulting from peaking the various trimmers in the r-f and i-f system, causes a maximum avc voltage reading, as indicated by the meter at point E.

If the receiver is equipped with an indicator eye, such as the 6E5, the eye itself serves as an ideal output meter. It, likewise, is actuated by the avc voltage and may be employed as an indicator just as the electronic voltmeter is. Maximum closure of the eye occurs when the avc level is highest, which in turn results when each trimmer is properly adjusted.

If there is no indicator eye used in the chassis, it is possible alternatively to employ a milliammeter in place of an electronic voltmeter. The meter may be an 0-10 ma type, connected as shown at point A in Fig. 1, so that it indicates the plate current of a tube under avc control. When the avc is maximum, which results when the trimmers are peaked, the grid bias on the con-

trolled tubes becomes a maximum. This causes the plate current to become a minimum. Therefore proper peaking is indicated by the lowest plate current reading for a given input signal.

Still another way out is to employ a 20,000 ohms-per-volt meter, connected at point E in the same manner as the electronic voltmeter shown. The positive terminal of the voltmeter should be connected to ground and the negative terminal to the avc bus.

Usually the maximum sensitivity of indication will be obtained when the voltmeter scale used is 100 or 250 volts, even though the avc voltage is much lower. This is because the voltmeter resistance is sufficiently high on such scale settings that the loading effect on the avc network is not too great to prevent a satisfactory indication.

It should be pointed out that the proper peaking of trimmers for a strong signal is not the same as that for a weak signal. For maximum sensitivity, a receiver should be aligned with a very weak signal, since that is the type of signal for which high sensitivity is required. For maximum selectivity, when fairly strong signals are ordinarily encountered, as is the case with most home receivers, alignment should be made with a fairly strong signal, using the output meter in the avc network. For the ordinary home receiver, the difference in results when either method is employed is so slight as to be

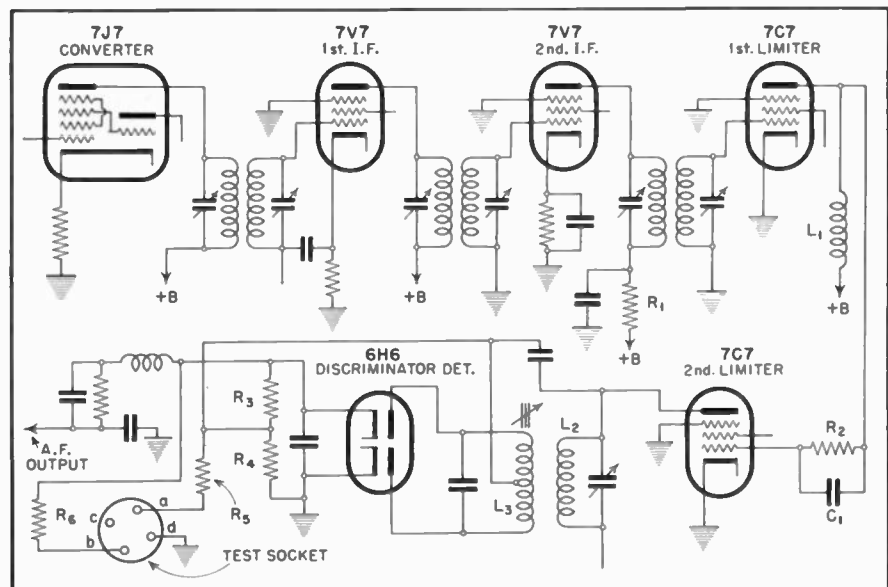


Fig. 4. Circuit of r-f and i-f channel of Zenith 10A3R f-m receiver.

unnoticeable without instruments. In many receivers, cathode resistors are left unbypassed in r-f and i-f stages, so that the resulting degeneration will tend to keep the stages in alignment with either strong or weak signals.

F-M ALIGNMENT

The methods of aligning f-m receivers as specified in the service notes of various manufacturers, are decidedly individualistic. Some, such as Pilot and Zenith, provide convenient points on the chassis to which connections can be made for aligning purposes. Others propose equipment which is not available to the serviceman and which may be improvised only with difficulty. From a practical standpoint, there is little difference in results, no matter which method of aligning such receivers is adopted. In fact, insofar as the i-f and r-f circuits are concerned, the adjustments are not as critical as in ordinary receivers, nor are they so frequently required. Note especially the latter; it is decidedly not necessary to touch up the alignment of f-m receivers, simply as a matter of routine, when a set is brought in for some other defect.

In other f-m sets, a resistor in the return circuit of the limiter grid served as a useful place to connect an electronic voltmeter as an output meter. This, too, is absent in the newer designs. Instead, in the circuit of Fig. 4, a socket is provided so that a special microammeter, having a zero center and a sensitivity of 50 microamperes for full scale deflection in either direction, may be employed as an output meter. The points to which the microammeter connects are designated as a, b, and d in Fig. 4.

For the application of the microammeter in aligning, we refer you to the Zenith service notes. For those who do not have such a meter on hand, there are alternative methods available which employ different types of output meters.

DISCRIMINATOR ALIGNMENT

To align the discriminator, the simplest method is to connect an electronic voltmeter (a 20,000 ohms-per-volt meter will likewise do the trick) across the output of the discriminator—point b to ground in Fig. 4. Feed an unmodulated signal at the intermediate frequency to the last i-f transformer

R3 and R4 to ground. The trimmer is adjusted until the meter reading is a maximum. It will then be necessary to recheck the secondary adjustment. Leaving the output meter connected at this same point, the signal may be fed in turn to each preceding i-f stage and peaking is accomplished in the usual way by observing the reading of the output meter and adjusting for maximum indication.

If no electronic voltmeter or highly sensitive d-c meter is available, a copper-oxide rectifier meter may be connected in the audio system, as shown in Fig. 1, picking out the corresponding point in the f-m receiver. A modulated i-f signal is then used for aligning, feeding to the same points as described before. However, the connection of the discriminator output to the a-f amplifier will have to be changed. The a-f amplifier input should connect to the junction of R3 and R4 (Fig. 4) rather than to the high side of R3. It will be necessary to unsolder the connection and reconnect at the new point to align. When this is done, aligning of the f-m receiver may be handled in exactly the same manner as for an a-m receiver, peaking each trimmer for maximum indication on the output meter.

In f-m receivers employing magic eye indicators, this tuning indicator may likewise be employed for aligning the discriminator (but not the i-f or r-f, circuits) when a type such as the 6AF6G, which is actuated by the discriminator output, is employed. When the tuning eye is connected in the avc network, it cannot be employed for aligning the discriminator but may be used for peaking the r-f and i-f stages.

LOOP ALIGNMENT

Aligning of sets employing a self-contained loop is often difficult, particularly when the receiver is of the miniature portable type. The adjustments will never be precisely the same when the chassis is in place as they are when the chassis is on the work bench because of the difference in the capacities of the loop to the set cabinet. For this reason, service notes frequently specify that certain adjustments, in the r-f and antenna sections, should be repeated after the chassis has been replaced in the cabinet.

(Continued on page 25)

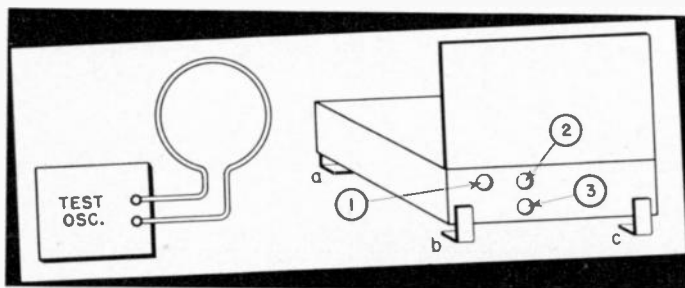


Fig. 5. Simple alignment jig for use in conjunction with midget loop sets.

Of the newer f-m sets, the Zenith chassis 10A3R is considered here because it represents a trend in design which will undoubtedly be found in many other f-m receivers. The converter, i-f, limiter and discriminator stages are shown in simplified form in Fig. 4. Note that two limiters are employed; a departure from earlier designs which used but one. Also, no avc is used. Some earlier f-m receivers did employ avc, though it was realized that this feature was fundamentally unnecessary in an f-m receiver, simply because it provided more stable operation. Now it has gone by the way, and with it a convenient point of connection for an i-f output meter.

secondary and adjust the trimmer across the secondary of the discriminator transformer until the meter reads zero. If the circuit is mistuned the meter will deflect in either a positive or negative direction, therefore a zero-center meter is most convenient to use. When properly adjusted—and the secondary adjustment is quite critical—the slightest movement of the trimmer in either direction will cause a sharp change in the reading of the meter.

The primary adjustment is not so critical. It is made immediately following the adjustment of the secondary by connecting the meter across half the discriminator load, corresponding to the junction of

Set of the Month— ZENITH 4K600 "POKETRADIO"

WITH THE arrival of the outdoor season, interest centers around the battery-type transportable radios. Notable in this group is the Zenith Model 4K600 (Chassis No. 4B01) Poketradio, using the now well-known series of miniature tubes in an extremely compact unit.

The receiver has a tuning range of 540 to 1620 kc, and a power output into a 3 1/2" pm speaker of .160 watt. The loop antenna is built into the hinged lid of the cabinet.

The complete circuit diagram, parts values and socket voltages are given at the bottom of this page. The 1R5 converter is coupled to the 1T4 i-f tube and the 1T4 coupled to the 1S5 detector-amplifier by means of 455-kc i-f transformers having adjustable iron cores. Bias for the pentode section of the 1S5 is developed across the 15-meg resistor R6. Bias for the grid of the power tube is developed across the resistor R9 in series with B minus and ground. Control bias, derived from the diode circuit of the 1S5, is applied to the 1st detector and i-f tubes.



SERVICING

The stage gains to be anticipated are as follows: Loop to 1R5 converter grid—down 1/3 x at 1000 kc. Converter grid to i-f grid—49 x at 455 kc. Overall audio—317 x at .05 watt, 400 cycles.

