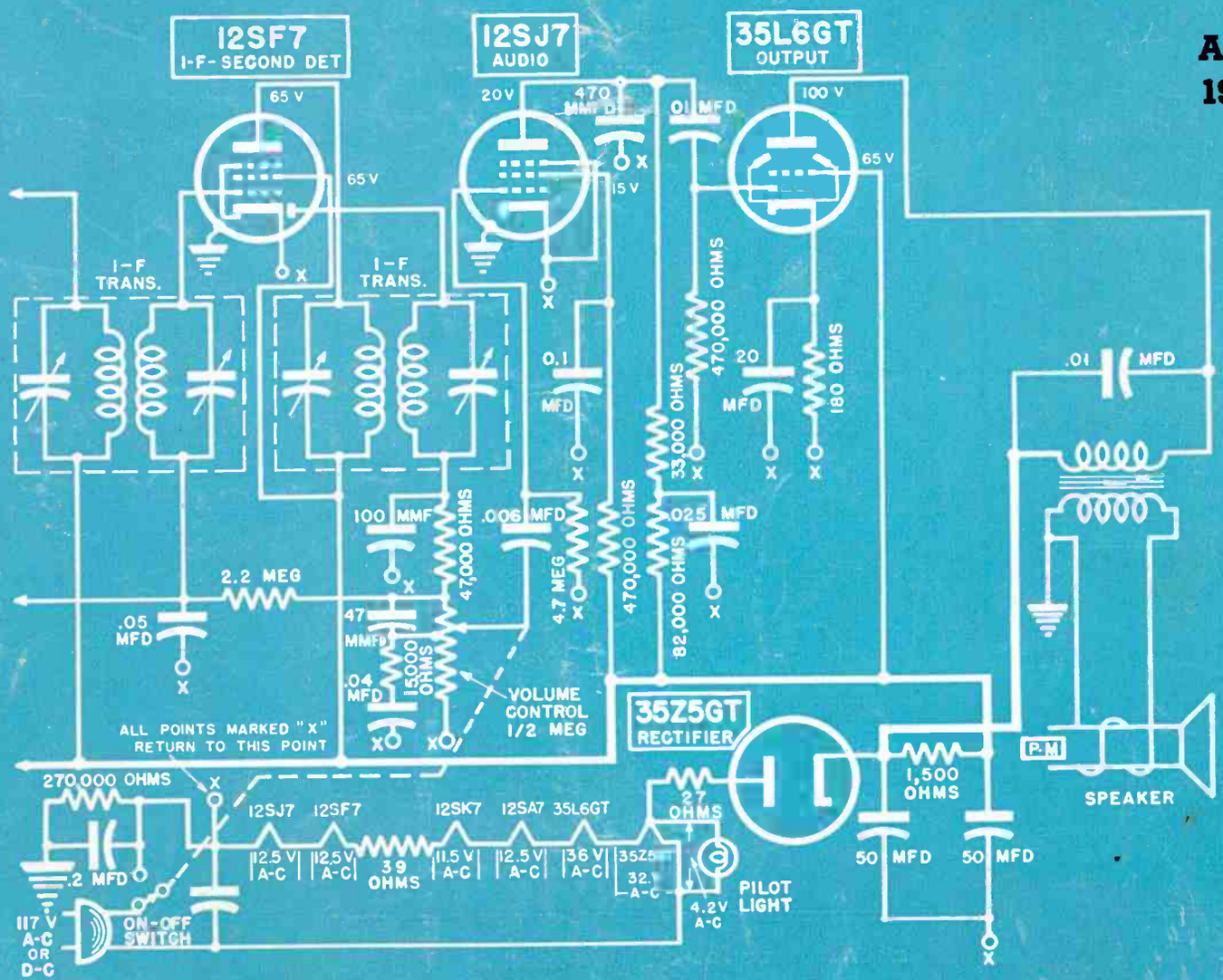
RADIO • TELEVISION • ELECTRONIC

SERVICE

April
1946



The i-f, second detector, audio and power supply stages of a current 5-tube and rectifier a-c/d-c model with a 1.3-watt output. *(See page 55.)*

THE TECHNICAL JOURNAL OF THE RADIO TRADE

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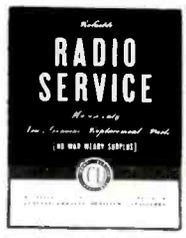

WINDOW CARDS

MATCH BOOKS

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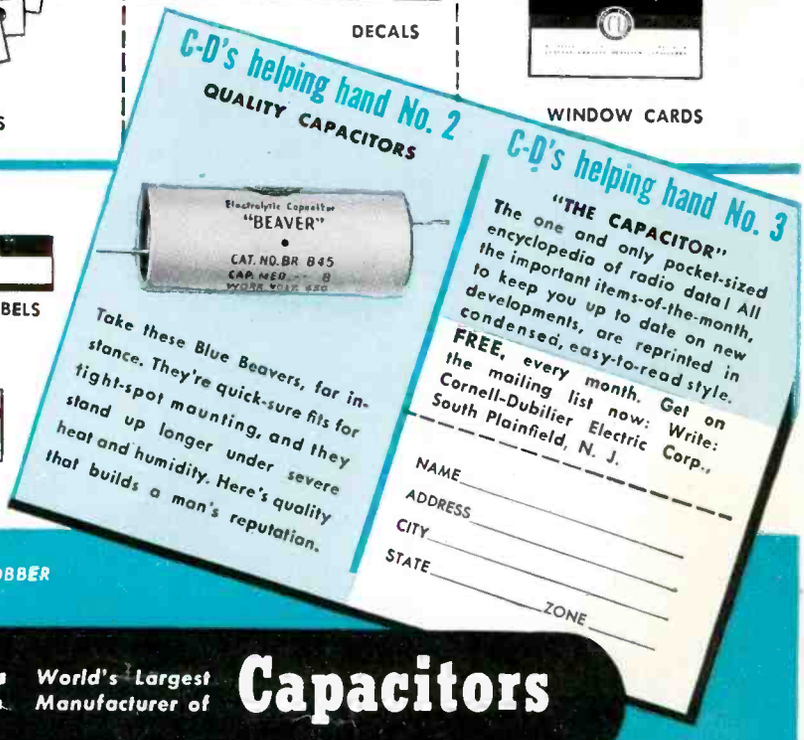

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EDITORIAL

INSTALLATIONS, once an all-important feature of the Service Shop, but reduced to an item of minor importance with the advent of the highly-sensitive a-m loop models, will again become a major Service Shop project, thanks to f-m and television. With the projected 1946 production of about 2,000,000 f-m and f-m/a-m sets (as reported by the FCC in their recent survey) most of which will use an external antenna, receivers will once again require a very careful type of installation. The alert Service Shop, thus, will now be in a position to offer an important two-fold service with every new receiver . . . *installation* and *maintenance*.

In many instances the installation will call for the sale of such items as an antenna, leadin, insulators and so forth. Thus the installation will involve more than a labor charge.

As pointed out in these columns several months ago, some Service Shops have already made arrangements with apartment house owners to serve on an exclusive basis. Others have followed the group pattern in their communities, operating in cooperation with other shops, to expedite installation and maintenance.

Some shops have already arranged with department stores, furniture dealers and other similar establishments to handle all the installation and maintenance work for the new models. Thoroughly-planned installation schedules are being worked out so that all installations can be made as per shop promise. Receivers will be pretested to assure perfect performance in the home.

Areas are being surveyed to acquaint Service Shops wilh all of the antenna problems that may be faced. Factors to be studied will include direction of stations, distance of stations, allowable antenna heights, mounting arrangements, etc. Thus, the Service Shop will be certain that no complications will prevail during the installation.

Interesting merchandising plans have also been suggested by many Service Shops. These involve a packaged service. In one case a shop has arranged to install the antenna, supply the accessories and maintain the receiver for a base charge, which will include one-year's maintenance. Others are offering an installation package which includes the antenna, installation, and service.

Many other effective procedures will, undoubtedly, be developed as the Service Shop gains installation experience. A series of discussions, covering on-the-scene installation activities, is now being prepared and scheduled for early publication in SERVICE. We would very much like to include your experience in these discussions. Send this information in as quickly as possible . . . as many items as you can can gather. Everyone will be grateful for this information. We hope we'll be hearing from you soon.

RADIO · TELEVISION · ELECTRONIC
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What DOES Make a BETTER Loud Speaker?

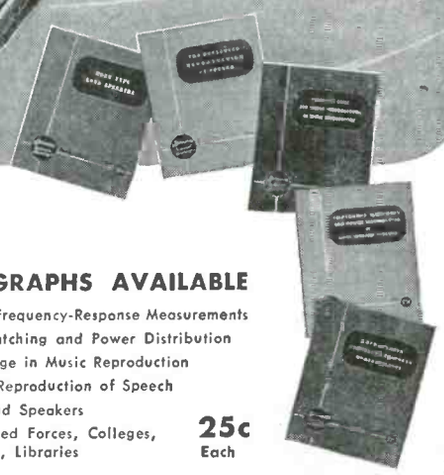
WILL the possession of physical facilities and desire create a better product? No, because for all of their importance, these possessions are certainly not unique. All institutions have them to some degree. Is it fanciful claims and fluent use of superlatives in product description that make a product better? Obviously not. Is it the achievement of theoretically perfect performance in the laboratory? No, not that either, for perfection in such respects does not necessarily create the *practical ideal.*

The simple truth is that no product can be better than *know how* and the honest application of that *know how* as the product is created and its virtues described.

What is the yardstick of these ingredients in a product? The record of achievements and the list of contributions to the advancement of science and art is one good measurement. The First PM Speaker, the Bass Reflex Principle, the Hypex Formula are just a few of the advancements contributed to the industry by JENSEN. There is also the endorsement by those users and connoisseurs of Loud Speaker performance whose first and last emphasis is always on superiority. JENSEN Loud Speakers and Reproducers are the overwhelming choice of such people. Finally, and perhaps most important of all, there is the established custom of the manufacturer to make honest statements as to the *real ability* as well as *limitations* of the product. Here at JENSEN this has always been a fixed policy, an absolutely essential ingredient in *honesty of purpose,* even though by some standards it is called "selling down."

And so, a better Loud Speaker is created because of *know how,* achievement as shown by the record, significant endorsement and integrity of purpose from start to finish. JENSEN Loud Speaker Products, personnel and policy meet these requirements.

For those interested in the proper appraisal, selection, use and operation of Loud Speakers, JENSEN is publishing a series of Technical Monographs—of which five issues are now in print. Note the titles listed below and write for one or all of them.



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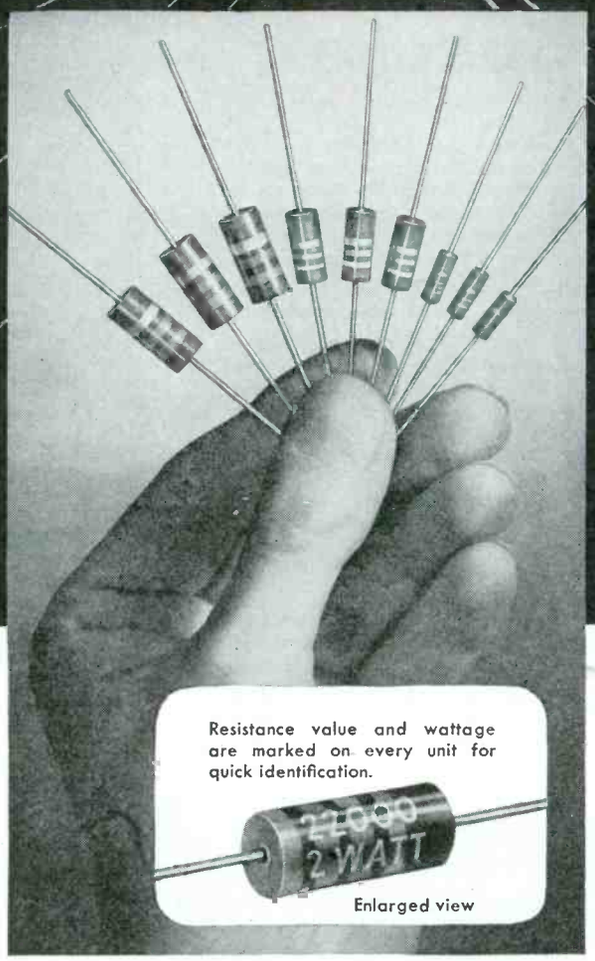

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2 Watt	1 1/16"	5/16"	10 Ohms to 22 Meg.	3500	25c

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IT'S NEW . . . IT'S STARTLING . . . it's one of RCA's contributions to the advancement of electron tube and parts distribution. Distributors throughout the country will hail it as the answer to one of their tube and parts selling problems.

What is it? It's *store selling in modern form* . . . lifted to new peaks of efficiency through the design of special sales-servers *adaptable to any floor layout* . . . geared to accommodate *any business volume.*

You'll see the complete line of sales servers . . . hear how they can bring more business your way. You'll be shown model store layouts that will help you visualize just how this new store-selling technique can build your business. Bring your floor plan dimensions with you and let's discuss and lay out an effective store arrangement for you.