All voltages are measured with a 20,000 ohms-per-volt meter from chassis to socket contact indicated, and are positive dc unless otherwise marked. Volume control

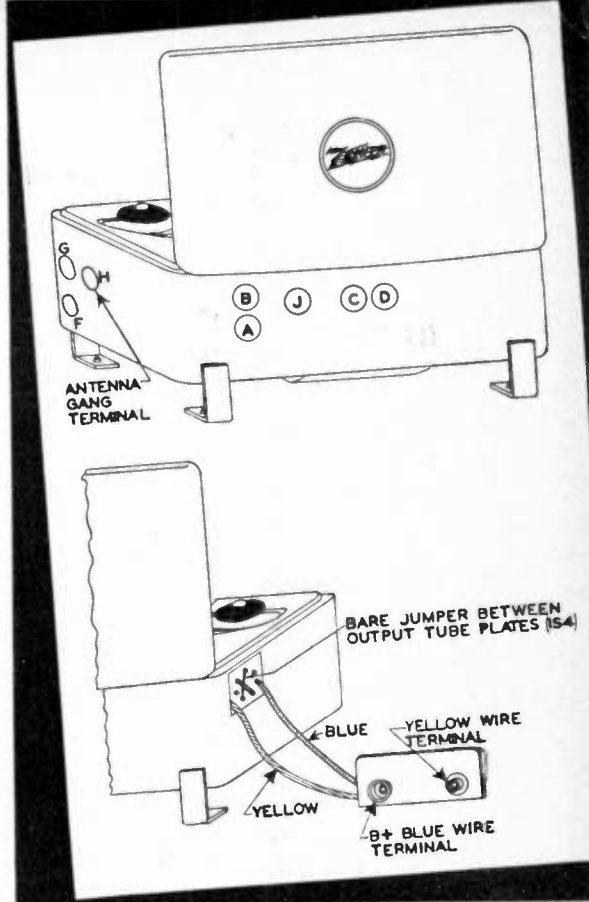


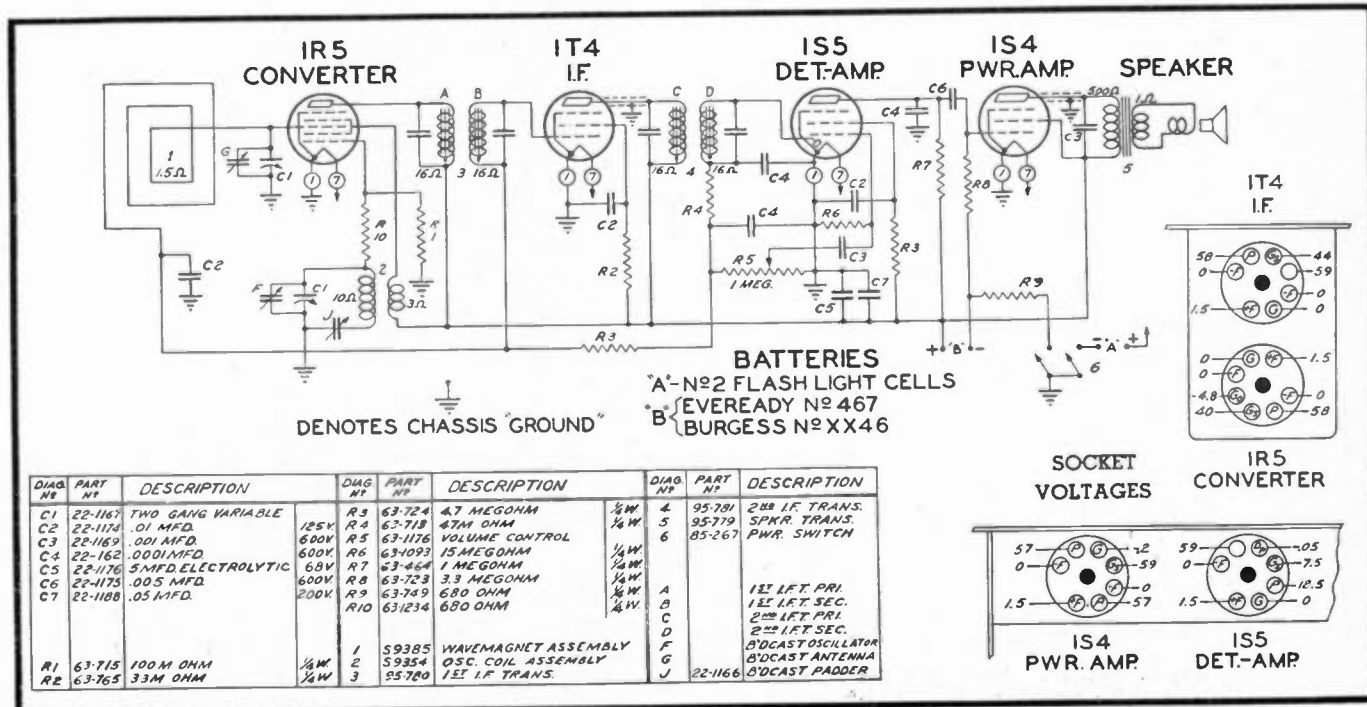
Fig. 1. Alignment jig and trimmer locations.

should be full on. Battery voltages are 67.5 "B" and 1.5 "A".

ALIGNMENT

Because of the compactness of the receiver, the following alignment procedure should be carefully followed, using a No. MS-652 Zenith Alignment Jig, to maintain actual shielding capacities during the balancing operations:

(Continued on page 23)



WILCOX-GAY RECORDIO SERVICING

IN ORDER to satisfactorily correct any variation in the speed of the turntable, which is usually evidenced by "wow" or a waver in the pitch of musical tones during the playing of records or home recordings, it is first necessary to determine the kind of speed variation encountered.

As the various types of turntable speed variation usually fall under two distinct classifications—**Intermittent variation and variation synchronized with turntable rotation**, the matter of diagnosis in any particular case of trouble is simplified.

INTERMITTENT VARIATION

It is important that the rubber rimmed intermediate drive wheels be kept clean and free from oil, to avoid slipping or irregular operation of the wheels. The drive wheel bearings are of Oilite Bronze and require no oiling to prevent wear, however, one drop of light lubricating oil may be applied to each drive wheel bearing if desired to "quiet" their operation.

All record shavings and other dirt particles that may have gotten under the turntable should be removed, as such foreign material may seriously interfere with the smooth operation of the mechanism.

If the drive wheels appear to slip, although the rubber rims and

Mechanical Adjustments And Repair Data On The Single And Dual Speed Recording Turntables

the turntable rim are free from oil, the tension of the drive wheel tension spring should be increased.

The round movable disc on which the dual drive wheel assembly is mounted, should be adjusted to a degree of tightness that affords minimum looseness of the assembly, at the same time maintaining entire freedom of movement. If the drive wheel assembly is allowed to tip while in motion, resulting in the drive wheels rotating out of the horizontal plane, the rim of the top wheel may ride high and intermittently touch the underneath side of the turntable.

The wire leads connected to the cutting head inside the recording arm should not be permitted to drag on the record or turntable, as this produces an intermittent braking effect causing the turntable to be slowed down, or to rotate with varying speed. Intermittent variation in turntable speed may also be due to a binding of the lateral feed screw bearing. An adjustment is provided on the gear housing of the feed screw assembly, to take up end play in the feed screw. When this adjustment is correctly made, only a very slight amount of end play should be perceptible;

however, it should be determined that this end play exists throughout the complete rotation of the feed screw.

SYNCHRONIZED VARIATION

If "wow" resulting from variation in the speed of the turntable is evidenced to be in the order of four times per turntable revolution, this would indicate a defect in the rubber rimmed drive wheel. The wheel may be out of round, or warped, or may have a flat spot or bump on the rubber rim.

If the "wow" is noticed to be once per turntable revolution, however, this would indicate some irregularity in the rim of the turntable. In handling, avoid bumping or dropping the turntable, as any pronounced dent in the rim of the table to throw it out of round will result in a very noticeable variation in turntable speed.

Running the finger tips lightly over the inside surface of the turntable rim will show up any irregularity sufficiently pronounced to produce "wow" in the recording or record reproduction. The bearing surface of the turntable rim does not necessarily have to be perfectly smooth, as the effect of minute irregularities of the surface are absorbed by the rubber rim of the drive wheel.

A badly warped record, either a home recording or commercial record, or one in which the center hole is worn or oversize, will tend to produce "wow" during its reproduction, and it is suggested that this be taken into consideration in investigating a complaint pertaining to waver or "wow" in record reproduction.

Ordinarily, recordings made on record blanks which are only slightly warped, will prove to be satisfactory. However, "wows" may be cut into the recording if the cutting head damper is incorrectly adjusted so that the felt damper bears against the cutting head with too much pressure.

To correctly adjust the Cutting Head Damper, proceed as follows:

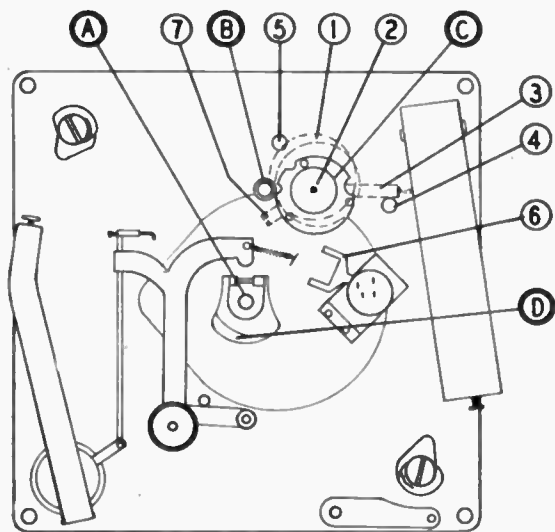


Fig. 1. Points of lubrication and adjustment on motor-turntable assembly. Pickup at left, cutter at right.

1. Turn the adjusting screw to the right so that no pressure is exerted on the cutting head by the felt damper.

2. Raise the recording arm to a rear vertical position so that the stylus screw is midway in the slot in the front end of the arm. Observe that when the stylus screw is moved to one end of the slot and released, it will move back and forth a few times, before coming to rest in the center of the slot.

3. Turn the damper adjusting screw to the left until, when the stylus screw is moved to one end of the slot and released, it will return to a midway position and stop. The tendency to continue moving back and forth has been eliminated.

In order to determine if "wow" is actually "cut" into a home recording, or if a variation in turntable speed exists during all functions of the turntable, first play an especially selected regular phonograph record, known to be entirely free from "wow." If the record plays satisfactorily, but "wow" is noticed in playing home recordings made on the same instrument, this gives evidence of the existence of some mechanical fault in the recording mechanism. As previously

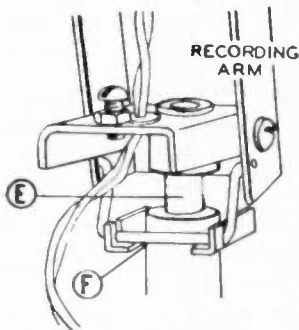


Fig. 2. Points of adjustment on recording arm.

pointed out, the cutting head leads may be dragging on the record or turntable during recording, or the rubber rimmed drive wheel may slip at the point of contact with the motor pulley or the turntable rim. Although the drive wheel tension may be sufficient to provide unvarying speed of the turntable during the playing of records, the greater power demand placed upon the power source during recording, due to the work involved in cutting the record groove, may cause the drive wheel to slip.

MOTORS

Dynamic Balance: All Recordio motors employed in dual-speed

models are now dynamically balanced by the motor manufacturer, and such motors have an identifying red dot on the bottom of the motor rotor. Thorough investigation indicates that the use of dynamically balanced motors eliminates all possibility of recorded flutter due to motor vibration. Prior to the use of dynamically balanced motors, all motors were passed through a very rigid vibration test to insure satisfactory performance from this standpoint.

Motor Shaft Sticks: In some of the early production units, sufficient vertical end play in the motor shaft existed to allow the lower end of the shaft to enter the motor bearing if the unit were subjected to rough handling during transportation. This sometimes caused the shaft to stick in the bearing, resulting in failure of the motor to operate when turned on. In the event a tight shaft is encountered, it may be freed in the bearing by lightly tapping the end of the motor shaft.

In motors of more recent production, a fibre washer is placed on the motor shaft to take up a sufficient amount of end play so that the shaft cannot become stuck in the bearing.

Oiling: When the Recordio leaves the factory, the equipment is properly lubricated and requires no immediate attention.

Frequent oiling of the recording mechanism is not required, although the use of a small amount of oil judiciously applied about once a year, in accord with the following directions, will suffice to maintain the equipment in good order.

Remove the turntable by applying upward pressure at the rim of the table, at the same time lightly tapping the top of the turntable spindle with a small tool.

Lift the dual drive wheel assembly from its mounting.

Lubricate the oiling positions indicated in Figs. 1 and 2, using only two or three drops of electric motor oil at each position, unless otherwise specified. The points are: **A**—Turntable shaft bearing; **B**—Upper motor bearing; **C**—Between drive wheel mounting disc and bed plate; **D**—Place a coating of petroleum jelly in the lip of the master cam; **E**—Recording arm pivot post; **F**—Pivot post straddle plate slot.

Carefully apply one or two drops of oil to each drive wheel bearing, so that the oil will not run on to the rubber rims of the wheels.

The lower motor bearings may be lubricated by application of oil to the felt wick surrounding the lower end of the motor shaft.

REPLACING DRIVE WHEEL

Replace dual drive wheel and turntable as follows: Referring to Fig. 1, place the dual drive wheel assembly (1) on the pin in the center of the movable mounting plate (2). The shift lever (3) of

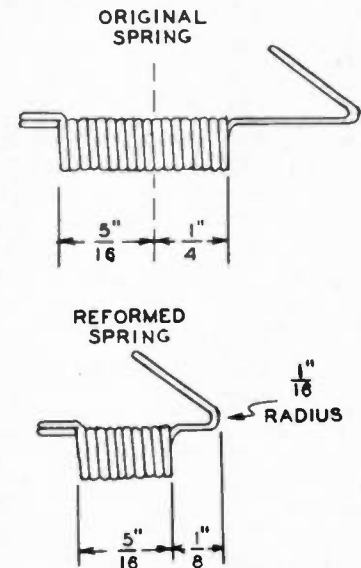


Fig. 3. Original and reformed intermediate drive-wheel spring.

the wheel assembly should be positioned against the stop pin (4) as shown in the drawing. Likewise, the switch arm (6) should be positioned as shown so that the switch actuating finger (7) will engage in the wide slot of the switch arm (6) as the shift lever (3) is moved between the stop pins (4) and (5).

Place the shift lever (3) against stop pin (5) so that the switch arm (6) is moved to the position opposite that shown in the drawing.

Carefully lower the turntable on the spindle. It will be observed that one of the rubber rimmed drive wheels protrudes beyond the rim of the turntable. With the finger tips, press the drive wheel into position so that the rubber rim of the wheel bears against the inside surface of the turntable rim.

Rotate the turntable by hand, permitting the key pin of the turntable spindle to engage the key slot in the turntable hub.

WOW IN MODELS A-93, A-94

If recorded "wow" is encountered in dual-speed recorder units No. 55-2020 of the automatic rec-
(Continued on page 21)

CIRCUIT COURT

REDUCING BIAS

Speaking of biasing methods, as we did last month, in the Portfolio, Fig. 1 is of interest. This shows a clever way of reducing a negative bias. The cathode current of the 117N7GT is utilized to operate the filaments of the four battery-type tubes, producing a total voltage drop in the cathode circuit of 5.6 volts. The grid requires a negative bias of 5.2 volts. To reduce the voltage, R1 is connected from cathode to grid. The total bias voltage is then impressed across R1 and R2 in series and the voltage at the junction of these two resistors, to which the grid is connected, depends on the ratio of R1 to R2. With the values given, the

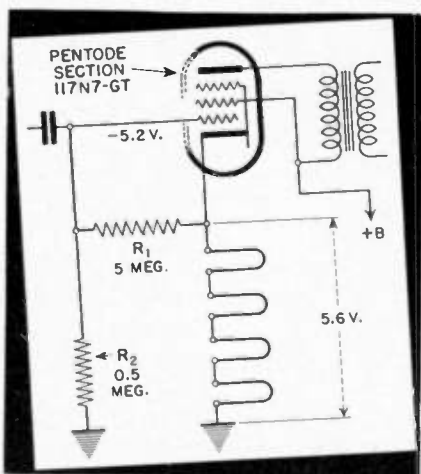


Fig. 1. Cathode-driven filaments.

voltage is reduced to approximately 5.2 volts, the proper value.

LOOP COUPLER

In Model 12X and some other receivers produced by RCA Victor, a permanently-connected antenna transformer is used in conjunction with the loop for optimum signal transfer when an external antenna is employed.

As shown in Fig. 2, the antenna transformer L2 consists of a high-impedance primary and a low-impedance secondary. The latter, of only a few turns, is connected in series with the loop and forms a part of the overall loop inductance.

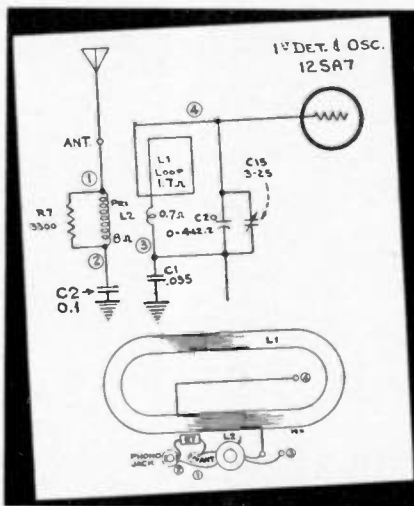


Fig. 2. Details of RCA loop coupler.

Coupling between the primary of the antenna transformer and the loop proper is kept at a minimum by mounting L2 at right angles to the loop, as shown in the sketch; yet sufficient signal coupling exists by virtue of the small secondary winding.

6SF7 CIRCUIT

As outlined in RCA Application Note No. 112, the 6SF7 is particularly useful as an i-f amplifier and detector. In this use, the pentode plate of the 6SF7 is coupled to the diode plate through a tuned i-f transformer, such as in the manner shown in Fig. 3. The a-f output circuit of the diode detector is conventional.

This arrangement has the important advantage, among others, of eliminating the familiar problem of "play-through," a condition encountered when the diode detector and the first a-f amplifier are in the same envelope and have a common cathode. "Play-through" ordinarily results from capacitive or electronic coupling between the diode plate and the first a-f amplifier. It occurs, regardless of the volume-control setting, because the internal coupling may transfer either the i-f voltage or the a-f voltage present at the plate of the diode to the a-f circuit. If the a-f system can feed back to the r-f or i-f circuits, the presence of i-f

currents in the a-f system may result in other spurious effects such as regeneration or oscillation, and may produce "birdies" when the r-f signal frequency is a multiple of the intermediate frequency. When the 6SF7 is used as the i-f amplifier and the detector, the fundamental cause of such spurious effects is eliminated because i-f voltage cannot reach the a-f tube and because the a-f voltage delivered to the a-f tube can be only that delivered by the volume control. The elimination of "play-through" effects also makes it possible to use the a-f system for phonograph reproduction or similar services, such as mike recording, without the necessity of making the r-f system inoperative by detuning it or by removing voltages from it.

When the 6SF7 is used as the i-f amplifier and diode detector, a desirable tube complement for a receiver with push-pull power output could be a 5Y3G rectifier, 6SA7

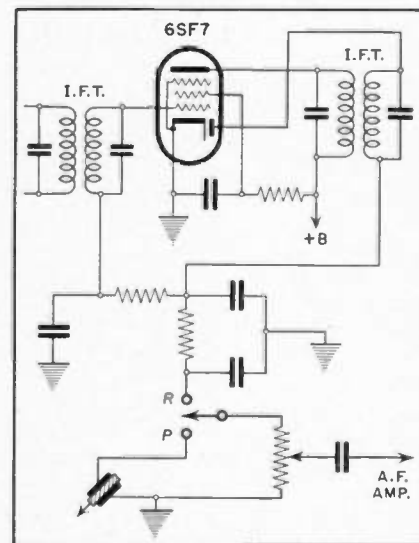


Fig. 3. A 6SF7 used as i-f amplifier and detector.

converter, 6SF7 i-f amplifier and diode detector, 6SC7 phase inverter, and two 6K6GT's in push-pull.

Another use of the 6SF7 as the i-f amplifier and diode detector is found in receivers employing a degenerative audio output stage. In these, a separate first a-f tube can be used which may be either a 6SJ7 or 6SK7. This arrangement

permits the use of a desirable method of inverse feedback, known as the "constant voltage type." It is accomplished by connecting a suitable resistor from the plate of the output stage to the plate of the first a-f stage. The success of this method is much enhanced when the first a-f stage utilizes a pentode having high plate impedance, instead of a triode with its relatively low plate impedance, because the plate impedance shunts the plate load. A low effective value of plate load leads to difficulties in obtaining an adequate degree of feedback.

FIELD-TRANSFORMER

There is nothing out of the ordinary about the circuit shown in Fig. 4 until it is made known that the speaker is of the electrodynamic type. The question then arises, Where is the field coil?

This is a portion of the circuit of the Zenith 5-tube receiver Model 5D610 (Chassis No. 5B01)—and the answer is that the primary, L, of the output transformer also functions as the speaker field.

Actually, a combined speaker and output transformer is used. The field, L, has sufficient impedance to act as the primary of the output transformer, and by the simple process of applying a voice coil winding over the field, an output arrangement results.

Though the performance of this arrangement is probably not quite up to a regular transformer and separate field (there being a slight sacrifice in power output), the idea may well find common use in the cheaper sets due to the inevitable scarcity of p-m speakers caused by the ear-marking of high-permeability alloys for national defense projects.

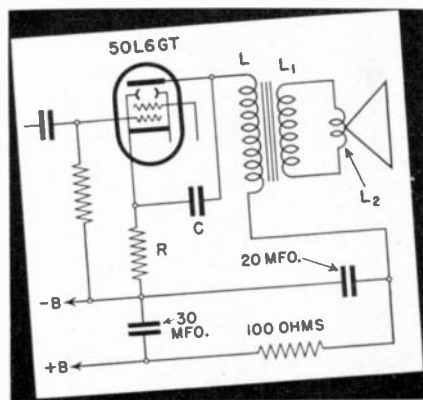


Fig. 4. Speaker field and transformer combined.

FOUR-WAY TONE

What might be termed "two-way tone controls" are employed in the Hallcrafters Model S-31A High-

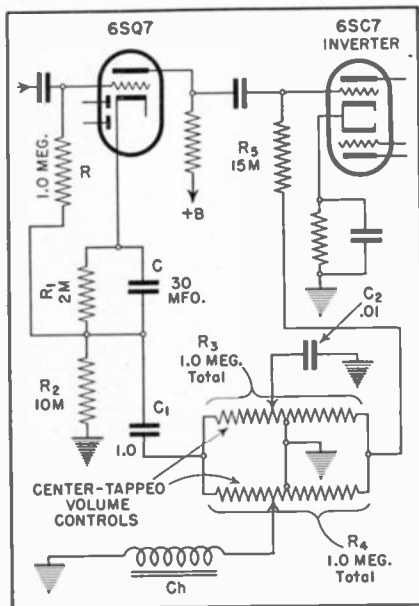


Fig. 5. Four-way tone control.

Fidelity Amplifier. One control provides either bass boost or bass attenuation; the other control offers treble attenuation or boost. Thus, four directions of control are available.

The portion of the circuit involved is shown in Fig. 5. The bass control consists of the 1-meg. center-tapped potentiometer, R4 and the audio choke Ch. The treble control consists of the 1-meg. center-tapped potentiometer R3 and the .01-mfd condenser C2.

There are a few points to be observed before analyzing the operation of the circuit. First to be noted is the presence of inverse feedback in the cathode circuit of the 6SQ7 triode. Bias for the grid is provided by the voltage drop across the 2000-ohm resistor R1. Since this resistor is bypassed by the 30-mfd condenser C, no inverse voltage is developed across this resistor. Instead, the inverse voltage is developed across the (substantially) unbypassed 10,000-ohm resistor R2. The d-c voltage developed across this resistor does not contribute to the grid bias because the d-c grid return is not to ground, but to the mid-point of R-1 and R2, through the grid leak R.

Now note that the center taps of the tone controls are grounded. Hence, the resistance in the grid circuit of the 6SC7 input triode is the sum of R5 plus half of R3 and R4 in parallel. The other

paralleled halves of R3 and R4, plus the condenser C1, are in shunt with the cathode resistor R2.