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Drop around anytime for a bit of friendly conversation—and refreshments. But make it a date for sure.

Listen to "THE RCA SHOW," Sundays, 4:30 PM, EST, NBC Network

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. . . why profit-minded dealers and distributors everywhere are stocking E·L Vibrators.

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E·L Vibrators are of the balanced resonance type, with 8 contacts instead of 4—*twice* as many as other makes in the non-synchronous types. Tests show they provide *33 per cent longer vibrator life*, with output and starting voltages held virtually constant throughout the entire life-span. The exclusive features and outstanding performance of E·L Vibrators are a product of exhaustive research into auto-radio requirements.

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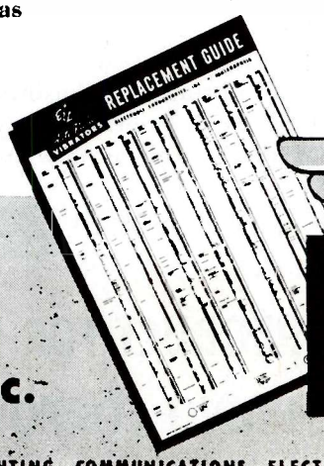

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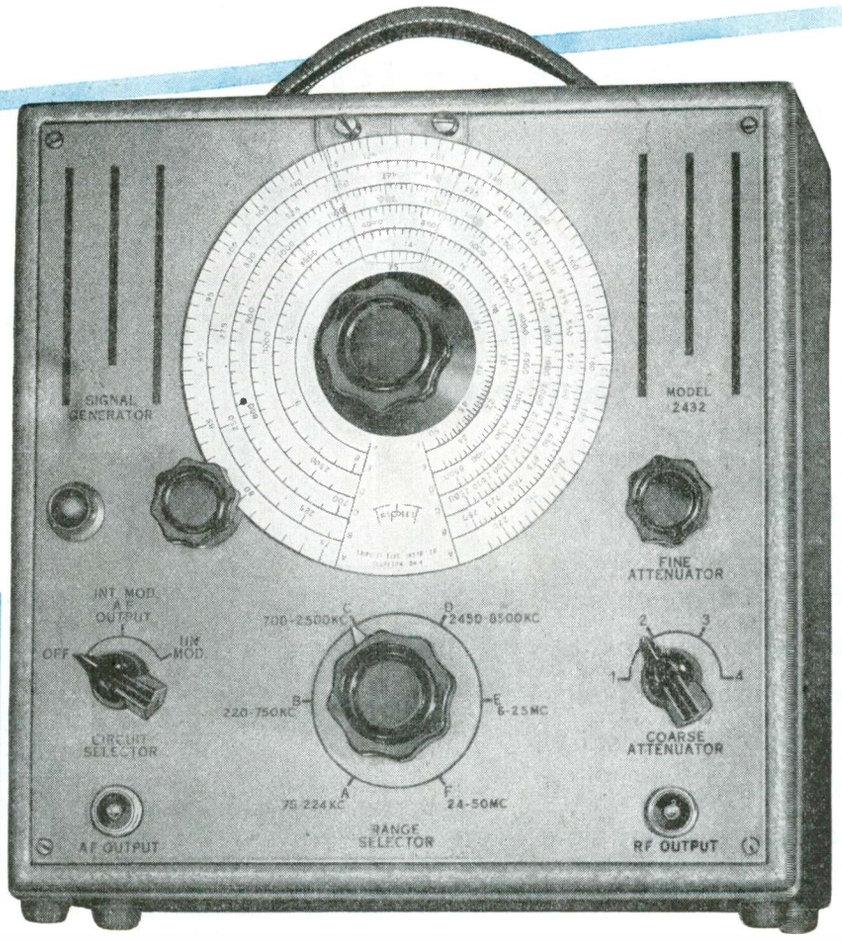


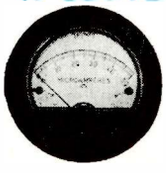
MODEL 2432 SIGNAL GENERATOR

Another member of the Triplett Square Line of matched units this signal generator embodies features normally found only in "custom priced" laboratory models.

FREQUENCY COVERAGE—Continuous and overlapping 75 KC to 50 MC. Six bands. All fundamentals. **TURRET TYPE COIL ASSEMBLY**—Six-position turret type coil switching with complete shielding. Coil assembly rotates inside a copper-plated steel shield. **ATTENUATION**—Individually shielded and adjustable, by fine and course controls, to zero for all practical purposes. **STABILITY**—Greatly increased by use of air trimmer capacitors, electron coupled oscillator circuit, and permeability adjusted coils. **INTERNAL MODULATION**—Approximately 30% at 400 cycles. **POWER SUPPLY** — 115 Volts, 50-60 cycles A.C. Voltage regulated for increased oscillator stability. **CASE**—Heavy metal with tan and brown hammered enamel finish.

There are many other features in this beautiful model of equal interest to the man who takes pride in his work.

See the 1947 Triplett Models. Radio Parts Show. Booth 139



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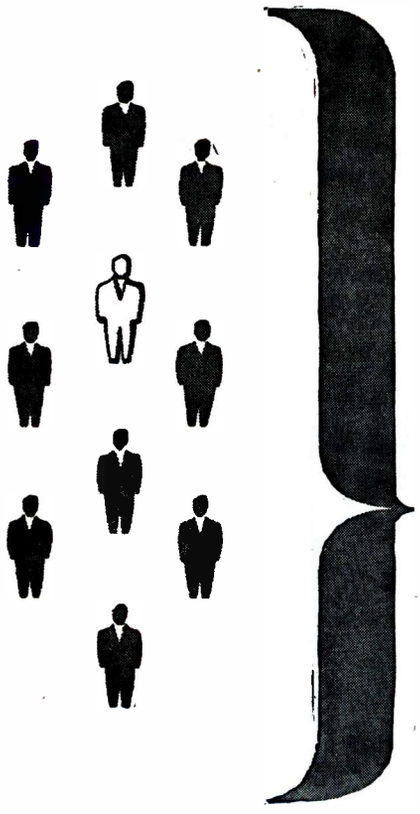


9 OUT OF 10 *want* THE PAYROLL SAVINGS PLAN CONTINUED!

Thanks to the cooperation and encouragement of America's industrial executives, 85 million bond holders have bought U.S. Bonds in the greatest savings program in history. Employees who have purchased billions of dollars of these bonds during the war now want to continue monthly purchases of savings bonds. Specific evidence of this desire to continue saving for personal security and prosperity through the Payroll Savings Plan was recently revealed by a survey which disclosed that 90% wanted the Plan continued.

Every employer can write in his own set of reasons why the Payroll Savings Plan should be continued as a part of his personnel relations program, but the principal advantages are obvious:

A large reservoir of national savings; a strong and stable bulwark against inflation.

An "automatic" thrift habit for the worker; to increase contentment and satisfaction in his job.

An opportunity for the employee to maintain his "share in America" with the safest, easiest, most profitable investment he can make.

An opportunity for the returned veteran to share in the Payroll Plan's varied benefits.

Your employees will require little "selling" on the idea—they are accustomed to their monthly saving habit. With the Treasury Department's savings bond program now in peacetime operation, your partnership is again invited to continue this systematic, convenient means of contribution to a prosperous peacetime future.

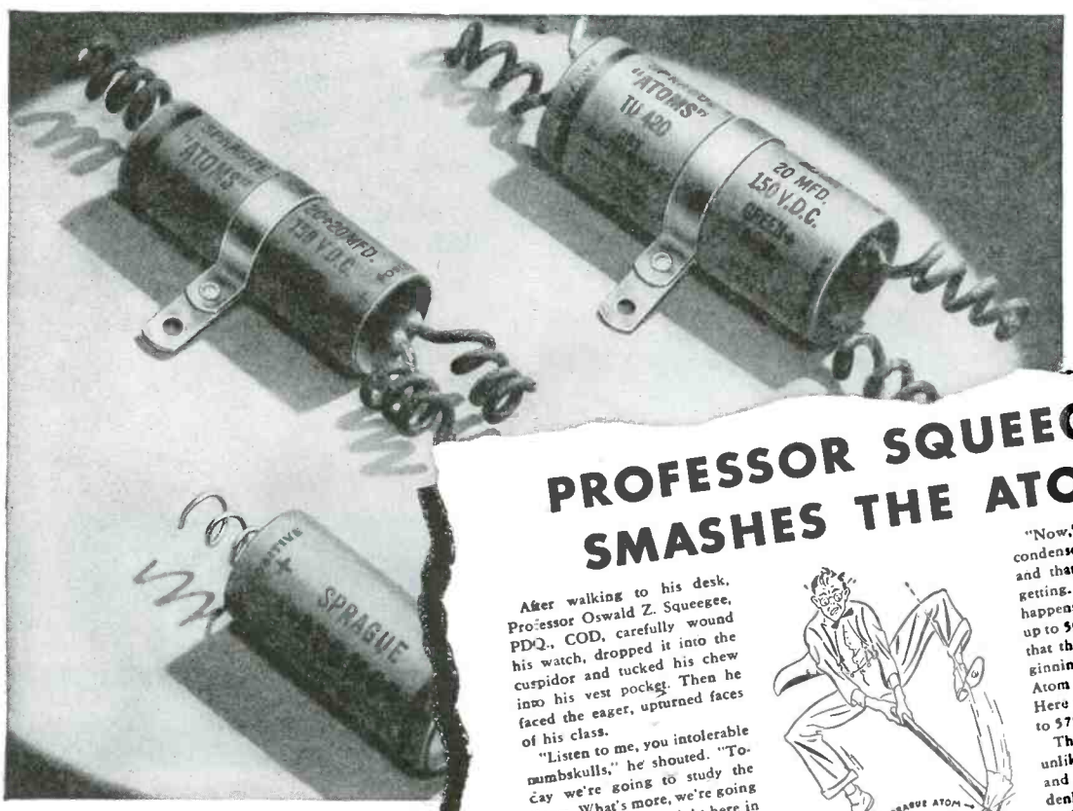
The Treasury Department acknowledges with appreciation the publication of this message by

SERVICE

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and Advertising Council

OL' PROF. SQUEEGEE DID THE JOB

. . . way back at



Professor Oswald Z. Squeegee is peeved. Extracts from a recent letter carefully typed on asbestos paper and perfumed with brimstone follow: "Listen here, you jerks. Isn't it about time I got credit as the first man, or reasonable facsimile thereof, ever to smash the Atom? Blow the dust off your files and you'll find I did the job way back in 1940 long before most folks even knew an atom from a dehydrated potato . . ."

And ol' Prof. Squeegee is right! Herewith is reprinted the Sprague advertisement of almost six years ago wherein mention was first made of his startling achievement. Credit where credit is due!

(NOTE: Sprague Atoms are even better today than when Prof. Squeegee performed the now famous experiment. Would he accept a challenge to repeat it now?)

PROFESSOR SQUEEGEE SMASHES THE ATOM

After walking to his desk, Professor Oswald Z. Squeegee, PDQ., COD, carefully wound his watch, dropped it into the cuspidor and tucked his chew into his vest pocket. Then he faced the eager, upturned faces of his class.

"Listen to me, you intolerable numbskulls," he shouted. "Today we're going to study the Atom. What's more, we're going to smash the Atom right here in this room. S'help me!"

The Professor paused, reached for a coughdrop, got an eraser by mistake and chewed it vigorously. Then he cleared his throat and continued:

"The Atom, as you ought to know but probably don't, is the unit of all matter. It is the alpha of everything—the smallest, theoretically indivisible portion into which anything can be divided and still maintain its identity. In that respect, it is a good bit like the salaries most of you will earn when you graduate—if you ever do.

"How to smash the Atom has long puzzled scientists, including myself. However, we won't go into that today. Instead, we'll deal with an entirely different type of Atom—the Sprague Atom Dry Electrolytic Condenser, appropriately named for its small size and great durability. This, however, is a type of Atom that *can* be smashed. What's more I'm gonna smash it!"

After ten minutes search, the Professor finally found an 8 mfd. 450 volt Sprague Atom in his cigar case—also a similar midget dry electrolytic of another make. These he connected into a weird electrical circuit on his desk. Then he slowly turned on the juice.

"Now," he gloated, "both condensers are rated at 450 volts and that's exactly what they're getting. As you see, nothing happens. We'll step the voltage up to 500. Now up to 525. Note that the other condenser is beginning to sizzle, although the Atom is still in good shape. Here we go to 550 volts—now to 575—now to—goodness me!"

There came an explosion not unlike that of a giant firecracker and the heads of the class suddenly disappeared beneath their desks.

"You're all wrong," shouted the Professor gleefully after order had been restored. "You thought I smashed the Atom—but I didn't. It was the other condenser that blew up—not the Atom."

Sure enough, the Atom on the desk was still connected—now hissing a bit under the strain of over 600 volts but functioning perfectly.