The inherent frequency characteristics of the amplifier prevail when both the controls are so set that the arms are at the center-tapped points. Moving the upper, treble, control arm to the right progressively attenuates the high frequencies since the condenser C2 then functions as a bypass to ground. Moving the same arm to the left of center tap places C2 in shunt with the left halves of R3 and R4, thus increasing the shunt capacity across the cathode resistor R2. Since this will serve to bypass the higher frequencies around R2, there will be less degeneration at these frequencies, resulting in the equivalent of a boost in treble response with respect to the lower frequencies.

Moving the lower, bass, control arm to the right places the audio choke Ch in shunt with the right halves of R3 and R4. Since the reactance of Ch is low at the bass frequencies, it functions as a bypass and serves to attenuate the bass response. Moving the same arm to the left places Ch in shunt with the left halves of R3 and R4. This will tend to bypass the lower frequencies around resistor R2, thereby attenuating the feedback voltage at these frequencies, and providing what is substantially a boost in the bass response.

OUTPUT STABILIZER

The type of inverse feedback as developed by an unbypassed resistor in the cathode circuit of a

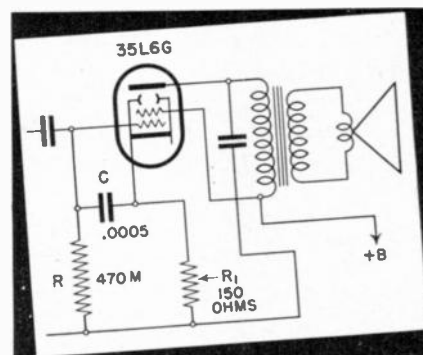


Fig. 6. Circuit stabilizer.

beam-power output tube, not only flattens the response characteristic and reduces certain types of distortion, but also gives rise to a large increase in the plate resistance of the tube. This rise in plate resistance promotes insta-

(Continued on page 21)

Shop Notes

EMERSON FU-424,-427,-428 Rectifier Tube

These three-way portables employ a 117P7 beam-power and half-wave rectifier tube. Should the occasion arise, the 117P7 may be replaced by a 117N7.

FARNSWORTH BKR-84 Recording Howl

The cutting head connecting lead should be kept as short as possible, and in the clear, free from other connecting leads and wires. If any microphonism or audio feedback is encountered during recording, which manifests itself in the form of a howl or whistle in playing the record, grounding one side of the voice-coil circuit will usually correct the condition.

RCA R-93F RECORD PLAYER Motor Data

Two types of synchronous motor-turntables are used in the R-93F and similar record players, as shown in Figs. 1 and 2. Smooth starting and running will be insured by keeping the bearings well cleaned and oiled.

Hum and Vibration: A small amount of hum when starting, decreasing to a negligible amount when running, is normal. If excessive vibration occurs, it may be due to: 1) Insufficient lubrication, or any failure that will cause binding. 2) Leather washer not oiled. (Check to make sure that the leather and steel washers are arranged in proper sequence, as shown in the drawings.) 3) Motor not properly fastened in cabinet. 4) Burrs on poles of rotor or stator. 5) Slight eccentricity of rotor or spindle. 6) Loose laminations of the stator. 7) Improper horizontal alignment of the rotor and stator (pertaining only to the type motor shown in Fig. 1). Correct

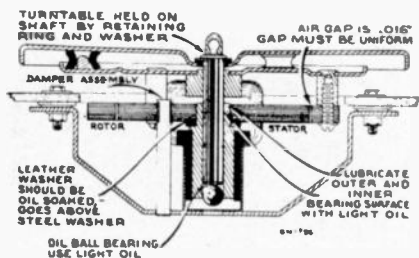


Fig. 1

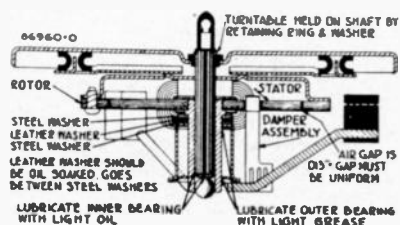


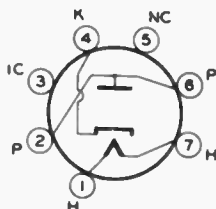
Fig. 2

horizontal alignment is as shown in the motor assembly drawing. The position of the stator is raised or lowered by adding or removing washers below the leather washer. In the type motor shown in Fig. 2, no adjustment is necessary because correct horizontal alignment is provided by the design of the motor.

The damper spring must fit without binding or chattering, in the slot in the stator. The stator must be free to deflect in either direction between the limits of the damper spring. Any binding in the washers or stator bearing which prevents the movement of the stator may cause speed variations in the motor. The damper spring must exert equal force in restoring the stator to its mid-position when the stator is deflected manually in either direction.

RCA 45Z3 TUBE

The 45Z3 is a miniature, half-wave high-vacuum rectifier of the heater-cathode type. Designed specifically for service in a-c/d-c/battery-operated portable receivers it offers the advantage of small size and low heat dissipation. Its heater requires



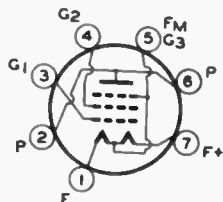
5AM

only .075 ampere at 45 volts and its output rating makes it capable of supplying rectified power for both filament and plate circuits in light-weight portables utilizing the miniature type tubes.

Socket connections are shown in the accompanying drawing.

RCA 3Q4 TUBE

The 3Q4 is a new, miniature-type, power amplifier pentode suitable for operation with 90 volts on plate and screen. It has a power output of 270 milliwatts with 7



7BA

percent distortion. The filament has a center tap which permits economical usage of this tube in series-filament arrangements with other miniature tubes.

Socket connections are shown in the accompanying drawing.

RCA MODELS 16T2, 16T3, 16T4 2nd Production Changes

In the 1st Production of these models, "A" band covers 540-1560 kc. In 2nd Production, the range is extended to cover 540-1600 kc.

Also in 2nd Production, the volume control is changed from .25 meg to 2 megs and the circuit is revised to isolate the control from the diode d-c current as shown in the accompanying sketches. This isolation reduces the possibility of controls becoming noisy. These changes should be made on any 1st Production receivers when this trouble is encountered.

WARDS AIRLINE 04BR-389T Voltage Readings

In order to prevent signal from acting upon the avc and affecting accuracy of voltage measurements, aerial and ground leads should be short-circuited while making measurements.

WILCOX-GAY RECORD PLAYERS Motor Lubrication

In record player and phonograph models in which the turntable shaft is driven directly through a reduction worm gearing housed within the motor assembly:

- 1—The motor should be demounted from the motor board.
- 2—Remove the three screws surrounding the turntable shaft.
- 3—Remove the shaft and worm gear assembly, and clean the assembly by washing in kerosene or other grease solvent.
- 4—Wash out the worm and gear housing of the motor assembly in a similar manner.
- 5—Make an application of 600-W motor lubricant to both the worm and gear, and place a small quantity of the same lubricant in the gear housing.

Note: An oil hole is provided on some of the motors in these models, so that lubricant may be added, however it is better to follow the above procedure especially in cases where the increased power demand placed upon the motor, because of a "dried out" condition of the lubricant, has become great enough to cause a noticeable reduction in turntable r.p.m.

Motors used in those models in which the turntable is rim-driven through an idler wheel, may be lubricated as follows:

- 1—Remove turntable.
- 2—Apply several drops of electric motor oil to the side of the motor shaft, allowing the oil to run down into the upper bearing.
- 3—Oil the idler wheel bearing, using only one or two drops of the oil so that it will not run out onto the rubber rim of the wheel.
- 4—Oil the turntable spindle bearing.
- 5—The lower motor bearing may be lubricated by saturating the felt wick which surrounds the lower end of the motor shaft.

Note: Electric motor oil may be procured at any automobile service station.

CIRCUIT COURT

(Continued from page 19)

bility and, on occasion, oscillation.

In the Zenith Model 6D516 (Chassis No. 6A24) a desirable reduction in high-frequency response and the insurance of circuit stability is brought about by connecting a small capacity, C, from grid to cathode, as shown in Fig. 6. This is a good stunt to keep in mind, and worth trying on unstable midgets.

RECORDIO

(Continued from page 17)

ord changer type used in equipment bearing serial numbers prior to 624010, a correction may usually be effected by increasing the tension of the intermediate drive wheel spring.

To accomplish this, proceed as follows:

1. Remove turntable and intermediate drive wheel assembly.

2. Remove recorder-changer unit by removing the four mounting screws, and disconnecting cables with plugs, from Recordio chassis.

3. Place recorder-changer unit on the work bench, tilted to a position that provides easy access to the under side of the unit. Do not place unit in an upsidedown position, as the record spindle may be sprung or bent.

4. Remove the intermediate drive wheel spring, and make alterations to the spring in accord with the specifications given in Fig. 3.

5. Remove twelve turns at the hook end of the spring. Straighten out three turns of the coil spring, and form a new hook so that the bend in the hook is only $\frac{1}{8}$ " from the coiled spring. Do not make a sharp bend in forming the hook. Instead, form a $\frac{1}{16}$ " radius as shown in the drawing.

6. Before replacing the spring in the unit, remove the burred or ragged edge of the hole in the base plate, through which the pin protrudes for attachment of the loop end of the spring.

7. After the spring has been installed, and the unit restored to the cabinet, the intermediate drive wheel assembly and turntable should be replaced in accordance with the directions given in the Operating Instructions.



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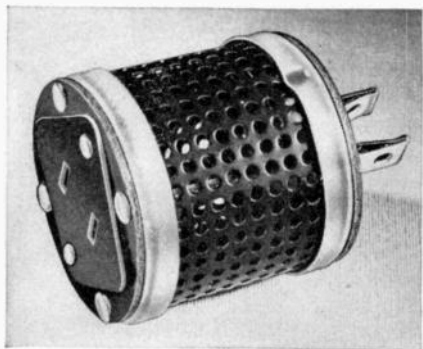
NEW PRODUCTS

OF THE MONTH

CLAROSTAT

Voltage Regulator—The automatic line-voltage regulator—a handy plug-in unit inserted between power cord and electric outlet—is being used as a lightning protection fuse in the Middle West and other localities subject to severe electrical storms.

It seems that the main lightning threat is over long, overhead and therefore exposed power lines, in severe electrical storm localities. The heavy induced charge travels over the line and gets into the radio set, causing serious damage. By inserting an automatic line-voltage regulator between set and outlet, however, the heavy induced charge is stopped short of the set, sometimes at the cost of a melted regulator serving as a fuse, but with no damage to the receiver. Meanwhile, of course, the usual lightning arrester is used to protect the set against any lightning bolt in the immediate vicinity of the aerial. The regu-



lator also serves to maintain the set voltages within satisfactory and safe limits. By Clarostat Mfg. Co., Inc., 285 N. 6th St., Brooklyn, N. Y.

ALLIED

Paging System—Special Industrial Paging System for factories, hotels, transportation terminals, etc., consisting of a Knight 30-watt amplifier, with tubes and volume-level meter, Shure crystal mike, 25-ft. mike cable and switch, desk-type mike stand, 4 Jensen 8" pm speakers with transformers, each



mounted in a Kainer steel projector baffle with wall-mounting brackets. By Allied Radio Corp., 833 W. Jackson Blvd., Chicago.

PARAMOUNT PRODUCTS

Electric Tool—The "Whiz" Electric Tool for drilling, grinding, sharpening, sanding, polishing, sawing, shaping, etching, engrav-

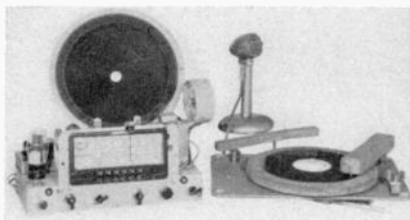
ing, carving, etc. Has heavy-duty motor; operates on any 110-volt a-c or d-c line; triple geared for extra power; ball-bearing thrust. Pistol grip handle; toggle switch



which can be operated with same hand as used for holding tool. Large fan in motor provides efficient cooling system. Die-cast alloy frame; unit weighs only 3½ lbs. Three-jaw coil spring universal type chuck takes all sizes up to ¼" capacity. Measures 7⅝" by 6" and comes complete with chuck, rubber cord and plug. By Paramount Products Co., 545 Fifth Ave., New York, N. Y.

HOWARD

Replacement Chassis—Ten-tube chassis for semi-professional recording and for installation in old or custom-built cabinets. The receiver has tuned r.f. on all bands and two i-f stages. Tunes three full bands to 13 meters. Records radio programs direct from air, from mike, or mike and radio programs can be mixed and faded. A



separate channel is provided for connecting an extra pickup and turntable, and records can be dubbed electrically. Mike can be mixed and faded while dubbing record. Supplied with 12" Jensen dynamic speaker, Astatic crystal mike, cutting arm and pickup and all necessary hardware. Maximum output, 11 watts. By Howard Radio Co., 1731 Belmont Ave., Chicago.

RADEX

Station Finder—Model B2 battery-operated signal generator covering the broadcast band. Calibration sufficiently accurate for all ordinary purposes. Provision made for personal calibration by zero-beating against broadcast station signal. Weighs 4¼ lbs with batteries and measures 6½" x 4½" square.

"Pocketracer"—An r-f and audio signal source of the multivibrator type for quick

analysis of circuit troubles. Generates a universal frequency which can be used for alignment or test purposes. Uses single penlite type flashlight battery. Current consumption only 150 ma. Easily carried in pocket. By Radex Corporation, 1733 Milwaukee Ave., Chicago.

LAFAYETTE

Utility Amplifier—Model 451-T, priced between the economy and de-luxe classes. Has 32 watts normal output, 45 watts instantaneous. Inputs for two mikes and two pickups with provision for mixing and fading the two mikes and either phono input. Overall gain, 120 db; phono channels, 92 db. Individual bass and treble equalizers and master mike gain control. Universal output transformer for loads of 2,



4, 8, 16, 50 and 500 ohms. Field supply for two 2500-ohm speakers. Optional feature is Type 566-P volume indicator meter.

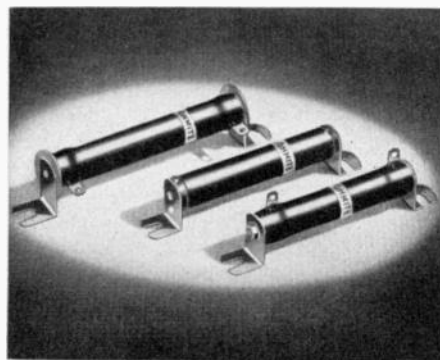
Finished in gray crackle with chromium bands, satin steel and black panel. Measures 9" x 17½" x 9". By Lafayette Radio Corp., 100 Sixth Ave., New York, N. Y..

OHMITE

Live & Dead Bracket Resistors—Ohmite wire-wound vitreous-enameled resistors are available in "live" bracket and "dead" bracket types for special applications.

The live bracket types have flexible leads connected to tin-plated brass brackets. They are designed for mounting and making electrical connection by bolting the slotted brackets to panel terminals. The dead bracket types are mounted by bolting to the brackets. Electrical connections are made separately to the lugs. By Ohmite Manufacturing Co., Dept. 10, 4835 Flournoy St., Chicago.

(Continued on page 33)



SERVICEMAN'S DIARY

(Continued from page 8)

She turned toward me, looking dreamy and languorous.

"What, I wonder, are you thinking of?" she murmured.

"You'd never guess," I answered. "But I'll tell you. I was thinking how wonderful it would be if I could sell the commodore of the club a record changer and a public address system."

"Yes," she sighed, "I thought it would be something like that. Radio is such a romantic occupation."

When I got back to the shop it was almost time to close up. Jerry welcomed me as expected.

"Where do you come off to leave me stuck in this place all day while you run off to a yacht?" he demanded.

"I spent most of the time in the sun on the beach," I murmured.

"Who's a—" He got red with anger.

"Wait!" I interrupted. "I'm not calling you names. I was working."

Then the phone rang. Could we bring down a record changer and a p-a system, like the one I had described to the commodore's daughter—and soon? I assured the owner of the voice at the other end that we could and would. Jerry listened.

"Sorry," he said, "I guess I didn't understand."

"No," I told him, "you didn't. You didn't appreciate how hard I worked for that order, how many pairs of shoes I wore out tramping over to the Yacht Club. And the terrible women I had to be nice to. You don't appreciate those things —"

He didn't. He walloped me one on the head.

"Lucky bum!" he muttered.

POKETRADIO

(Continued from page 15)

First remove back of receiver, then the "B" battery (but not the "A" batteries). Then remove the case of the receiver. This is done by first placing the receiver on the bench with the lid down, placing a screw driver under the spring clips and prying up, at the same time pulling the case away from the chassis. After the spring clips have been released, the case can be lifted off the chassis. Next remove the clips by turning and pull-

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ing away from the chassis. Then place chassis in Alignment Jig, as shown in Fig. 1.

Connect one lead from the output meter to the bare jumper connecting the plate leads of the 1S4 output tube, and the other output meter lead to B + (blue wire) at the battery. Keep signal from test oscillator at minimum so that the avc action will not give a false peak.

As the first operation, connect test oscillator to the 1st detector grid through a 0.1mfd condenser,

making the connection at H, shown in Fig. 1. Set oscillator to 455 kc, set receiver dial at 1600 kc and adjust the i-f transformer trimmers A, B, C and D for maximum.

Proceed by connecting the test oscillator to a radiating loop, which may be a Zenith No. S9434, or one turn, approximately 10" in diameter, made from the signal generator leads. This loop is employed for all the remaining operations and should be loosely coupled to the loop in the receiver lid.

As the next step, the test oscil-

lator and receiver dial should be set at 1600 kc and the oscillator trimmer F adjusted for maximum. Then set oscillator and dial to 600 kc and, while rocking the gang condenser, adjust padder J for maximum tracking.

Wind up by setting test oscillator and receiver dial to 1400 kc and adjusting trimmer G for maximum antenna peak.



INDUSTRIAL SOUND

(Continued from page 6)

trouble during the several months in which the system has been in operation.

These same considerations influenced the selection of midget type marine speakers for all locations except the office, where an 8" p-m unit in a standard wall baffle is employed.

WIRING

The 200-ohm microphone line consists of a two-conductor, lead-covered cable. Such cable combines the advantages of shielding with high proof against moisture, etc. It is of incidental but important interest that this cable is thoroughly insulated from contact with pipes, conduit and other metal bodies and is grounded at only one point. More than once serious trouble in such circuits has been encountered due to unintentional grounding at two or more points.

The installation of the speakers was simplified by the use of the same wiring originally installed for the gongs of an earlier signal system. This wiring was in rigid conduit and proved ideal for the speakers.

Although each department has a microphone and loudspeaker, feedback is avoided through judicious placement of these units and by taking advantage of the partially directional characteristics of each.

Strangely enough, the amplifier is mounted high up on the wall of one of the departments. The reason for this is that floors and the lower walls are washed down frequently to clear them of precipitates formed by the chemicals in the air. By the simple expedient of mounting the amplifier far out of reach of these activities the chances of an occasional "shower bath" are eliminated.

1942 ? FACTS

About Next Year's Models!

FACT 1. It takes a long time to build a really GOOD test instrument—to get the "bugs" out—to prove, and improve, its performance and reliability. Then—when it's REALLY good—why change?

FACT 2. Today's SUPREME Instruments are as modern, as accurate, as dependable as test equipment can be built.

FACT 3. That is because SUPREME believes in, and practices, a policy of continuous improvement instead of just "putting a new coat of paint on an old chassis."

FACT 4. A new SUPREME model is never announced until progress in radio has developed a definite need for such an instrument.

FACT 5. Therefore, SUPREME will announce NO "new" models at the June radio show. Which proves that SUPREME Engineers know their business—that they know, and are guided by, YOUR requirements.

FACT 6. SUPREME Test Equipment for 1942 will be as it is now, your best buy, and "SUPREME BY COMPARISON!"

Write for SUPREME'S current catalog. It pictures and describes the instruments your Jobber has in stock NOW—for 1942. Due to present conditions, prices and prompt delivery guaranteed only until June 1st.



—and they'll be just as good next year as this!

JOE'S RADIO SERVICE

Still time to get your new SUPREME Book explaining a new servicing procedure that makes an ailing radio talk to you like a patient talks to his doctor. Only 35c to cover cost of printing and mailing.

A NEW SYSTEM OF DYNAMIC ANALYSIS

Send Coupon today or buy from your favorite parts jobber!

SUPREME

SUPREME Instruments Corp., Dept. SD2 Greenwood, Miss. Gentlemen: I enclose 35c. Please send me your new book referred to above.

NAME _____

ADDRESS _____

CITY _____ STATE _____

INSTALLATION PROBLEMS

It has been the purpose in the foregoing to bring out some of the unconventional conditions encountered in this installation because the unconventional in both application and installation details is likely to be the rule rather than the exception in industrial installations. This is one reason why such installations involve more careful planning in some respects, and why they are usually more in the custom-built class. Regardless of the peculiarities of any installation, however, its requirements can in almost every case be met by standard components. The special features are those involved in combining these standard units into a special whole and in planning the sometimes complicated details of the installation. These are definitely functions of the installation man. They make his contribution to the job more important, increase the selling price of the job and provide for him a greater portion of this price.

Coupling these facts with the rapidly increasing potential sales prospects offered by expanding industry, points to this as a field which the capable service-dealer soundman can cultivate to excellent advantage. It offers him more prospects and greater profits than ever before and, for the immediate future at least, is far less competitive than many other fields of sound application.

PORTFOLIO

(Continued from page 14)

Since these are low-priced sets, and because accurate alignment is more important in such sets than in others which have a larger reserve of sensitivity, anything which can be done to cut down the time required for accurate alignment is well worth while.

One method to accomplish just this is shown in Fig. 5. This setup is recommended by Zenith, particularly for their Poketradio Model 4K600, but the idea involved may be applied to other receivers similar in type. Note that the receiver is supported by (four) small metallic angles, labeled a, b, and c, which keep the proximity of the loop to the work bench about the same as that which maintains when the back cover is in place. The signal is fed to the receiver by means

of a loop connected to the signal generator attenuator, and no direct connection is made to the set. This loop may consist of one or more turns of insulated wire, such as No. 12, which is sufficiently rigid to be self-supporting.

With such an arrangement, adjustment of the oscillator and antenna trimmers may be accurately and quickly done. These trimmers are designated by numbers 1, 2 and 3 in the sketch, which are purely illustrative and do not represent the exact locations of these trimmers in any particular set.


NEW LITERATURE

Battery Guide. National Carbon Co. is offering a Replacement Guide, which tells at a glance what types of batteries are needed for any given portable set and helps eliminate the necessity for carrying large stocks of different type batteries. A card to National Carbon Co., Dept. RG, P.O. Box 635, New York, N. Y., will bring it.


Tube Booklet. RCA Transmitting and Special Purpose Tubes are covered in a 16-page booklet just released. It catalogs transmitting types, television tubes, oscillograph tubes, phototubes, acorn tubes, gas-

(Continued on page 27)

New!




**EASY-TO-INSTALL
DOUBLE-FLATTED
Type A SHAFTS**




IRC never rests on the oars no matter how far out in front it may be. That's why IRC engineers have been working to make "the easiest shafts to install" even easier to use on an even wider variety of installations.