"The Atom," continued the professor, "is especially protected against blow-outs—against moisture, heat and whatnot. The way to smash the Atom is not merely a matter of overloading it. The way to smash the Atom is this."

The professor grasped an axe hung over a sign "Use only in case of fire." Swinging this with the skill of a woodchopper and shouting wildly all the while he brought the blunt end down on the Atom—again and again and again.

"There!" he screeched, gleefully looking at the shattered remains. "We've done it. We've succeeded where others have failed. That, gentlemen, is how to smash the Atom. Class dismissed."

A TYPE FOR EVERY DRY ELECTROLYTIC REPLACEMENT NEED

SPRAGUE PRODUCTS COMPANY

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FOR COMPACT HIGH FIDELITY EQUIPMENT

Ultra compact, lightweight, these UTC audio units are ideal for remote control amplifier and similar small equipment. New design methods provide high fidelity in all individual units, the frequency response being ±2 DB from 30 to 20,000 cycles. There is no need to resonate one unit in an amplifier to compensate for the drop of another unit. All units, except those carrying DC in Primary, employ a true hum balancing coil structure which, combined with a high conductivity outer case, effects good inductive shielding. Maximum operating level +10 DB. Weight–5½ ounces. Dimensions–1½" wide x 1½" deep x 2" high.

Unit shown is actual size. 6V6 tube shown for comparison only.

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ULTRA COMPACT HIGH FIDELITY AUDIO UNITS

Type No.	Application	Primary Impedance	Secondary Impedance	± 2 DB from	List Price
A-10	Low impedance mike, pickup, or multiple line to grid	50, 125, 200, 250, 333, 500 ohms	50,000 ohms	30-20,000	$12.75
A-11	Low impedance mike, pickup, or line to 1 or 2 grids	50, 200, 500 ohms	50,000 ohms	50-10,000 multiple alloy shield for extremely low hum pickup	13.90
A-12	Low impedance mike, pickup, or multiple line to push pull grids	50, 125, 200, 250, 333, 500 ohms	80,000 ohms overall in two sections	30-20,000	12.75
A-18	Single plate to two grids	8,000 to 15,000 ohms	80,000 ohms overall, 2.3:1 turn ratio overall	30-20,000	11.60
A-24	Single plate to multiple line	8,000 to 15,000 ohms	50, 125, 200, 250, 333, 500 ohms	50-12,000	12.75
A-25	Single plate to multiple line 8 MA unbalanced D.C.	8,000 to 15,000 ohms	50, 125, 200, 250, 333, 500 ohms	30-20,000	11.60
A-26	Push pull low level plates to multiple line	8,000 to 15,000 ohms each side	50, 125, 200, 250, 333, 500 ohms	30-20,000	12.75
A-30	Audio choke, 300 henrys @ 2 MA 6000 ohms D.C., 75 henrys @ 4 MA 1500 ohms D.C., inductance with no D.C. 450 henrys				8.70

The above listing includes only a few of the many Ultra Compact Audio Units available . . . write for more details.

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2. *Rider Manuals are authoritative.* They enjoy world-wide recognition because they have given world-wide satisfaction for the past 16 years. (Only Rider Manuals contain Scott receiver diagrams, received officially from E. H. Scott Radio Labs., Inc.)

3. *Rider Manuals are constantly being improved.* As part of our five year postwar publishing program we are developing new ideas for inclusion in Volume XV, ideas that will make Rider Manuals even more valuable as time-savers.

4. *Rider Manuals are part of a continuing service.* The findings of the staff of engineers employed in the Rider Laboratories are reported in "Successful Servicing," the technical business paper soon available free to the radio industry. It will keep them up to date in all phases of the servicing field.

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UNDERSTANDING MICROWAVES

by VICTOR J. YOUNG

This new book provides a basis for understanding microwave radio and radar. For those who have not previously considered radio waves shorter than 10 centimeters it provides a foundation from which they can proceed to an understanding of the various microwave developments of the past five years. (During those war years Dr. Young worked exclusively on the development of radar equipment.)

Because of the introductory nature of the opening chapters, this book will be helpful to both engineers and those interested in the servicing or operational phases of microwave radio. To simplify explanations, mathematics have been placed in footnotes wherever possible.

Section Two of the book is devoted to a detailed description of terms, ideas, and theorems used in microwave communication and radar work—extremely valuable to those interested in microwaves. Place your order today for earliest delivery.

CHAPTER HEADS SEC. I

CHAP. I. The Ultra High Frequency Concept
CHAP. 2. Stationery Charge and its Field
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CHAP. 4. Alternating Current and Lumped Constants
CHAP. 5. Transmission Lines
CHAP. 6. Poynting's Vector and Maxwell's Equations
CHAP. 7. Waveguides
CHAP. 8. Resonant Cavities
CHAP. 9. Antennas
CHAP. 10 Microwave Oscillation
CHAP. 11. Radar and Communication

SEC. 2

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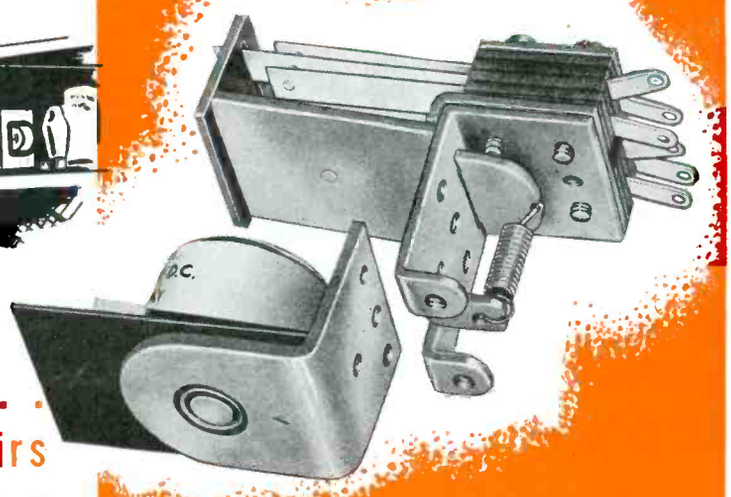

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Now you can have exactly the *right* relay at your fingertips. No time-consuming search for a hard-to-get relay. Simply go to your nearest radio parts dealer and select the correct Guardian Series 200 Interchangeable Coil and Contact Assembly for your job. A quick twist of your screw driver assembles them firmly and snugly, ready for dependable, efficient operation.

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More than 400 of the Nation's leading wholesalers have them in stock now. Find out how easy it is to get exactly the Series 200 Relay you need. Be sure to visit The Guardian Exhibit at Booth 51, Radio Parts Show, Chicago, May 13-16.

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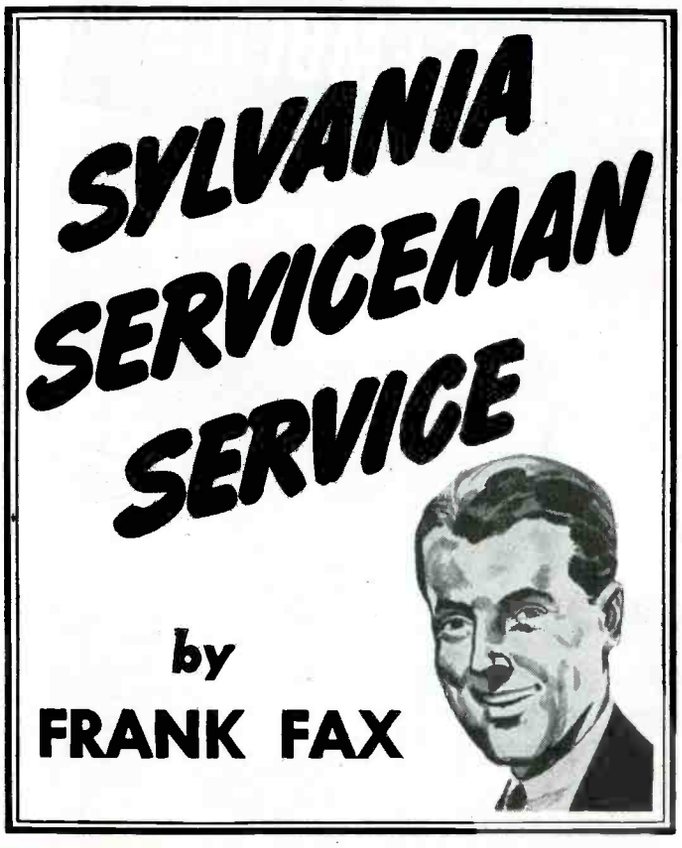
SYLVANIA NEWS
RADIO SERVICE EDITION

APRIL *Prepared by* SYLVANIA ELECTRIC PRODUCTS INC., Emporium, Pa. 1946



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SERVICE

If I Ran A SERVICE SHOP . . .*

by CHARLES GOLENPAUL

Sales Manager, Jobber Division
Aerovox Corporation

PROFIT always has been and will be the main issue in any business. And it certainly applies to the Service Shop. Unless you are vitally concerned about profits, you won't stay in business very long.

I don't recall exactly what percentage of new businesses survive beyond the first year, nor again the second year nor even the first five years. But I do know that most of them die in their infancy. You can get the exact percentages of those business fatalities from your local newspaper or from one of the financial journals. But I can tell you that less than 20% of all new businesses survive those first five years. And the reason for the 80% fatalities is simply the lack of profit.

Now *profit* is no simple matter although it sounds so simple. In its most elementary form, profit is simply the difference between what something costs you and what you sell it for. And in servicing, it is *profit* that gives you an income.

However, it isn't easy to figure profit, and even less easy to make a real profit. For example: The parts for a job may cost you $1.00. You charge the customer $2.00. You've presumably made $1.00 for yourself. But hold on a minute—you're jumping at false conclusions. And it's because of such hasty conclusions that many Service Men soon go broke.

The parts cost you $1.00 and you got $2.00 for the job. But you didn't make a whole dollar for your own personal services. No indeed. To that $1.00 for parts, you have got to add your *overhead*. By the time the proper overhead is added, the $1.00 cost becomes $1.25 or even $1.50, so that your own earnings are reduced to 75¢ or even 50¢ and very often even down to zero.

Overhead . . . some of you may ask? Why we have no overhead, some of you may say. But believe me, everybody's got overhead. There are expenses to be met in your little setup. You must have some rent to pay. It doesn't matter whether you operate out of a small or large store. There's rent—more or less of it—and that rent must be charged proportionately against every job you handle, as part of the overhead.

Then there are the ordinary business tools. No doubt you've got a telephone. That expense is part of your business overhead.

Then you must have electricity to pay for. Electricity is a legitimate expense—part of your business overhead. And you may have fuel, janitor service, the fellow who shovels the snow in front of the shop, and so on.

And what about traveling expenses? Are you using a car—even if it's the family buggy? Or do you go by street car or bus? Regardless, traveling expenses are part of your cost of doing business.

Then there are the books, service manuals, subscriptions to radio publications, membership in radio organizations, and perhaps a correspondence course and other means of keeping abreast of radio knowledge. These are expenses—part of your business overhead.

There are your tools, test instruments, service benches, desk, typewriter, file and so on. These items don't last forever; they wear out in time. Or again, they become obsolete and must be replaced by newer models. Will you have the necessary money saved when it comes time to replace those items? You will, if you charge off a good percentage of the cost of such equipment each year, and put the money aside as a trust fund. Your income tax permits such a reduction for depreciation.

These and many other items add up to your actual overhead. The total is really astounding. Your actual overhead can easily run 25% to 35%. Therefore, when you figure the cost of a job, include say 35% as your general overhead, and add your own personal services or those of the men working for you, on top of the cost for actual materials. You'll then arrive at your actual cost, and the difference between that actual cost and what you get for the job will determine your net profit. And remember, it's *net profit* that keeps all of us going in business.

Right here we have the very essence of most business failures. Too many would-be businessmen simply don't know their costs. They are fooled into believing that gross profits are real profits. Especially these days, when Uncle Sam and local authorities take a healthy slice out of each and every one of us by way of income and business taxes. If you don't watch your overhead costs and make due provision for meeting them over and above your personal weekly "take", you'll be in the same predicament as the car driver who keeps right on driving blissfully without paying due attention to the gasoline gage. Sooner or later he's got to get out and walk.

Many may say that overhead and profit are alright, but my trade won't pay for all that freight. So now we go on in our discussion to the justification of fair and profitable prices.

A fair price is one based on an *honest* repair job and covering the cost of parts, labor, your overhead, and your profit. Worthwhile trade is willing to pay such a fair price. Those who are unwilling to pay a fair price are just not worth bothering with.

The main thing the radio set owner wants is to get that inoperative set going again. When he calls you into the case, you can be sure he's usually fussed around with the trouble himself. But present-day receivers don't respond to such home remedies. The handyman with screwdriver and pliers doesn't get very far these days. It takes test instruments plus a lot of know-how to figure what's wrong with the set—to find that low-emission tube or that broken-down capacitor or that burntout transformer.