Eliminate Inserts and Filing!




Shaft positioned in knob requiring $\frac{1}{32}$ " flat.



Shaft positioned in knob requiring $\frac{1}{32}$ " flat.

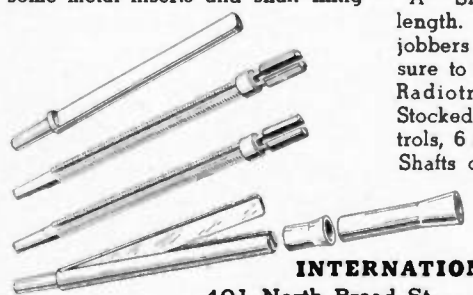


Shaft positioned for set-screw knob.



Only edges of shaft filed for odd types.

Now—in the new double-flatted Type "A" Tap-in Shaft for Type D Universal Controls—you have IRC's answer to simplified fitting for all knobs. Here's the end to bothersome metal inserts and shaft filing



for all $\frac{1}{32}$ " and $\frac{3}{32}$ " standard flats. Even the occasional odd type knob requires little more than a brush of your file on the edges of the shaft to make it fit. Moreover, Type "A" Shafts are easier to cut to length. See them today at your jobbers . . . and, at the same time, be sure to ask about the IRC Master Radiotrician's Control Cabinet. Stocked with only 18 Type D Controls, 6 switches and 5 extra Tap-in Shafts of special design, it covers 60% to 75% of all control replacement needs.

INTERNATIONAL RESISTANCE CO.
401 North Broad St. Philadelphia, Pa.

RADIO SERVICE-DEALER, MAY, 1941

25

PREPARE FOR BUSINESS!

Go to the Radio Parts National Trade Show

Stevens Hotel, Chicago • June 10-11-12-13

Business as Un-Usual . . . It's the order of the day . . .
Business based, not on the usual methods of demand
and distribution, but predicated on demand and
distribution, PLUS supply and production . . .

At the Trade Show, you'll rub elbows with thousands
of others in the Radio Parts Business . . . Suppliers, de-
signers, producers, merchandisers, distributors, from
every part of the country . . . from Canada and all the
Americas . . . all fired with enthusiasm and the will
to meet the day's problems squarely . . .

Come to the Show . . . It's timed so you can leave
your business. Soak up the zeal and the pep and
the ideas . . . It's a tonic that has no equal.

JOBBER DAYS

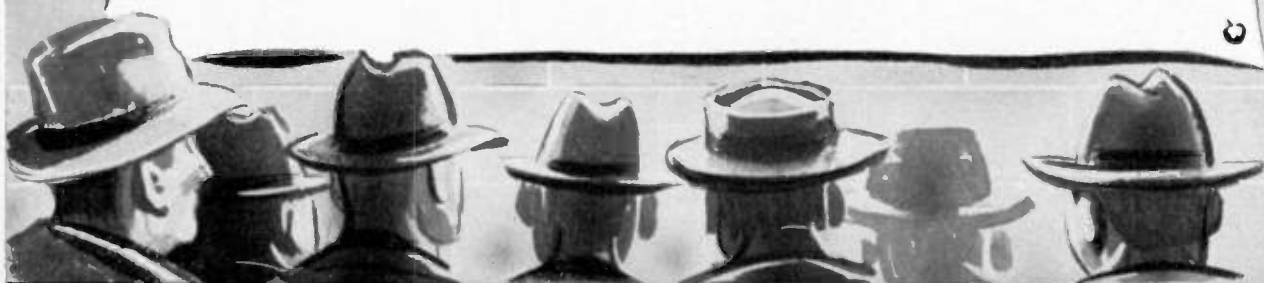
start at 2:00 p.m. Tuesday, June 10 and run to 6:00 p.m.
Thursday, June 12.

RSA SPECIAL PERIOD

Thursday, June 12, 6:00 p.m. to 10:00 p.m.

OPEN HOUSE

Friday, June 13, 11:00 a.m. to 8:00 p.m.



Radio Parts National Trade Show

*Sponsored by Radio Manufacturers Association and Sales Managers Club
Executive Office • 53 WEST JACKSON BOULEVARD • CHICAGO*

(Continued from page 25)

tubes, voltage regulators, and special amplifier tubes. Charts of phototubes and transmitting tubes facilitate selection of a tube type for a particular service or application.

Copies available from nearest RCA distributor or by sending 10 cents to Commercial Engineering Section, RCA Manufacturing Co., Inc., Harrison, N. J.

Antennas. Vertrod Manufacturing Co., 132 Nassau St., New York, N. Y., have issued a new catalog describing the company's line of broadcast, broadcast-short-wave, broadcast-short-wave-f.m., communications, and f.m.-a.m. antennas.

Replacement Chassis. Howard Radio Co., 1735 Belmont Ave., Chicago, has issued folder No. 105 listing a complete line of replacement chassis, including frequency modulation units and home recorders. Also available is folder No. 106 listing metal and paper base recording discs and needles.

Remote Controls. Bulletin No. 237 covering remote controls and kits for auto radios, has been issued by Crowe Name Plate & Mfg. Co., 3701 Ravenswood Ave., Chicago. The various kits and controls illustrated may be used in conjunction with most auto radio sets. The No. 700 controls are interchangeable on all cars, and with the proper panel kits a set can be moved from one car to another. Bulletin sent on request.

Capacitor Manual. Available on request is the new C-D Capacitor Manual for Radio Servicing for 1941. Over 300 pages of data pertaining to capacitor replacements in standard receiver models. The new edition covers all models brought out within the last year, plus data on some older models previously not available, and some new models not as yet on the market. Write Cornell-Dubilier Electric Corp., South Plainfield, N. J.

Data Sheets. Revised engineering data sheets on the many different types of Clarostat resistors, controls and resistance devices, gathered together in a loose-leaf binder, have been made available to design and production engineers, by Clarostat



Peter L. Jensen, Vice-President, Utah Radio Products Co., and O. F. Jester, General Sales Manager, look over the new Utah Catalog announced last month.

Mfg. Co., Inc., 285-7 N. Sixth St., Brooklyn, N. Y. Other data are available to servicemen.

Russ Diethert Co., 7910 Drexel Ave., Chicago, has been appointed rep. for Ken-Rad in southern Michigan, Toledo, and northern Indiana.

American Television & Radio Co., 300 E. 4th St., St. Paul, Minn., have released their Catalog No. 141 covering the complete ATR line of vibrator-operated and rectifier power supplies, including dc-ac inverters, A-battery eliminators, battery chargers, etc. Copy free.

United Radio Supply, 616 Main St., New Britain, Conn., have issued a 1941 Catalog of radio and sound equipment containing 265 pages. Copies free to amateurs, servicemen and dealers in the New Britain area.

FOLDERS

Ken-Rad Tube & Lamp Corp., Owensboro, Ky., has issued a folder titled, "Selling Helps for Ken-Rad Dealers," which illustrates the merchandising material available to Ken-Rad outlets.

(Continued on page 29)

DESIGNED FOR THE FUTURE



"PRECISION" Test Equipment is designed TODAY for TOMORROW'S servicing problems.

Design and Engineering effort concentrated EXCLUSIVELY in the development of BETTER BASIC TEST EQUIPMENT has produced an unmatched selection of apparatus truly magical in accuracy, performance, quality, workmanship and VALUE.

● FOR EXAMPLE — PRECISION SERIES 954 Combination Dynamic Mutual Conductance Type Tube Tester and 20,000 OHMS PER VOLT multi-range AC-DC Set Tester. Ranges to 6,000 volts, 60 Microamperes, 12 Amperes, 60 Megohms, 70DB, etc. . . . and the exclusive "PRECISION" anti-obsolescent tube analyzer circuit . . . a complete, compact, AM-FM-Television-Service laboratory.

ASK or WRITE for the PRECISION 1941 catalog describing Series 954 and more than 40 other instrument models. Prices start as low as \$14.95 . . . See them at your local distributor . . . INQUIRE ABOUT "Servicing by Signal Substitution".



PRECISION TEST EQUIPMENT

Standard of Accuracy

SEE THEM AT YOUR JOBBER

PRECISION APPARATUS COMPANY • 647 KENT AVENUE • BROOKLYN, N. Y.
Export Division: 458 Broadway, New York City, U. S. A. Cable Address: Morhanex



Moving...

WITH THE "SPIRIT OF YOUTH"



RADIO SERVICE-DEALER is young; just entering its second year. We're proud of our youth, proud that we haven't gotten into a rut or old-fashioned. We know it's our duty to our readers to maintain a staff out in the field working closely with service-dealers, soundmen and jobbers—making their problems our problems. No other serviceman's magazine has such a staff. We aren't satisfied with RSD. We'll continually strive to keep our readers best informed technically and otherwise. The radio servicing profession is becoming more complex as days pass by. The nation's best radio service-dealers subscribe to RSD, for we accept subs from only the best men in the profession. Join the growing ranks (now over 5,000 paid) and send us your subscription today. Use—and urge your associates to use—the coupon below.

This distinctive six-inch decalcomania lithographed in four colors (red, white, blue and gold) which will help your business, available FREE to all subscribers classified as Independent Radio Service-dealers on request.

-----TEAR OUT AND MAIL TODAY-----

RADIO SERVICE-DEALER

132 West 43rd Street, New York City, N. Y.

Sirs: Here is my check (or money order) for \$.... Enter my subscription order to RSD for the next issues. (12 issues cost \$2.—24 issues cost \$3.) Canadian and Foreign subscriptions are \$3 annually. The information given below is accurate. If my subscription is rejected I expect an immediate refund in full.

Name (print carefully)

ADDRESS FIRM NAME Est. 19....

CITY STATE YOUR POSITION

Please check whether firm is

- An independent servicing organization
- An independent service-dealer (engaged primarily in service work)
- A service-dealer (does servicing, but is primarily interested in retailing)
- Selling, renting or servicing Sound Equipment
- Jobber Any other classification
- Manufacturer (State it)

We stock the following checked items:

- TUBES
- PARTS
- RECEIVERS
- BATTERIES, etc.
- SOUND EQUIP.
- ELEC. APP'L'S.

We own the following instruments:

- V-T Voltmeter
- Tube Checker
- Analyzer
- Oscillator
- Signal Generator
- Volt-Ohm Meter
- Others
- MANUALS

I belong to a serviceman's organization Yes No

(Continued from page 27)

Hallicrafters offer a 12-page illustrated booklet titled, "A Short Story on Short-wave Radio Receivers" which discusses the advantages of the Communications type receiver for long-haul reception. Copy free. Address Hallicrafters, 2611 Indiana Ave., Chicago.

NATIONAL DEFENSE FRONT

Idea Clinic. The meeting place for men with ideas and businesses seeking new sales opportunities has just been provided with the inauguration of the sales-idea clinic, a department of the advertising agency of **Austin C. Lescarbourea & Staff, The Wordshop, Croton-on-Hudson, N. Y.**

"In connection with the present national defense emergency, industry needs new sales ideas as never before," states Lescarbourea, former Managing Editor of "Scientific American" and therefore well acquainted with inventors' problems. "Following the present rush of war business, most industries will need new things to make and sell, whereby to pick up the slack resulting from the completion of war contracts. Even today many plants have excess production capacity which they wish to put to work on new products that can be readily sold. With this situation in mind, I have inaugurated the sales-idea clinic.

"We welcome practical ideas or inventions that have an obvious market appeal. Gadgets, simple devices, and marked improvements on existing products, are preferred. Submitted items need not necessarily be patented, but patent protection is obviously preferable. Manufacturers are also invited to get in touch with us, stating their excess production capacity, the kind of things they would like to make, and markets now covered by existing sales setup."