Consider a parallel case: Little Annie becomes deathly sick suddenly. Mother reads that family medicine book or the old almanac, and tries to fit some stock remedy to Annie's particular symptoms. Then the corner druggist is consulted. One or two patent medicines may be tried. But when all such makeshifts fail, the doctor is summoned. And his word goes. He scribbles some Latin and numbers on a slip of paper and tells you to

(*Continued on page* 36)

*From a talk delivered recently before the Philadelphia Radio Service Men's Association.

CAPACITORS

CAPACITOR is just another name for an electric condenser. The former is preferred because it eliminates the confusion arising from the fact that the term *condenser* is applied not only to the device for storing of electrostatic charges but also to equipment of an entirely different nature (for condensing of vapors, etc.).

Capacitors are frequently classified according to the dielectric or insulating medium which separates the two juxtaposed electrodes or conducting members, Fig. 1. Thus, there are air-capacitors, mica-capacitors, oil-impregnated paper capacitors and many other varieties. The type, quality and purity of the dielectric are of paramount importance as they determine in a large measure the characteristics of the capacitor (its capacitance or ability to store electricity, its insulation resistance, power factor, breakdown voltage, electrical and chemical stability, self-healing properties, etc.), its cost, compactness, reliability and service life.

Air Capacitors

An air-type capacitor is distinguished by a high insulation resistance (low leakage current) low electrical losses, as expressed in a small power factor, even at very-high frequencies and by its electrical stability. While the dielectric strength of air is not very great, in case of a flash-over (due to surges or overload) the capacitor is not damaged. If of the variable type, the air capacitor permits a convenient and stepless change of capacitance. Since the dielectric constant of air (and gases in general) is low, about unity, air capacitors are bulky compared to other types of capacitors of the same rating. Air-type capacitors are extensively used for tuning and in other applications where low losses, particularly at high frequencies, are of vital importance.

Vacuum Capacitors

The breakdown voltage of air (and gases in general) is lowered with the reduction of pressure and vice versa. To improve the breakdown voltage characteristics of such capacitors, the air in the container, where the spaced electrodes may be placed, can be compressed. On the other hand, if evacuation of the container is carried far enough, the trend in the lowering of the breakdown voltage is reversed and very high voltages may then be impressed across the electrodes. This phenomenon was used in the development of vacuum capacitors—fixed and variable, Fig. 2; they are distinguished by their compactness, high current carrying capacity, low power factor, low distributed capacitance and self-healing after overload.

Oil Capacitors

By immersing in oil a capacitor structure similar to that of the air-dielectric type, the capacitance is increased, since this quantity varies directly with the dielectric constant of the medium between the electrodes; the dielectric constant of mineral oil for instance is about 2.2 and of castor oil 4.7. The breakdown voltage is also augmented because of the greater dielectric strength of the oil (300-400 volts per mil). Oil capacitors are self healed after a flash-over resulting from surges. The capacitance per unit bulk of this type capacitor is not great because of the substantial spacing between the electrode plates, the capacitance being inversely proportional to the spacing.

Mica Capacitors

High grade mica is an excellent insulator, widely used as a dielectric in capacitors, particularly where compactness, high insulation resistance, reliability and low electrical losses, even at high frequencies, are required; its dielectric strength is less affected by frequency variations compared to other solid insulators. In many cases the use of the higher priced mica capacitor is justified in view of these valuable characteristics. The dielectric constant of mica is usually between 4.5 and 7.5 and depends on the grade of the material. As in the case with other solid dielectric capacitors, mica capacitors may be permanently damaged when the insulation is punctured.

Impregnated Capacitors

In oil- or wax-impregnated paper capacitors, Fig. 4, the electrode foils are very closely spaced since the thickness of the paper layers (two or more) is usually of the order of .0003″ to .0004″. The minute thickness of the spacers, as already indicated, contributes to the increase in capacitance per unit of bulk. The moderate cost of the materials used in the manufacture of this type of capacitors and the ease of building up even large units by winding, are reasons for their lower cost as compared with mica capacitors. When properly

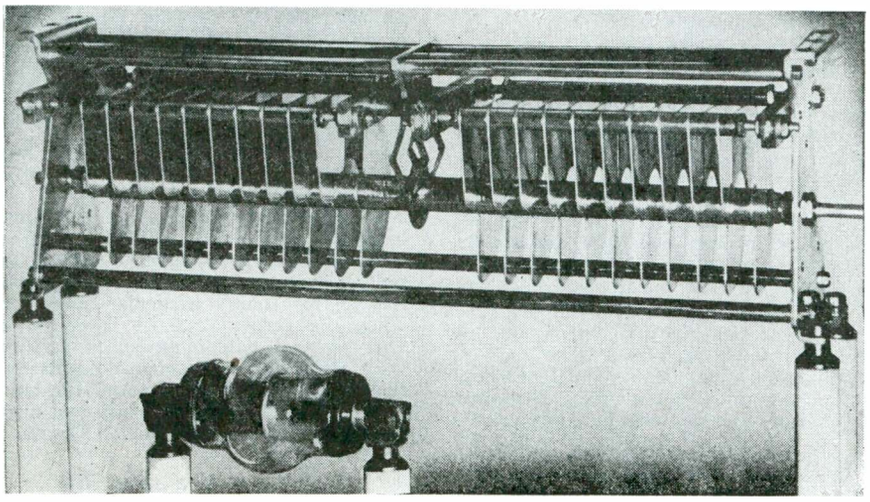
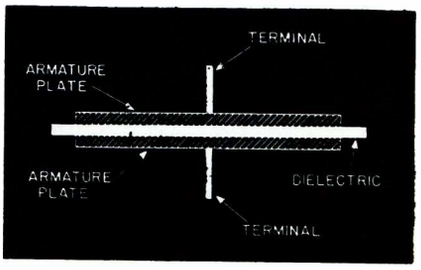


Fig. 2. Comparison of vacuum-type capacitor and variable of similar capacities.
(Courtesy G. E.)

Fig. 1. A two-plate fixed capacitor.



Types... Uses Construction...

by ALEXANDER M. GEORGIEV

*Author of book . . . "The Electrolytic Capacitor"**

made, such capacitors have a high insulation resistance, high breakdown voltage, reasonably low losses (power factor less than 1%). The capacitance per unit active area, power factor and other electrical characteristics already mentioned depend on the grade and quality of the paper and on the impregnant; furthermore, the electrical and chemical stability of the capacitor are influenced by these two items. For instance, the capacitance of a capacitor winding of given dimensions will be considerably greater if impregnated in castor oil (or in a suitable chlorinated hydrocarbon) instead of in mineral oil; on the other hand, mineral oil imparts a greater stability to the capacitor with regard to temperature effects and otherwise. A flash between the foils is apt to put capacitors of this type out of commission, but if properly processed and assembled and if used according to their rating, they are reliable and are widely employed in many diversified applications. For instance, in receivers they are used in filter circuits, tuned circuits, bypassing and blocking of currents and in networks they serve for power factor correction. Use is made of these capacitors for the gradual storing and instantaneous release of electrical charges in welding, flash photography and other pulse applications.

Substitutes for impregnated paper spacers used sometimes in capacitors are synthetic resin-films (for instance Lectrofilm). These materials exhibit valuable features—uniformity in capacitance (low tolerance limits), high insulation resistance, low capacitance-temperature coefficient.

Ceramic Capacitors

Capacitors incorporating a high dielectric-constant ceramic are used successfully even in ultra-high frequency applications, since their power factor remains low. A thin membrane of a special grade of glass of a high breakdown strength and of low electric losses is also being introduced as a capacitor dielectric. In this case a thin metallic deposit on the dielectric serves as an electrode.

Electrolytics

All types of capacitors considered so far have one common feature; essentially they consist of some well known electrical insulating material positioned between two conducting members. Basically different from these types is a group of capacitors known as electrolytic, in which in addition to the mentioned components an electrolyte is present. Another fundamental distinction of the electrolytic capacitor is to be found in the peculiarities of its dielectric. This dielectric being extremely thin (less than one millionth of an inch) is generally referred to as the film. It has undirectional conducting properties (and is therefore also used in electrolytic rectifiers), is formed on the electrode (usually made of aluminum) electrolytically and comprises one or several layers of aluminum oxide. Theories have been advanced citing that the aluminum oxide dielectric is supplemented by a gas (oxygen) absorbed into its pores.

Since the film dielectric is so exceedingly thin, the capacitance per-unit-area of the electrolytic capacitor is very great. The lower the forming voltage, the thinner the film will be and the higher the capacitance of a capacitor of given physical dimensions, but also the lower the voltage which can safely be applied to the unit.

Structurally electrolytic capacitors can be classified as wet and dry. The former ordinarily comprises an aluminum electrode with the dielectric film formed on it and known as the anode

[1]Popular before the war. Many manufacturers are now discontinuing wet electrolytic production in favor of the dry type.

*Published by Murray Hill Books, Inc.

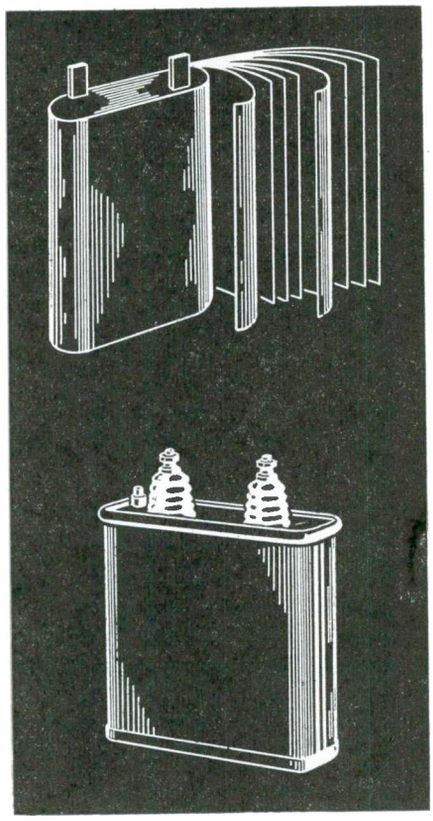


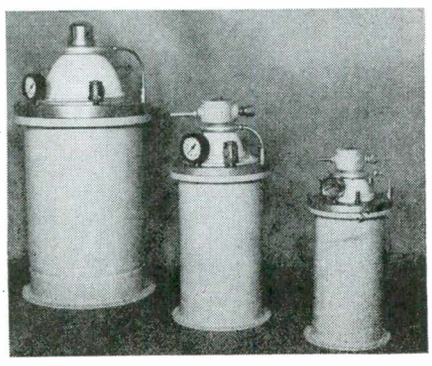
Fig. 4. Oil-impregnated paper capacitor.

or the positive electrode, and a second metallic member which is not necessarily of aluminum, has no dielectric film and is called the cathode or the negative electrode. In most cases the capacitor can serve as the cathode. It contains an unabsorbed aqueous solution designated as the operating electrolyte. Wet capacitors[1] have been used almost exclusively in filters where they are subjected to unidirectional potentials. If a voltage surge occurs, the film may be punctured but it is healed immediately and automatically after the overload ceases; hence, the capacitor remains operative.

In appearance the dry electrolytic type, Fig. 5, resembles an oil-impreg-

(*Continued on page* 38)

Fig. 3. Gas-pressure type capacitor.
(*Courtesy E. F. Johnson*)



OHM'S LAW Problems and Solutions

by L. A. MOHR

PROBLEM: Bleeder-type supply systems often present a burn-out problem. In this system, Fig. 1, the voltage for the screen grid of a tube is supplied by a tap on a resistor bank R_1 and R_2. Usually resistor R_1 burns out and a new resistor must be used to replace it. However, the value of the original resistor is unknown.

By referring to a tube manual, we find that the current required for the tubes involved, adds up to .005 ampere. The voltage required is 100 volts, the supply voltage is 250 volts. With this information we can proceed to find the value of the required resistor, and its minimum wattage rating.

Solution: We first determine the current which flows through R_1 under the established conditions. Since the voltage across R_2 is to be 100 volts, the current flow through this resistor is

$$I = \frac{E}{R} = \frac{100}{10{,}000} = .01 \text{ ampere}$$

Therefore, the current flowing through R_1 will be the sum of the current flowing through R_2, plus that flowing to the screen grids, or .01 + .005 = .015 ampere.

Since the voltage across R_2 is 100 volts, and the supply voltage is 250, the difference between the two must be the voltage across R_1, or 150 volts. Applying Ohm's law,

$$R = \frac{E}{I} = \frac{150}{.015} = 10{,}000 \text{ ohms}$$

To find the minimum wattage rating of this resistor,

$$W = E \times I = 150 \times .015 = 2.25 \text{ watts}$$

Accepted practice is to use a resistor whose value is at least twice the wattage dissipated through it, as a necessary safety factor. Therefore, a 5-watt, 10,000-ohm resistor would be required in this case.

Problem: Let us now take up a case where the cathode resistor for a pair of 6L6s has burned out, Fig. 2. We have to determine the value and wattage rating of a new resistor. From the tube manual, we note that the supply voltage is 250 and find that the plate current of each tube is .075 ampere; screen current, .007 ampere; desired cathode voltage, 14.