The appointment of **William J. Halligan**, President of The Hallicrafters Company to **The Chicago Commission on National Defense** has been announced by Chicago's Mayor, Edward J. Kelly. Mr. Halligan served in the communications division of the Navy during the last world war and during the conflict was assigned to a mine layer operating in the North Sea. At the close of the War he attended West Point and is an active member of the West Point Club of Chicago.



Sam Poncher, Pres., Newark Electric Co., is presented with a portable bar at the announcement of his marriage. Left to right: W. S. Hartford, Sam Poncher, W. J. Halligan, Arthur Schmidt, and Sid Shure.

APPOINTMENTS

National Recording Supply Co., Hollywood, has been appointed by **Duotone Co., Inc.,** New York, as distributors for its line of phonograph and home recording equipment in Southern California.

Dulaney Distributing Co. has been appointed as wholesale distributors of **RCA** products in the Oklahoma City territory.

Gordon E. Gray has joined the sales staff of **Ralph M. Hill,** electrical manufacturer's representative, 1 N. Crawford Ave., Chicago. Mr. Gray was previously with **Sears, Roebuck and Ohmite.**

Andrew Nash has been appointed by **RCA Manufacturing Co., Inc.,** to handle parts jobber contacts exclusively within the state of California.

Philip J. Wood, formerly of the San Francisco office staff, will take over Mr. Nash's previous duties, with headquarters at Seattle.

Sylvania Service School. Southeastern radio servicemen, at meetings conducted jointly by Sylvania commercial engineers **George C. Connor** and **Frank D. Langstroth,** heard talks on deriving profits from service problems, the construction of the "lock-in" tube, and fluorescent lighting.

At meetings in Florida, **John Carter** and **Angus MacDonald** spoke on the future of fluorescent lighting.



All-Wave Antenna Systems




Terminals



Extension Cord



Replacement Cords



Indoor Aerial Wire



Ground Clamps



Lightning Arresters



Power Line Filters



Hook-Up Wire

Things to Take Along to Make a Good Connection

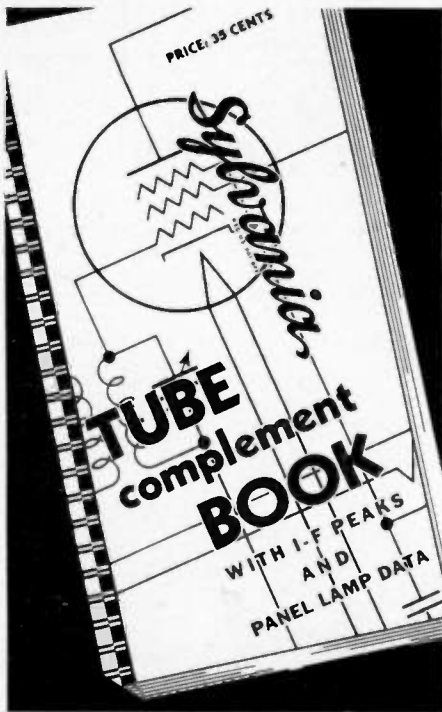
Good radio service usually requires more than tube replacement, which any clerk might handle. As a professional serviceman—you can easily find the other troubles that interfere with good reception. A new antenna, a power line filter, hook-up wire, or one of the many other radio wire accessories may restore that "brand new" set condition. Take them along—give satisfaction to your customer—get the real profits your knowledge of this business deserves.

You'll find these fast selling items and many more in the Belden radio wiring line. Make a good connection—buy Belden from your jobber.

Belden Manufacturing Company
4639 W. Van Buren St., Chicago, Ill.

Belden Wire

FOR GOOD CONNECTIONS



SERVICEMAN'S STANDBY

1941 EDITION . . .
NEW, IMPROVED
ONLY BOOK OF ITS KIND

272 Pages—16,730 Radio Models shown—including data on '41 receivers. Tube replacement information for 100,380 Tubes or Sockets. 586 Trade Names of receivers. Names and Business Addresses of 190 Receiver Manufacturers. Patented, Hold-Tite, Wire-O Binding.

The First and Only Compilation Of Panel Lamp Numbers

Every Radio Serviceman should own one of these Sylvania Tube Complement Books. All the information you'll need—from the oldest set, up to and including the latest '41 models—is packed into those 272 pages. And the book is bound by the WIRE-O process. It opens flat and there's no danger of it falling apart or of the pages pulling out.

This valuable compilation, the only book of its kind in the field, is one of the 125 silent salesmen Sylvania has created to help you build a sounder, more profitable business. Write today for Sylvania's Tube Complement Book, enclosing 35c in stamps or coins, and for a full list of the surefire, tested, dealer aids. Some are free and some are available at a very nominal cost—all of them are designed to help you sell more, and *make more!* Radio Tube Division, Hygrade Sylvania Corporation, Emporium, Penna.

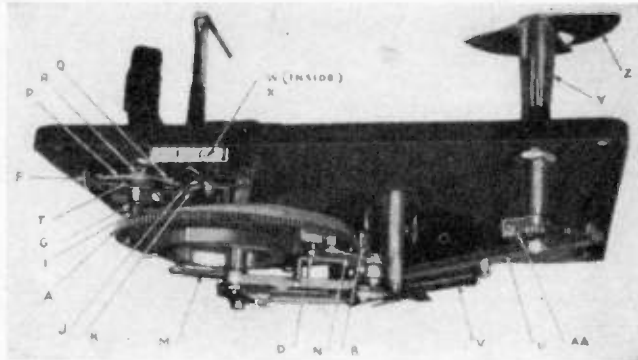
SYLVANIA

Set-Tested Radio Tubes

Also makers of Hygrade Lamp Bulbs, Hygrade Fluorescent Lamps and Miralume Fluorescent Light Fixtures

G. E. Model JM-1B Synchronous

Motor Automatic Record Changer



THIS SYNCHRONOUS motor automatic record changer is used in the General Electric Model J-1108, and is designed for operation on 110 volts, 60 cycles. Operation from 50 and 25 cycle sources is provided by a change in the motor assembly.

OPERATION

The turntable is driven through a friction drive wheel mounted on the motor housing. The drive motor bearing is lubricated from oil wells filled and sealed at the factory and should not require lubrication in the field.

The turntable is a press fit on the tapered spindle C; thus, to remove the turntable release the two setscrews on pinion B and lift the turntable and spindle assembly. Caution should be exercised not to bend the spindle.

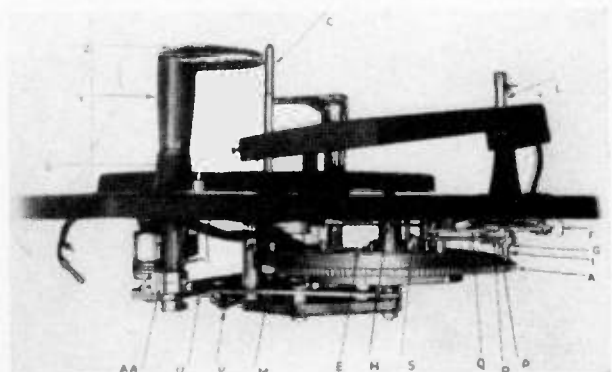
The changer mechanism is operated by the main cam A which in turn actuates all parts. The main cam A is engaged with the pinion B on the turntable spindle C by the

release of the starting dog D. The starting dog is released by the latch lever E when it is moved by the sweep assembly F attached to the tone arm pivot G, or by the control lever H.

The upper side of the main cam A raises and lowers the tone arm through the lift pin I and swings the tone arm by the sweep assembly F. A stud on the main cam A resets the 10-inch K and 12-inch J stop levers and throws the mixer assembly L to the clear position.

The lower side of the main cam A drives the record feed lever M and has a notch at one side which latches the main cam A in "home position" by engagement with the homing lever N.

The control lever H is operated by a stud in the control slide O. In the manual position one leg of this lever holds the starting dog D out of engagement. In the automatic position the starting dog D is permitted to fall into engagement but is reset by another part of the control lever H. In the reject position the control lever H engages the



Above and to the right are two views of the G.E. Synchronous Record Changer, with points of adjustment marked.

latch lever E, releasing the starting dog D.

The sweep assembly F carried on the tone arm pivot shaft G consists of, 1) positioning plate P which works against the stop levers J-K, 2) positive trip lever Q which strikes the latch lever E when the tone arm is swung toward center, and, 3) sweep lever R which engages the pawl S on the latch lever E moving the latter to release starting dog D when tone arm swing is reversed.

These three parts are held on a bushing held on the tone arm pivot shaft G by a clamp. Connection between the sweep lever R and the positioning plate P is by a horse-shoe spring T. This spring deflects when the tone arm swings in to complete change-cycle providing the "kick-in" force to enter the needle in the playing groove.

The record lever M on the underside of the main cam A drives the record feed link U through the relief spring V. This lever pulls on the spring in operation and rests against a stud in the record feed link U when at "home position."

ADJUSTMENTS

There are three adjustments that can be made; all are correctly set at the factory, and ordinarily need never be altered. Should it become necessary to remake any of these adjustments, due to accident or tempering, proceed as follows:

Adjusting landing position of needle on record: This can be made from above and does not require removing the record changer from the cabinet. Remove the button located at the right-hand side of the tone arm pivot and with a small screw driver rotate the slotted stud slightly. Clockwise rotation causes the needle to drop closer to the edge of the record while counter-clockwise rotation causes the arm to drop further in on the record.

Adjusting starting of change-cycle: This adjustment is made from above through a hole in the motorboard. Remove the button located to the left-hand side of the tone arm pivot and with a small screw driver rotate the slotted stud slightly. Rotate clockwise to start change earlier. Rotate counter-clockwise to delay the change.

Adjusting tone-arm height: If tone arm rise is incorrect, raise the tone arm and adjust the hexagon head screw which lift pin I strikes.

LUBRICATION

Vaseline or light grease should



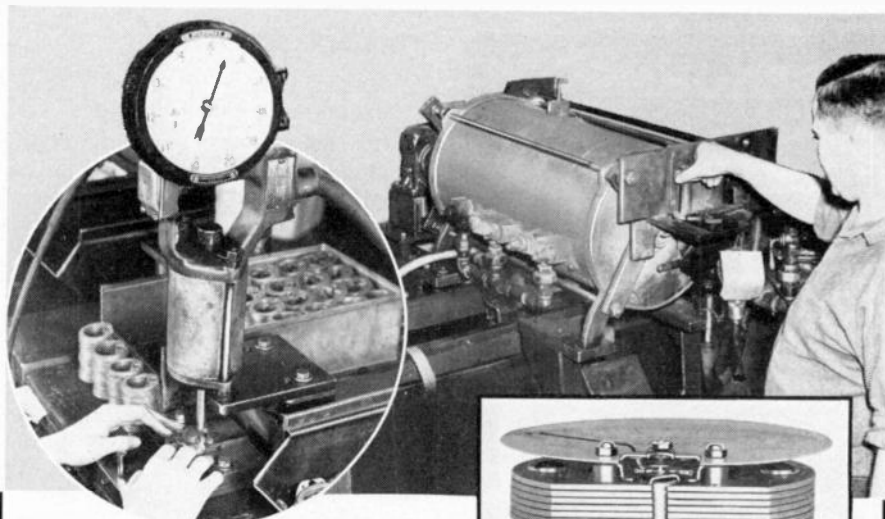
QUIET, PLEASE! GENIUS AT WORK!

Homer says that he didn't realize, prior to his connection with Burgess, that there were so many dealers needing his help. As an indication, look at all those

letters on (and around and under) Homer's desk. They are from dealers everywhere, wanting to know what battery fits what radio—and Homer tells 'em—and sends each dealer a copy of the "Burgess Replacement Guide to Portable Radios"—including the new Burgess "Quick Reference Price List".