Solution: From Fig. 2, we note that the two tubes are actually parallel current paths, joined together at the cathode resistor which forms a common path. Therefore, the current that flows through the two tubes will flow through the cathode resistor. Since the total current flowing through the cathode resistor is the sum of the currents through the tube, therefore,

$R = \frac{E}{I}$, where $E = 14$ volts and

$$I = .075 + .007 + .075 + .007 = .164 \text{ ampere}$$

$$R = \frac{14}{.164} = 85.04 \text{ ohms}$$

$$\text{Wattage rating} = E \times I$$

$$= 14 \times .164 = 2.296 \text{ watts}$$

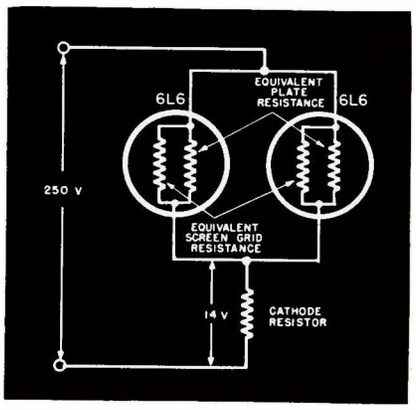


Fig. 2. A cathode-resistor problem. In this case, the plate current of each tube is .075 ampere, and the screen current is .007 ampere. The plate and screen-current paths are designated by their equivalent resistances.

Therefore, an 85-ohm resistor of 6-watts rating would be necessary. Several points should be noted. There is a wide latitude in determining parts values to be used, depending on the circuits involved. In practice, a 5-watt resistor would be used, since this is the closest standard size available. In addition, the resistor size is not so critical in this application, that we have to closely adhere to this value.

Problem: Replacement of a filter choke and speaker in a 4-tube and rectifier midget receiver, Fig. 3. The rectifier tube, which is the source of voltage and current, can deliver a maximum voltage of 120 volts, at a current of .100 ampere. Current requirements of this model are .060

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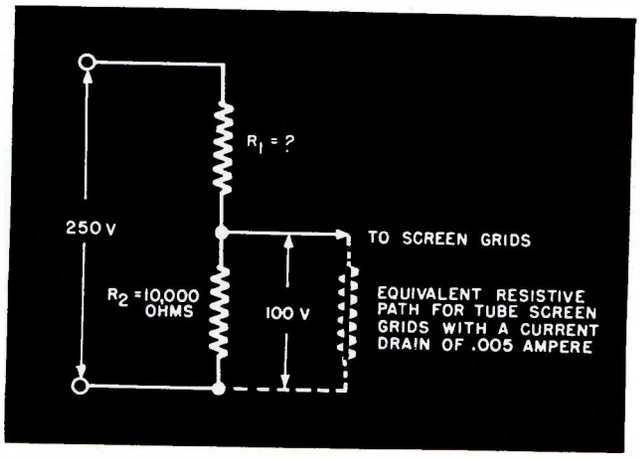
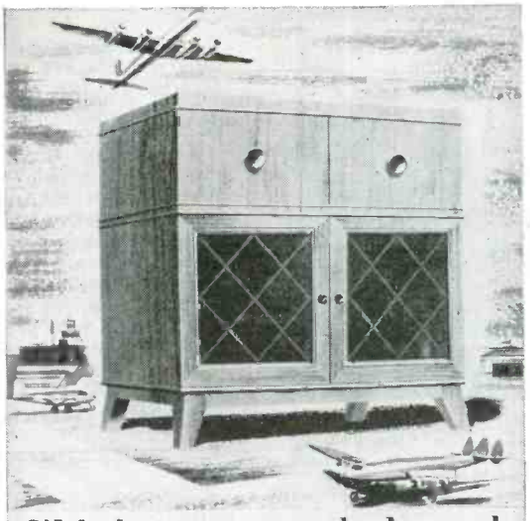


Fig. 1. A typical receiver problem, where R_1, whose value is unknown, has been burned out and must be replaced. Dotted resistor circuit illustrates the equivalent resistive path of the tube screen grids.



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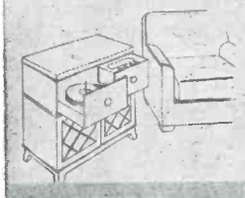

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TOOLS And ACCESSORIES

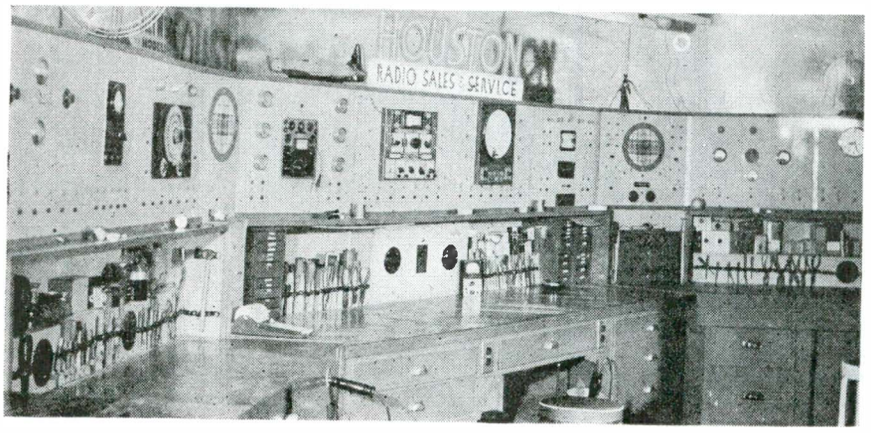


Fig. 1. A modern radio work bench with tool equipment in handy racks within convenient reach of the Service Man.
(Courtesy Houston's Radio Service, Maryville, Missouri)

Every Service Shop needs tools . . . from a basic set to a more complete assortment. The type and variety depends, of course, on the extensiveness of Servicing.

All of the tools required for all types of Servicing will be thoroughly described in this series of articles. Discussions will cover purposes of the tools and reasons for the selection of certain types. Complete tables of sizes of taps, drills, screws, etc., will be presented.

The data will prove helpful to the oldtimer and newcomer. For tools are the basic need of every Service Shop, and their proper selection and use insures better Servicing.—*Ed.*

A SELECTED group of tools and accessories play a very important part in efficiently performing the large amount of mechanical work involved in maintenance and repair of receivers. Because this is so, the well-equipped Service Shop includes a full complement of tools and accessories that are selected just as carefully as the all-important test instruments. In Fig. 1 we have a modern shop with a typical assortment of the necessary tools and accessories, all placed within easy reach of the Service Man.

A working knowledge of those tools and accessories that experience has proved to be the most helpful in this work, as well as the proper types and sizes to purchase, can be of great assistance in simplifying the newcomer's task of accumulating this part of the new Service Shop's working equipment. To this may be added the obvious advantage that such knowledge makes it possible to obtain the maximum amount of really helpful equipment for a given expenditure of funds budgeted for this purpose.

Choice of Wide Variety

A glance through the many pages devoted to *tools and accessories,* in the familiar catalogs of mail order supply houses, reveals that an extremely wide variety of tools, gadgets and numerous kinds of supplies are now being offered. It is an array that must be bewildering to the novice. To complicate matters, most of the tools are offered in such a confusing multiplicity of styles and sizes that it is extremely difficult for the newcomer to decide what to buy.

Which Tools Are Necessary?

In a pinch, many a competent Service Man has managed to repair with nothing more than a screwdriver and a pair of pliers. However, on the basis of these scattered successes, we could hardly put down only these two tools, or even as few as half a dozen common varieties, as the basic tools required for modern servicing. The matter of efficiency—of the labor cost in man-hours—is part of the Service Man's profit and the customer's cost. Obviously, the availability and use of the essential tools and accessories necessary for successful performance of every mechanical job the Service Man is called upon today will be of dollars-and-cents benefit to both parties. While the same statement may be applied to the Service Man's test instruments, we will only concern ourselves with the tool and accessories angle—the *mechanical* side of the job.

It is not a question of the *minimum* number of tools and accessories with which the Service Man can *get by* in his work. The point is that *enough*

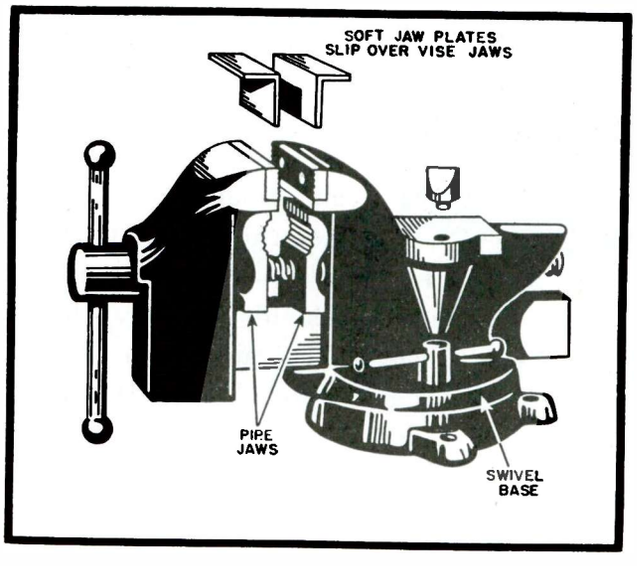


Fig. 2. Typical swivel-type bench vise for the Service Shop. Pipe jaws are shown in place. A pair of soft jaw plates are illustrated too.

For the NEW SERVICE SHOP

by ALFRED A. GHIRARDI
Advisory Editor

[*Part I . . . Basic Tools*]

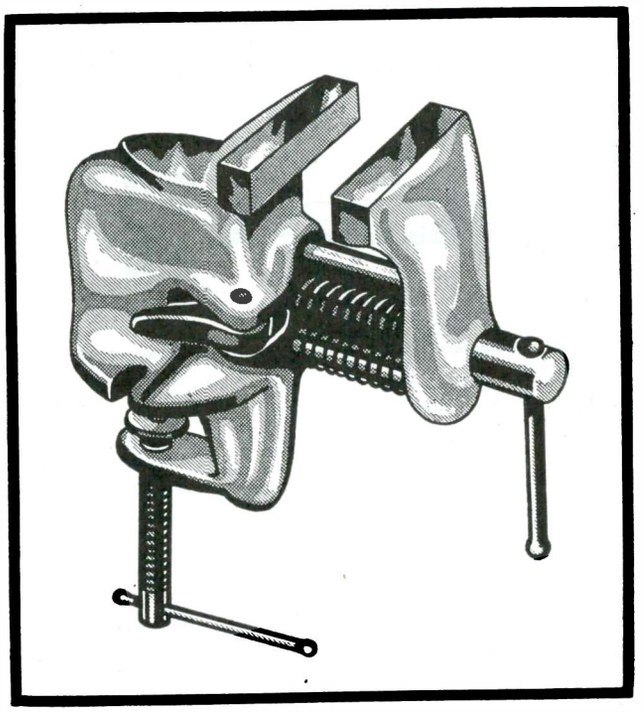


Fig. 3. Vise with quick-release trigger. *(Courtesy Grand Specialties Co.)*

tools are needed for every job; but which ones are *basic?*

The tools and accessories really needed in any shop depend chiefly on two things:

(1) The nature and type of work handled by the Service Shop.

(2) The individual tool preferences of the particular Service Man.

The Service Man whose repair work involves the more simple types of home receivers naturally will not need as much equipment as the fellow who also installs and services auto radios, modernizes old receivers, does custom installation or construction work, or is frequently called upon to tackle large phono-radio-recorder combinations. Then too, the Service Man who is in the habit of repairing many faulty components himself needs more such equipment than does one whose policy is to replace faulty components with new ones.

Most Service Men have developed their own ideas as to their tool preferences. To Tom Brown a particular type of aligning tool may be *the* irreplaceable best, while Bill Jones may not care much for it.

The Basic List

Because this *human element* enters into the selection of the tools and accessories, there are many opinions. However, on the basis of the experience of a large number of old timers in the business, and as a starting point for the bewildered newcomer, the following list of *basic* tools and accessories is presented, the author being fully aware that *your* selection may be somewhat different. With this basic equipment, most of the ordinary mechanical jobs likely to be encountered can be tackled. In the succeeding articles of this series many extremely useful supplementary tools and accessories intended to round out the equipment for the larger shop, will be presented.

Basic Tools and Accessories

Vise:
- Medium size (3" size), swivel type, with pipe jaws.

Hammers:
- Ball-peen, ¾ or 1 pound size.
- Soft face (light-weight) mallet, dual head.

Keyhole hacksaw:

Soldering iron:
- *Good* electric type (about 100 watts) with ⅜" screw tip.

Drills:
- Small hand drill (*eggbeater* type) preferably two-speed type and to take twist drills up to ¼" or ⅜" diameter.
- Portable electric drill to take twist drills up to ⅜" or ½" diameter (mainly for auto radio installation work).
- Assorted round-shank *high speed* twist drills (as many as you can afford between about No. 50 and ¼" or ½", depending upon size of hand drill or electric drill chuck).

Taps:
- For the most common machine screw sizes used in radio equipment, such as 4-36, 6-32, 8-32 and 10-32.

Pliers:
- Diagonal side-cutting, 6" long.
- Long-nose, 6" long.
- Electricians' side-cutting, 6½" long.

Screwdrivers:
- Small, ⅛" x 3" blade for knob and dial set-screws.
- Small, 3/16" x 4" or 3/16" x 5", round blade.
- Large, ¼" x 8", square blade.
- Bakelite or other insulated type.
- Phillips (for #5 to #9 size screws).

Wrenches:
- "Spintite" set socket wrenches.
- "Hex" end wrenches, inexpensive set for hex nuts from ¼" to 1".
- Small adjustable end-wrench (to 1").
- Tap wrench (adjustable).

Snips:
- Tin-snips (small size, 10" to 12").

Knife:
- Paring, *Boy Scout* jacknife, or *Electrician's* jack knife.

Small Tools:
- Scratch awl or ice-pick scribe.
- Center punch.
- Solid punch.
- Chisel, small cold-chisel (½" tip).

Files:
- 2 small ignition breaker-point type, coarse.
- 1 flat hand, 8", any cut, with handle.

- Hook for dial cable (similar to crocheting needle).
- Alignment tool, type designed to be useful also for certain trimmer adjustments.

Accessories:
- Brush, small camel's hair for dusting.
- Probe light.
- Shims, loudspeaker centering.
- Carborundum sharpening stone (small pocket type).
- Duco household cement (small tube).
- Light machine oil in squirt can.
- Friction tape.
- Rosin-core solder.
- Solder paste (non corrosive)

Tool Box and Tool Kits:

Tool Purchase Hints—the Vise

A bench vise is a very useful tool for holding work of various kinds on which some operation such as sawing, filing, drilling, soldering, etc., is being

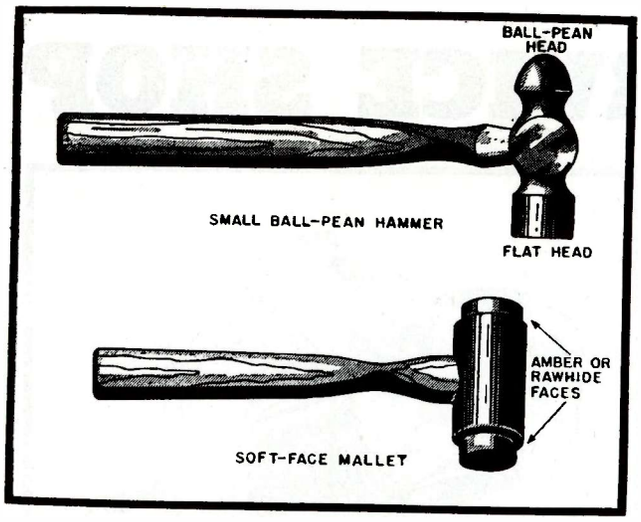


Fig. 4. Two types of hammers most frequently used in the Service Shop. Above is a small ball-peen hammer. Below appears a soft-face mallet.

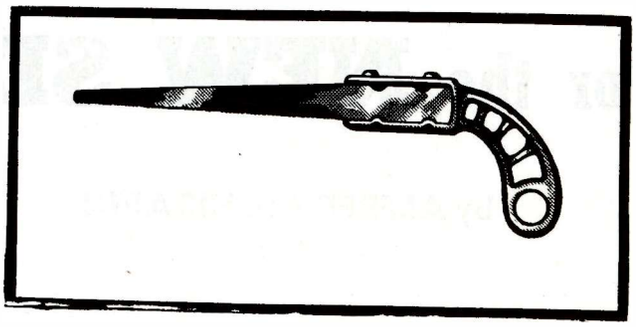


Fig. 5. Handy keyhole-type hacksaw for sawing metals, bakelite and wood.

performed. One should be permanently installed at a convenient place on the work bench.

Vises are made in several styles and are sized according to the maximum distance to which the jaws open. A 3″ or 4″ swivel-type vise of the type illustrated in Fig. 2 is suitable for the Service Shop. The swivel arrangement enables the work to be turned around to the most advantageous position for any operation that is to be performed; however, it adds to the cost of the vise.

A recently announced 3″ vise for Service Shops can be released by a finger-trigger. It is shown in Fig. 3. In this vise ¾″ of the thread on the main screw is held down under spring tension when the vise is tight. The vise, known as Quickcet, opens instantly to its full 3″ by pressure of the thumb or finger on the trigger release (shown just below the fixed jaw) after tension has been eased by a turn of the looseproof handle.

Separate pipe jaws are shown in place on the vise illustrated in Fig. 2. They are helpful when round stock is to be held rigid.

As the vise is frequently called upon to hold objects of bakelite and soft metals such as brass, aluminum, etc., it is important to prevent its hardened steel jaws from biting into the work and denting or otherwise damaging its surface, or from altering its shape. A pair of soft jaw plates (see Fig. 2), easily made from two pieces of sheet copper, can be laid over the vise jaws to prevent this when soft materials are being held.

Hammers

The two types of hammers most useful in repair work are illustrated in Fig. 4. Each has its special uses. The ball-peen hammer has the advantage of providing both a flat and a round head, to suit the various types of work which are encountered. The flat head is used for all ordinary hammering purposes; the ball-peen head is used for heading rivets and similar peening operations. Such a hammer need not be very heavy for radio work, and therefore one of ¾ to 1-pound weight is satisfactory.

Mallets with heads or faces made of soft material such as lead, copper, amber or rawhide, are called soft-face mallets. The soft-face mallet is used generally for any operation where a steel hammer might mar or injure the work, or where a non-magnetic material is wanted on the job. A small dual-head mallet having 1″ to 1 5/16″ face of amber or rawhide is suitable for the service shop.

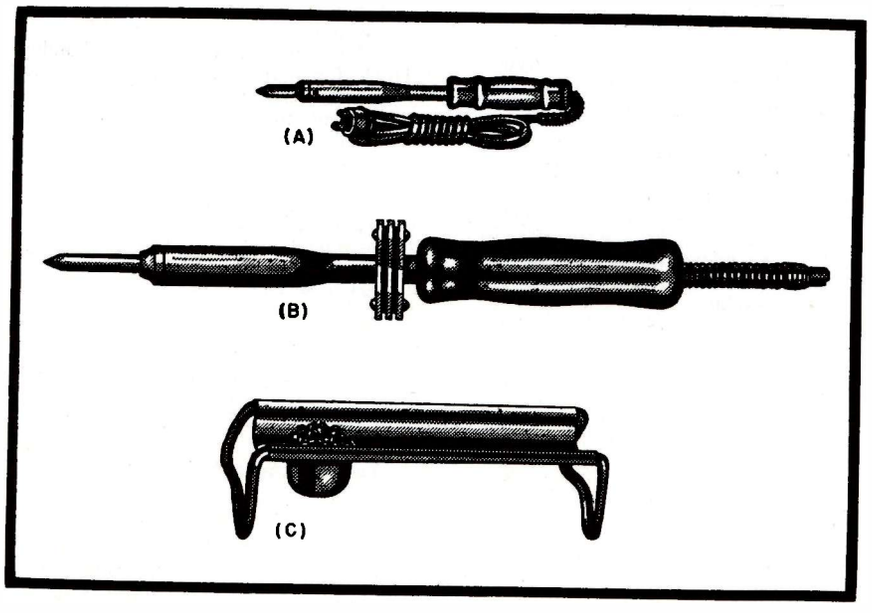


Fig. 6. Soldering irons and iron stand. At (*a*) we have a standard type of soldering iron. The iron at (*b*) is an extra-hot type of iron and is provided with heat-dissipating fins to assist in keeping the handle cool. In (*c*) we have a stand that is provided with steel wool for cleaning the tips of the iron.
(Courtesy Drake Electric Works, Inc.)

The Keyhole Hacksaw

Hacksaws are saws specially made for the cutting of metals and other hard materials. A hacksaw is very handy around the Service Shop for cutting screws, metal panels and chassis, the shafts of volume and tone controls, tuning capacitors, etc. While a larger adjustable-frame hacksaw such as will be described in the next article of this series is desirable, a small keyhole hacksaw of the type illustrated in Fig. 5 is extremely useful and less costly. Such saws are made with a pistol grip and have easily replaceable stiff steel blades about 7½″ long, provided with very fine teeth (about 18 per inch). They cut all metals including steel, bakelite, wood, etc., quickly and cleanly. The blade is tapered and gets into hard corners where ordinary hacksaws often are difficult to use. They can be used to cut circular or rectangular holes in panels and chassis when necessary.

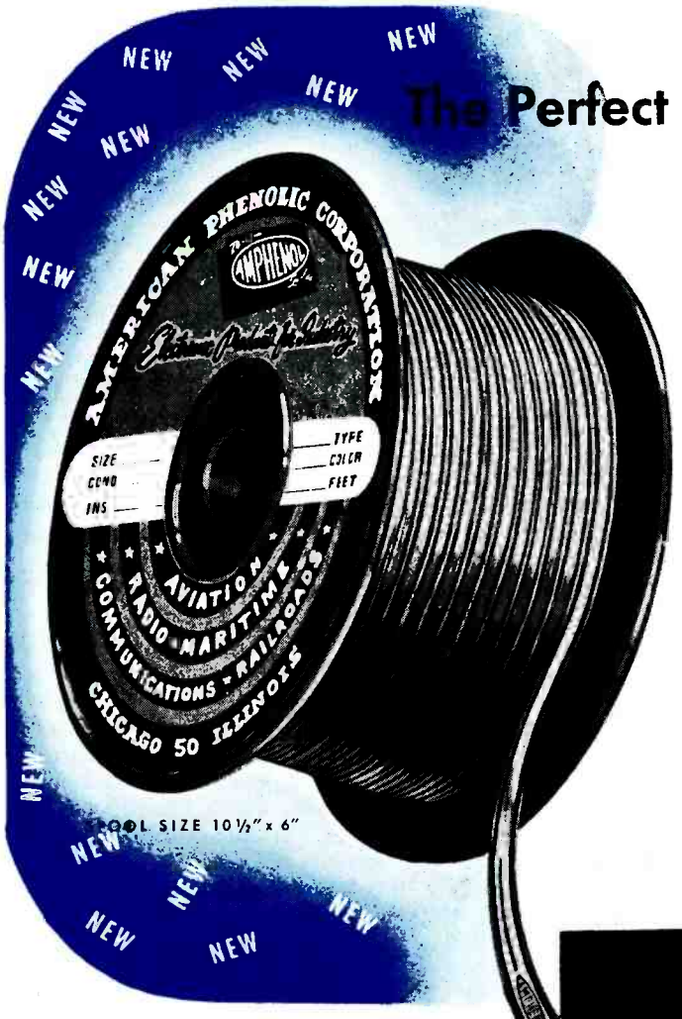
The Soldering Iron

A *good*, dependable general-purpose electric soldering iron of either 80- or

(*Continued on page* 31)

AMPHENOL

The Perfect Parallel Line Lead-in Wire



Amphenol Twin-Lead is a new type of radio frequency transmission line which combines the low cost of an open line with the excellent dielectric qualities of Polyethylene as a continuous spacer and insulator for the line. It is light and flexible — it can be tacked to a wall and is easy to lead in under a window sash. Its resistance to moisture, cold and heat is far superior to the usual rubber insulated, woven-braid-covered twisted pair used for antennas prior to the war.

Twin-Lead is made in three impedances that serve numerous applications. Selection of type is a simple matter. The *300 ohm* line is the most universal in use, particularly for FM and Television reception. Amateurs are using this line for both antenna and lead-in. The *150 ohm* type is excellent for antennas used mostly for short-wave broadcast reception, and is useful as a link between stages of a transmitter. The *75 ohm* line, originally designed for amateurs who operate in narrow bands of frequency, is also many times better for broadcast reception than the conventional rubber covered or cotton covered wire generally used.

It is to be emphasized that Amphenol Twin-Lead should not be thought of as exclusively for use at ultra-high frequencies. It is THE antenna lead-in for all frequencies.

AMERICAN PHENOLIC CORPORATION
CHICAGO 50, ILLINOIS
In Canada • Amphenol Limited • Toronto

ELECTRICAL DATA

Amphenol "Twin-Lead" Transmission Line is available in 300-ohm impedance value. RMA standardized an 300-ohm lead-in line for Television as the most efficient over broadband operation.

Amphenol also supplies 150-ohm twin-lead to those interested in particular applications and experimental work.

Designed especially for amateurs who operate in very narrow bands of frequency or one particular frequency. Ideal for dipoles with a nominal impedance of 72 ohms at the frequency for which they are cut. This line is also excellent for broadcast reception.

Dielectric constant of Polyethylene — 2.29. Capacities (mmf per ft.): "300"— 5.8; "150"— 10; "75"— 19.

Velocity of propagation (approximately): "300"— 82%; "150"— 77%; "75"— 69%.