They're both free for the asking. See your distributor or write to Homer G. Snoopshaw, B. R. S., c/o Burgess Battery Company, Freeport, Illinois.

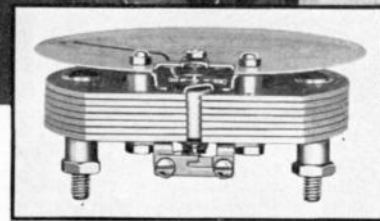
BURGESS
The Complete Replacement Line



It's got to be right

TO BE

TRIPLETT



Interior View of D.C. Movement... Double truss bridge protects against any vibration—insures permanent perfect alignment of bearing supports, and provides correct scale readings.

In every phase of manufacture, Triplett exercises rigid control over the quality of every part. In instrument manufacture, for example, heat-treating magnets the Triplett way, plus careful ageing, insures permanency. Following heat-treating, processing by special electric hammers insures initial uniformity and freedom against change. Triplett instruments have perfect alignment magnetically and mechanically, with the result that scale readings are linear and free from "curve error." That is why Triplett instruments have been recognized internationally for their precision, long life, and reasonable prices. That is why more and more people are standardizing on Triplett instruments, because they know—"It's got to be RIGHT to be Triplett."

Write for Catalog—Section 475 Harmon Avenue

THE TRIPLETT ELECTRICAL INSTRUMENT COMPANY
Bluffton, Ohio

Simplest

WAY TO REPLACE
BALLASTS

- 4 STANDARD TYPES of Amperite Regulators replace over 200 types of AC-DC Ballast Tubes now in use.
- Not to be confused with ordinary dropping resistors. Amperite actually regulates.
- Amperite Regulators are equipped with a patented Automatic Starting Resistor which prevents initial surge and saves pilot lights.
- Amperite AC-DC Regulators; List \$1.00. Amperite Replacements for 2V Battery Set ballasts List \$1.25

WRITE FOR REPLACEMENT CHART "S"

AMPERITE Co. 561 Broadway, N. Y. C.

AMPERITE

GREENOHMS

for that extra
OVERLOAD FACTOR

100-watt Greenohm. Note clean-cut construction. Particularly sturdy mounting brackets.



Wire-wound. Unique cold-setting inorganic cement coating. No weakening in production. No corrosion.

10, 25, 50, 80, 100, 160 and 200 watt ratings. Fixed and adjustable.

★ Notice those green power resistors in better-grade amplifiers, power packs, transmitters, oscillographs and other instruments? They are Greenohms—the toughest thing in power resistors. Use them in your assemblies and service jobs that must stand up. Cost no more.

★ Ask jobber for them. ★ Or write us for literature—Clarostat Mfg. Co., Inc., Dept. 5D3, 285-7 N. 6th St., Brooklyn, N. Y.



be applied to the cam, main gear, spindle pinion gear, and gears of the record posts.

Light machine oil should be used in the tone arm vertical bearing, motor bearing, and record post bearings.

Do not allow oil or grease to come in contact with the rubber idler wheel or motor pulley. Use carbon tetrachloride to clean the rubber parts.

TONE-ARM REPLACEMENT

The following procedure should be gone through in installing a tone arm that has been removed. Hold sweep lever assembly F under tone arm pivot shaft G bearing with sweep lever assembly F roller engaged in main cam A. Insert tone arm; assemble clamp; then tighten screw just enough to hold assembly together. Drop lift pin I into place.

Push control button to "Rej" and rotate turntable clockwise by hand until tone arm drops to record level with one record on the turntable. Hold clamp and sweep lever assembly F against stop lever J and rotate tone arm to proper drop point for 10-inch record and tighten clamp. A maximum of .010 inch end play should be allowed in tone arm pivot shaft G.

TROUBLE SHOOTING

Among the principal trouble symptoms are the following:

1. Mechanism is slow in starting, or stalls during a change-cycle, but a slight forward push with the hand starts it again: This may be caused by failure to lubricate properly; loose setscrews; or weakness of drive due to low line voltage or damaged motor windings.

2. Motor fails to run when proper voltage is applied directly to the two ends of its windings: This indicates trouble in motor windings. Unless the damage is easily seen and repaired, replace motor.

3. Motor is slow in starting: The changer may have been in a very cold place, and may not yet have reached room temperature. Give it a fair chance to get warmed up before concluding that motor is defective.

4. Changer stalls suddenly: Rotate turntable backwards $\frac{1}{8}$ turn and release. Do not use force. Remove turntable by releasing the two setscrews on pinion B and lifting turntable. See that motor runs and rubber idler wheel is free and in good condition. Lubricate the turntable spindle with light grease

Quality in PAPER CONDENSERS



- For applications requiring paper-type condensers, be sure to check with the latest Aerovox catalog. Despite the preponderant use of electrolytics today, Aerovox still maintains a wide choice of paper condensers.

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and reassemble. Set in lock pinion **B** with top of teeth even with top of teeth in main cam **A**. Check condition of levers previously described and clear any jammed lever.

5. Changer does not trip: Check starting dog **D** and latch lever **E** for bind and see that springs are in place. Check pawl **S** and pawl spring. Check positive trip lever **Q** and sweep lever **R** for free action. Check horseshoe spring **T**.

6. Changer repeats cycle: Check latch lever **E** and spring. See that control lever **H** clears latch lever **E** when control button is in "Auto" position.

7. Tone arm doesn't drop in proper position when playing 12-inch records: The difference in drop points for 10-inch and 12-inch records is fixed by stop levers **J-K**. When the Landing Position of the pickup is adjusted to a 10-inch record, it should automatically adjust itself for 12-inch records. Change the stop levers **J-K** if they have been damaged. If tone arm always drops in one position, check toggle lever spring **W** inside of stock bracket **X**.

8. Improper record feed: Check records for warp. Check and level platforms **Y**. Use flat record and adjust platforms **Y** by tightening or loosening the screws. Check selector **Z** tip elevation. This should be 1/16 (.062) inch. Adjust whole selector **Z** blade. Do not bend tip. Also check timing of selector **Z** tips to edge of 12-inch record. They should be approximately 1/4" from the edge of a 12-inch record and should be equally distant from the edge of the record. To adjust loosen the clamp screw on the pinion **AA** and swing selector **Z** tip away from record. Set to correct position while approaching record and lock clamp screw.

9. If wow is heard: Remove turntable by releasing the two set-screws on pinion **B** and lift turntable and see that rubber idler wheel is not worn or oily. If idler is oily, clean with carbon tetrachloride. Re-lubricate the turntable spindle **C** and reassemble.

NEW PRODUCTS

(Continued from page 22)

WESTERN ELECTRIC

Aviation Receiver—A two unit midget radio receiver for aircraft, that also serves as an interphone. It may be tuned continuously or operated as a crystal-controlled unit on two spot frequencies. Known as the 33-A, it has three tuning bands of

250 to 625 kc, 3900 to 7500 kc, and 6750 to 12,200 kc.

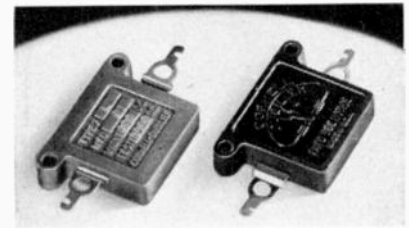
Including its separate power conversion apparatus which may be installed in any convenient place, the apparatus weighs 18 pounds 7 ounces complete with crystal equipment. Its mounting space in the instrument panel is only 7 3/8" by 6". By Western Electric Co., Inc., 300 Central Ave., Kearny, N. J.

SPEAK-O-PHONE

Recorder—Model 9MA dual speed, outside rim drive, cast aluminum 12-inch machined turntable. Speed change accomplished by lifting or depressing idler pulley. Underneath cutter drive. Equipped with crystal pickup, spring-adjusted cutting head and G.E. constant-speed motor. Mounted on 1/8" black crackle steel panel 15" x 15", with 2 3/4" hole for meter. For use with separate amplifier. By Speak-O-Phone Recording and Equipment Co., 23 W. 60th St., New York, N. Y.

CORNELL-DUBILIER

Molded Micas—Type 7 molded bakelite mica capacitors, similar to Type 4 but with wider spacing between insulated mounting holes to meet the 1 1/2" standard called for in many applications. Available in capaci-



ties beginning at .00005 mfd and running up to .03 mfd for those rated at 600 volts, .01 for 1200-v. rating, and .003 for the 2500-v rating. Standard tolerance is plus or minus 10%, insulation resistance 20,000 ohms. By Cornell-Dubilier Electric Corp., South Plainfield, N. J.

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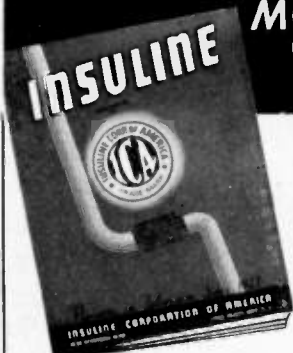


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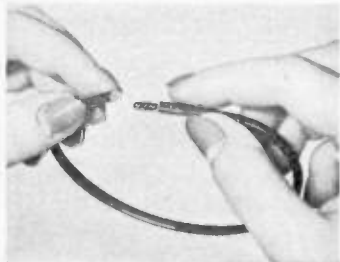
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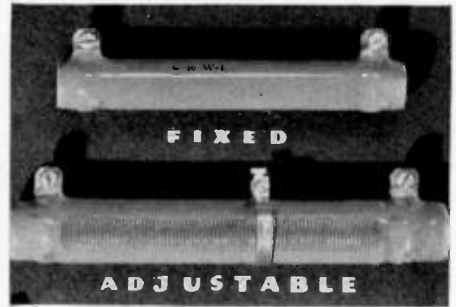


extremity for set screw, which insures correct positioning in pickup. The WN-55 is specifically designed for pickups having needle pressure of 2 ounces or less, and at one ounce pressure will give approximately 12,000 playings. By The Electrovox Co., 424 Madison Ave., New York, N. Y.

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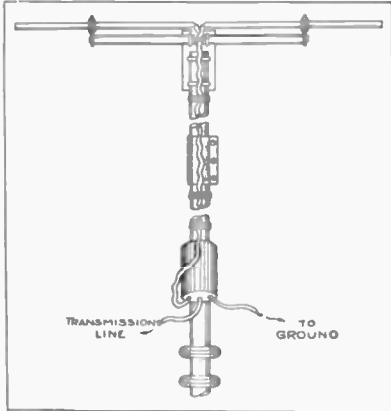
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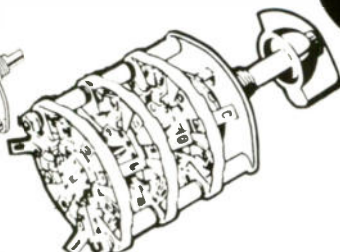
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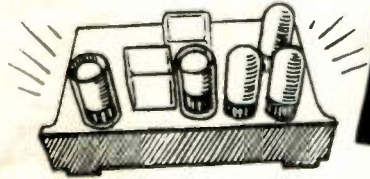
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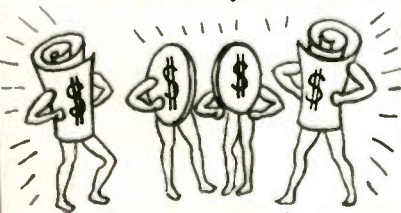
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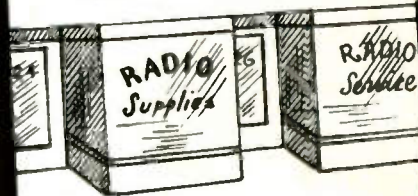
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