Power factor of Polyethylene — up to 1000 Mc — .0003 to .00045.

ATTENUATION — FM AND TELEVISION BAND

Megacycles	300-ohm DB per 100 Ft.	150-ohm DB per 100 Ft.	75-ohm DB per 100 Ft.
25	0.77	0.9	1.7
30	0.88	1.03	2.0
40	1.1	1.3	2.5
60	1.45	1.8	3.4
80	1.8	2.25	4.3
100	2.1	2.7	5.0
200	3.6	4.7	8.3

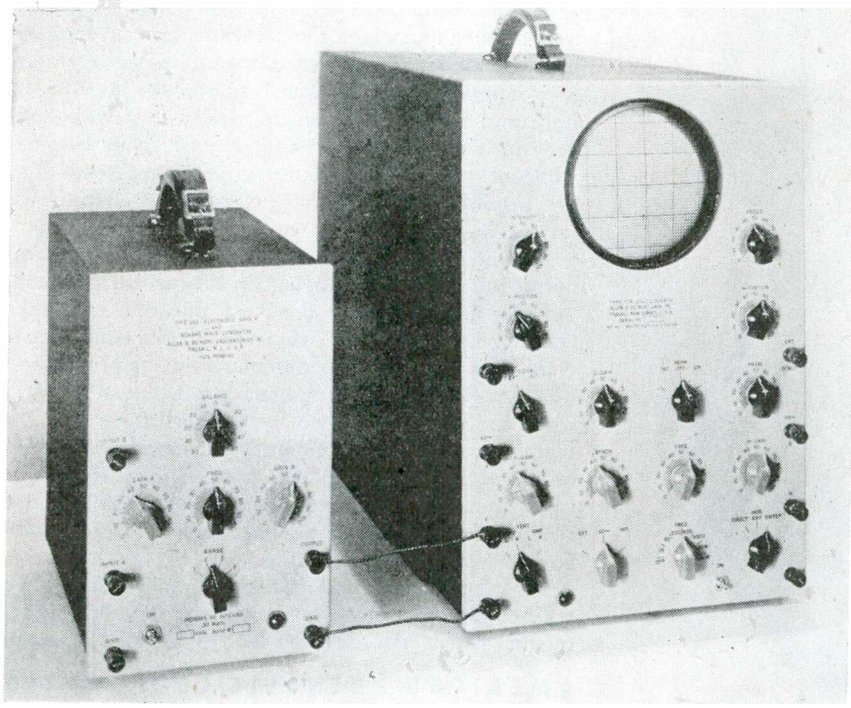
Depend upon AMPHENOL Quality

COAXIAL CABLES AND CONNECTORS • INDUSTRIAL CONNECTORS, FITTINGS AND CONDUIT • ANTENNAS
RADIO COMPONENTS • PLASTICS FOR ELECTRONICS

TESTING With The C-R OSCILLOGRAPH

by S. J. MURCEK

[Part II]



A portable cathode-ray oscillograph equipped with a transparent screen chart which facilitates the calibration of the screen pattern. A square-wave generator (at left) is used for circuit checks.

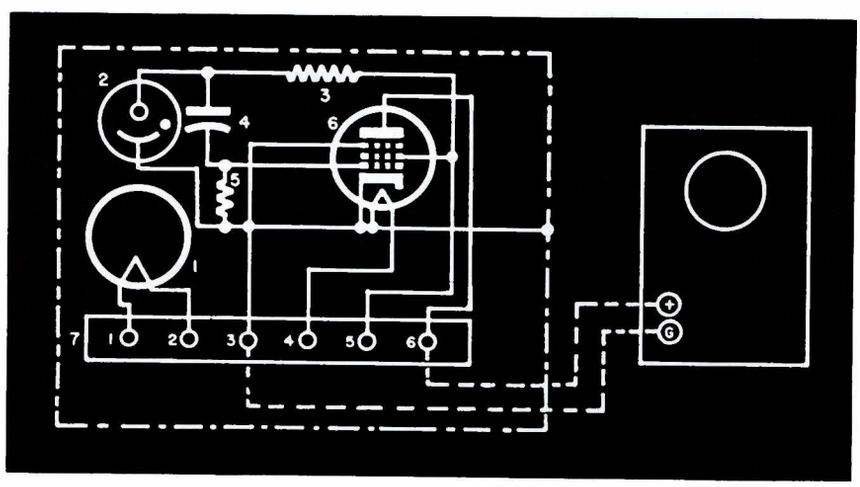
(*Courtesy Du Mont*)

PARASITIC oscillations and other spurious frequencies often occur in defective electronic circuits. The presence of these oscillations, as well as their immediate sources, cannot be localized without the cathode-ray oscillograph, inasmuch as the power developed by these circuits is negligible. In a photoelectronic sheet-metal pinhole detection amplifier, for example, the failure of a cathode bypass capacitor causes parasitic oscillations in the high-gain amplifying stage. The output voltage of the phototube amplifier remains at a maximum, since the subsequent stages amplify the oscillation potential developed in the defective stage. As a result, the control grid of the shear-control thyratron remains positive and the unit does not operate properly. Since the plate loading resistor of the amplifier tube in the affected stage is 250,000 ohms, the application of a high resistance a-c voltmeter to the plate circuit of the tube will overload this parasitic oscillation circuit, and the spurious oscillations will cease. However, since the input resistance to the vertical amplifier stage of the oscillograph is very high, the oscillation may be readily checked on the cathode-ray tube screen as a wave of high frequency.

Pulse and other potentials of short duration are readily measured with the oscillograph. Due to the inertia inherent in the mass of the conventional meter movement, electrical potentials of this description cannot be measured with conventional voltmeters. In the oscillograph, however, the pulse can be applied to the input terminals of the vertical amplifier, and the screen of the cathode ray tube can be calibrated in volts. The magnitude of the periodic voltage may then be measured accurately against the linear calibration of the electron screen.

In conventional a-c voltmeters, the value obtained with a conventional meter is in rms units,[3] which is considerably less than the *crest* voltage attained in the cycle. However, when this a-c voltage is measured with the oscillograph, the crest voltage is obtained directly from the pre-calibrated electron screen as the maximum voltage attained in each cycle. In this re-

(*Continued on page* 40)



[3]The rms (root mean square) equivalent of the a-c potential is its potential with respect to the heating, or d-c, value of a particular waveform potential, and is taken as 70.7% of the crest a-c potential. See *Principles of Radio Engineering*, McGraw-Hill Book Co., p. 3.

Fig. 1. Noise testing circuit for photo-electronic camera of register regulator. When the camera circuits are properly energized from the regulator power supply system, noise voltage impulses effect the writing of steep vertical patterns on the oscilloscope screen. Difficulty is often encountered in attempting to develop a *complete* noise impulse pattern since the initial trace disappears because of its great velocity.

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RADIO RECEIVING TUBE DIVISION
NEWTON, MASS. • NEW YORK • CHICAGO

1946 RADIO PARTS AND ELECTRONIC

Stevens Hotel . . . Chicago . . . May 13-16, 1946

Alphabetical Listing of Exhibitors

Name	Booth
Advance Electric Relay Co.	140
Aerovox Corporation	90
The Alliance Manufacturing Company	98
Alpha Wire Corporation	141
American Coil and Engineering Co.	136
American Condenser Company	129
American Microphone Co.	28
American Phenolic Corporation	38
American Radio Hardware Co., Inc.	71
Amperex Electronic Corporation	67
Amperite Company	133
The Astatic Corporation	95
Atlas Sound Corporation	80
Audio Devices, Inc.	96
Barker & Williamson, Inc.	76
Belden Manufacturing Company	87
Bell Sound Systems, Inc.	13
Bliley Electric Company	6
David Bogen Company	40
William Brand & Company	105
British Industries Sales Corporation	158
The Brush Development Company	65
Bryan Davis Pub. Co., Inc.	64
Bud Radio, Inc.	54
Burgess Battery Company	156
Caldwell-Clements Publishing Co.	27
Camburn, Inc.	22
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Cinaudagraph Corporation	161
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Condenser Products Co.	28
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Corning Glass Works	66
Cowan Publishing Company	23
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Eastern Electronics Corporation	134
Eitel-McCullough, Inc.	140
Electric Soldering Iron Co., Inc.	93
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Electro Products Laboratories	127
Electronic Engineering Company	42
Electro-Voice, Inc.	15
Electrovox Mfg. Co.	151
The Erwood Company	104
Freed Transformer Company	114
General Cement Manufacturing Co.	79
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General Electronics, Inc.	33
The General Industries Company	120
General Transformer Corporation	59
Gothard Manufacturing Company	150
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The Hallicrafters Company	35
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Hardwick, Hindle, Inc.	130
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Premax Products	18
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Price Electric Corporation	30
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Rad-El-Co Manufacturing Company	160
The Radiart Corporation	153
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Radio & Television Weekly	23
Radio City Products Company, Inc.	62
Radio Essentials, Inc.	29
Radio Manufacturing Engineers, Inc.	77
Radio Receptor Co., Inc.	134
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R C A-Victor	145
Raytheon Manufacturing Company	110
The Recordisc Corporation	2
Reiner Electronics Company, Inc.	48
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United Catalog Publishers	1
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Ward Products Corporation	102
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Weller Manufacturing Company	47
Westinghouse Electric Corporation	7
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Wirt Company	78
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Worner Electronic Devices	8
Ziff-Davis Publishing Company	11

NOTICE ON HOTEL ACCOMMODATIONS FOR THE SHOW

In view of the critical housing shortage in Chicago, those planning to attend the show should be sure that they have confirmations on their hotel accommodations.

The housing committee for the show has assigned 1,100 rooms, allotted by Chicago hotels, which include: Stevens, St. Clair, Planters, Webster, Eastgate, Maryland, Harrison, Morrison, Bismarck, Chicagoan, Croydon, Brevoort, Atlantic, Parkway and Plaza.

There are still available rooms in some Chicago hotels, since all hotels did not set up an allotment. Persons coming to the show who do not already have a confirmed hotel reservation should try *now* to get accommodations by writing to anyone of the following hotels: Blackstone, Congress, Palmer House, LaSalle, Sherman, Knickerbocker or the Edgewater Beach.

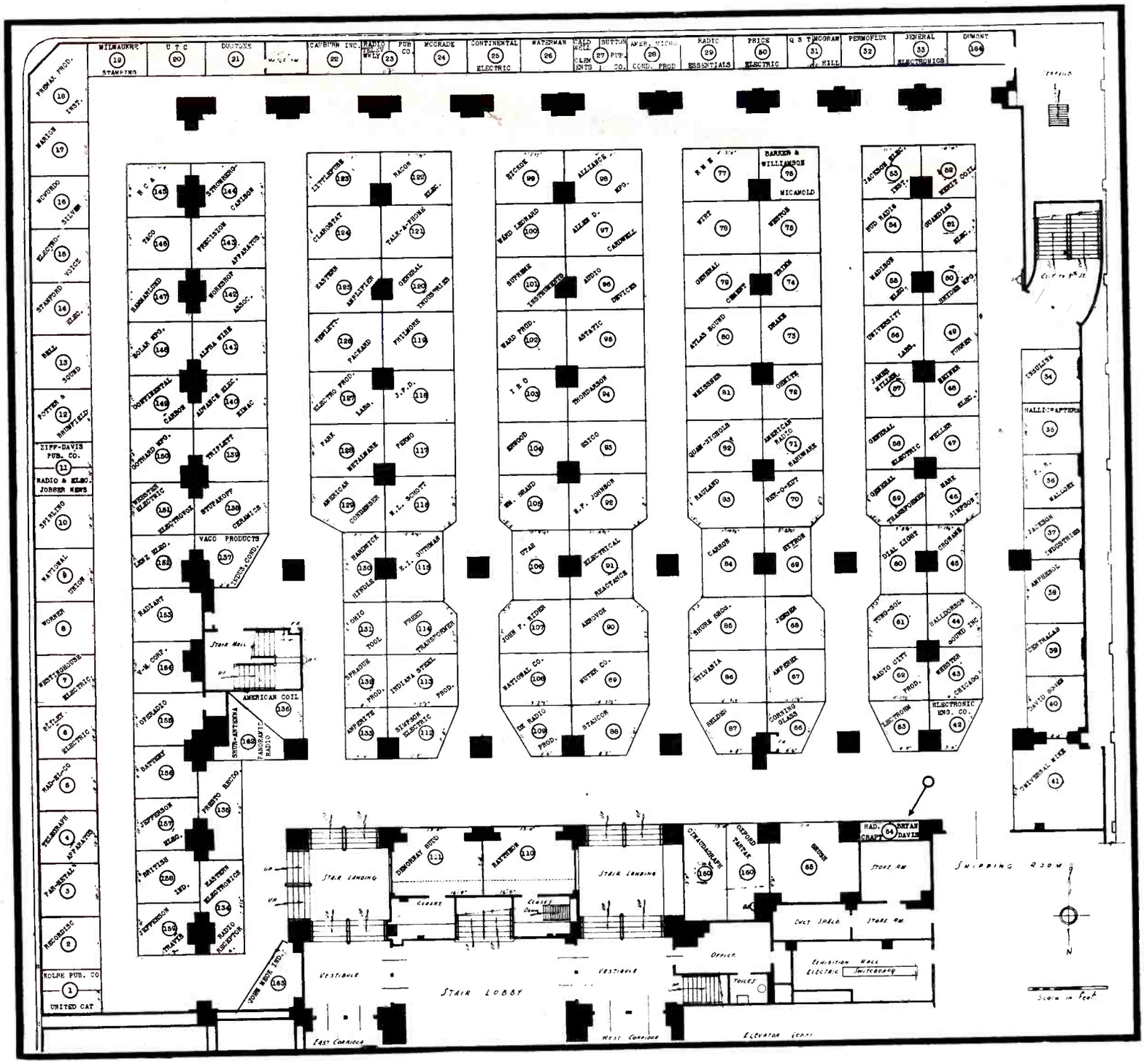
KEYNOTE DINNER

The keynote dinner of the 1946 Radio Parts and Electronic Equipment Conference and Show will be held in the grand ballroom of the Stevens on Monday, May 13, 1946, at 7 P.M.

There'll be 1500 tickets available at $5.00 per plate. Reservations should be mailed to the show headquarters, suite 2214, 221 North La Salle Street, Chicago 1, Ill.

EQUIPMENT CONFERENCE AND SHOW

Floor Plan



We'll be at Booth 64. . . . Hope we will have the pleasure of seeing you!

A value range equal to its frequency range . . .

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We've been designing and producing signal generators for a good many years—each one the best we were able to produce in that year. They have always been pace-setters. Over the years they have become the standard of utility in such instruments for servicemen—distinguished always by that inbuilt Simpson accuracy that stays accurate. Every new model has stepped up the value, dollar for dollar, of the serviceman's investment.

Now this Model 415, with the widest frequency range of them all, tremendously widens the value range as well. Every dollar of its price buys more than a dollar ever bought before, even in a Simpson instrument. We know, for instance, of several signal generators built for laboratories only, selling *at twice and three times the price* of the Model 415, that will do very little more than this new Simpson Wide Range Signal Generator for AM and FM. And no serviceman's instrument we know of even approaches Model 415 in range, control, constancy of output, completeness of attenuation and degree of utility. Here is another of Simpson's 1946 developments in instruments for radio and television servicemen, the product of long and rewarding research.

We offer Model 415 in the proud knowledge that it is not likely to see its peer for a long time to come.

1. Direct reading dial with continuous coverage from 70 Kilocycles to 130 Megacycles in the following ranges: 75-200; 200-600; 600-1750 Kilocycles and 1.5-4.5; 4-15; 14-30; 29-65; 58-130 Megacycles.
2. Model 415 is practically independent of line voltage fluctuation. Calibration is stable regardless of wide variations in line voltage.
3. RF output is controlled through its entire range, eliminating the necessity of a separate connection for high uncontrolled output as found in other signal generators.
4. RF output voltage is practically constant throughout the entire frequency range.
5. Modulation from 0 to 100% using either the 400 cycle internal sine wave or an external source. A range from 0 to over 20 volts of 400 cycle sine wave is available for external use.
6. High fidelity modulation up to 100% from below 60 cycles per second to over 10 Kilocycles per second.
7. No unwanted frequency modulation present.
8. Each Signal Generator is individually calibrated against a crystal controlled frequency standard.
9. Substantial construction assures maintenance of calibration accuracy indefinitely.

PANEL—Lustrous black anodized aluminum. Dial is encased in a molded bakelite escutcheon with glass covering for protection against damage and dirt. Functional switches and controls are mounted on engraved molded bakelite panels.

CASE—Steel, copper plated for shielding effect and finished in black durable wrinkled enamel. Leather carrying handle.

SHIELDING—In addition to the overall shielding offered by the case and panel, the coils and tuning condenser are individually shielded, then an additional shield is placed over these two assemblies. This series of shields together with other factors reduce leakage to an absolute minimum.

COILS—Low loss RF coils are individually calibrated by means of variable inductance and variable minimum capacitance. These adjustments provide the means for greatest possible accuracy in calibration.

BAND SELECTOR—The rotating turret coil assembly permits the use of shortest possible wiring, resulting in minimum circuit capacitance and permits quick selection of any frequency range.

CONDENSER—A two section tuning condenser using either one section or the other provides for ideal inductance to capacity ratio on all bands. Smooth vernier tuning permits accurate adjustment of the selected frequency.

Price **$115.00**

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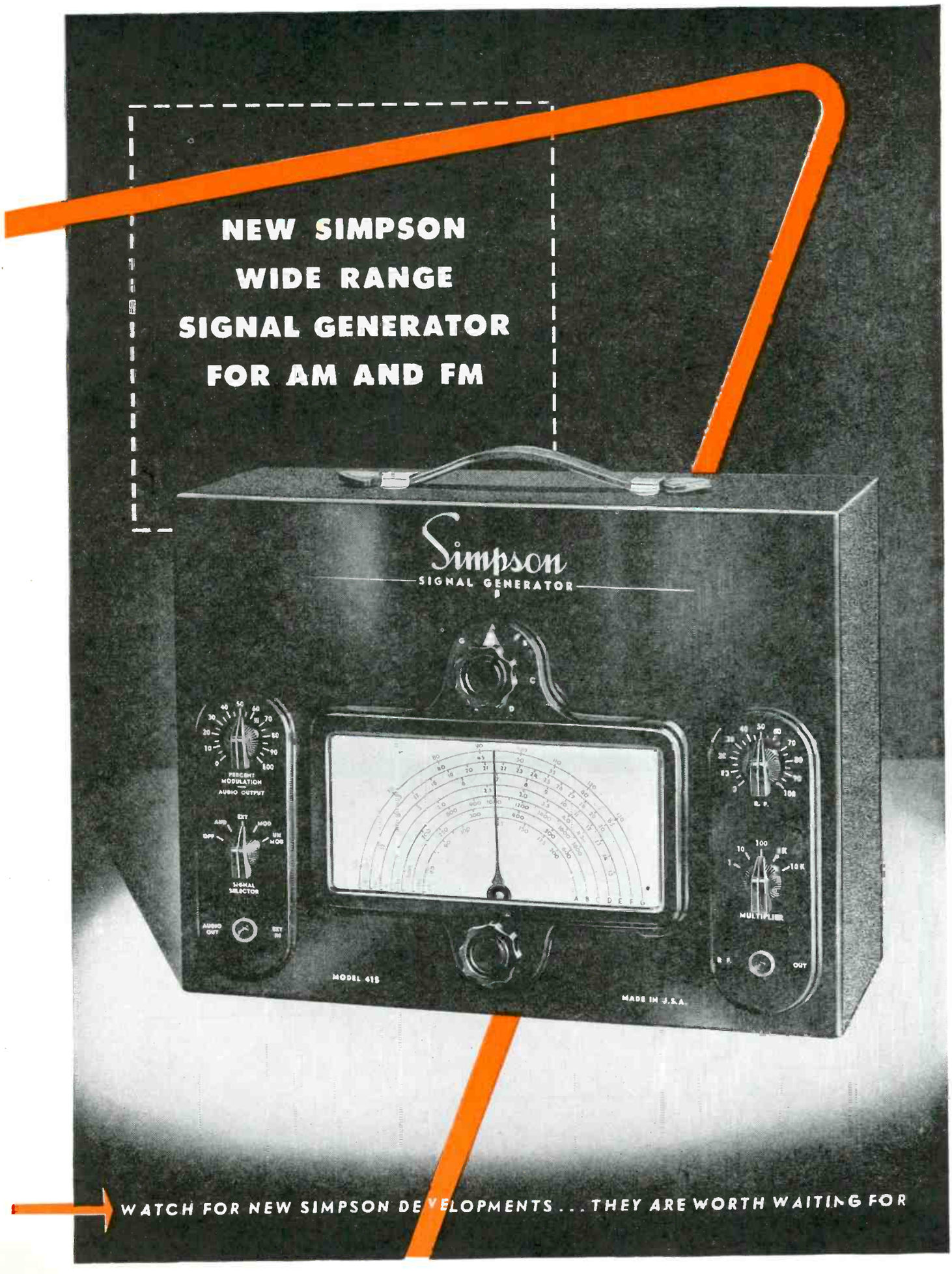
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WIDE RANGE
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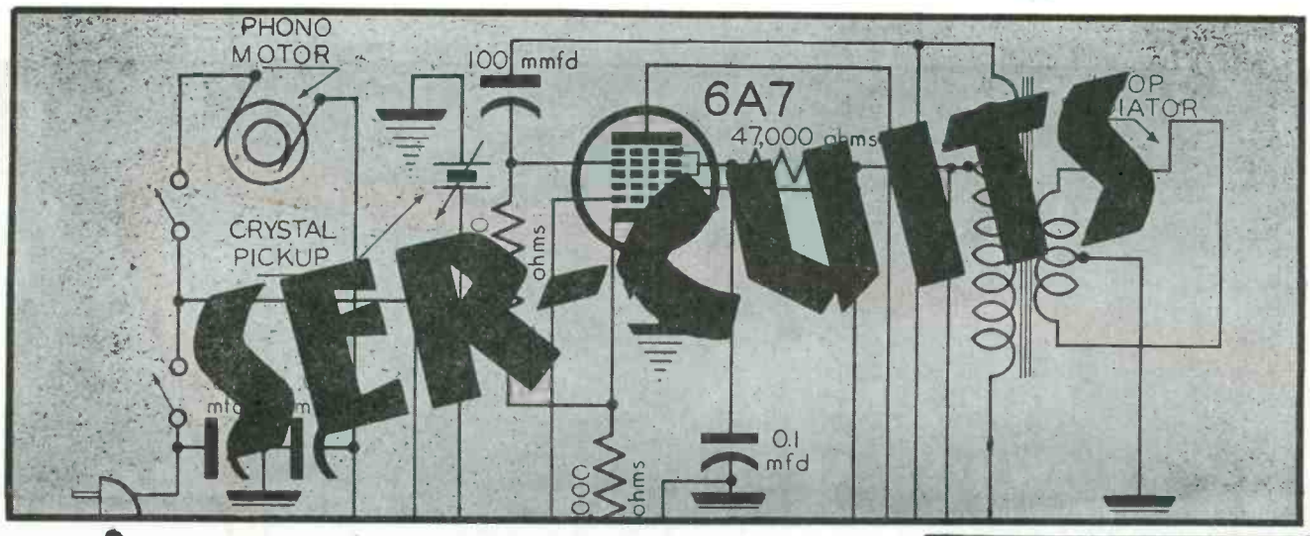
MULTIPLIER
WATCH FOR NEW SIMPSON DEVELOPMENTS . . . THEY ARE WORTH WAITING FOR



POSTWAR receiver analyses continue this month with data on the Admiral models.

by HENRY HOWARD

Admiral 5B1

Admiral's 4-tube-and-rectifier 150 mil a-c/d-c model, 5B1, appears in Fig. 1. With no hum bucking facilities possible with a p-m speaker, the *B* filter is made more efficient through the use of a filter choke. No surge reducing resistor is included in the 35Z5 load circuit. The *B* – is connected to the chassis by a 0.2-mfd capacitor in parallel with 150,000 ohms.

Admiral 6A1

Admiral 6A1 has a very unusual 3-gang tuning system, with a 2-gang capacitor in combination with a variable core permeability tuned unit. The capacitor tunes the oscillator and the loop antenna feeding the 12SJ7 r-f amplifier, while the 12SA7 first detector is tuned by a variable inductor. The latter is actually in the plate circuit of the r-f amplifier and resistance-coupled to the detector through a 250-mmfd blocking capacitor. The grid leak has a 10,000-ohm value. The i-f stage is conventional but the detector and avc circuits merit close attention.

The detector load resistance consists of a ½-megohm volume control with

(*Continued on page* 45)

CONDENSERS

Symbol No.	Capacity	Type
C1	.1 mfd.	200 V.
C2	.00005 mfd.	Mica
C3	.02 mfd.	400 V.
C4	.01 mfd.	400 V.
C5	.01 mfd.	400 V
C6	.00025 mfd.	Mica
C7	.0005 mfd.	Mica
C8	.02 mfd.	400 V.
C9a	30. mfd. (Elect.)	150 V.
C9b	50. mfd. (Elect.)	150 V.
C10	.2 mfd.	900 V.
C11	.05 mfd.	400 V.
C12	.005 mfd.	600 V.
C13a	.00042 mfd. (max.)	Var.
C13b	.00018 mfd. (max.)	Var.
C14	.00002 mfd.	Mica

RESISTORS

Symbol No.	Ohms	Type
R1	22,000 ohms	C½W
R2	470,000 ohms	C½W
R3	10 meg ohms	C½W
R4	220,000 ohms	C½W
R5	470,000 ohms	C½W
R6	150 ohms	C½W
R7	150,000 ohms	C½W
R8	1 meg ohm Vol. Con.	

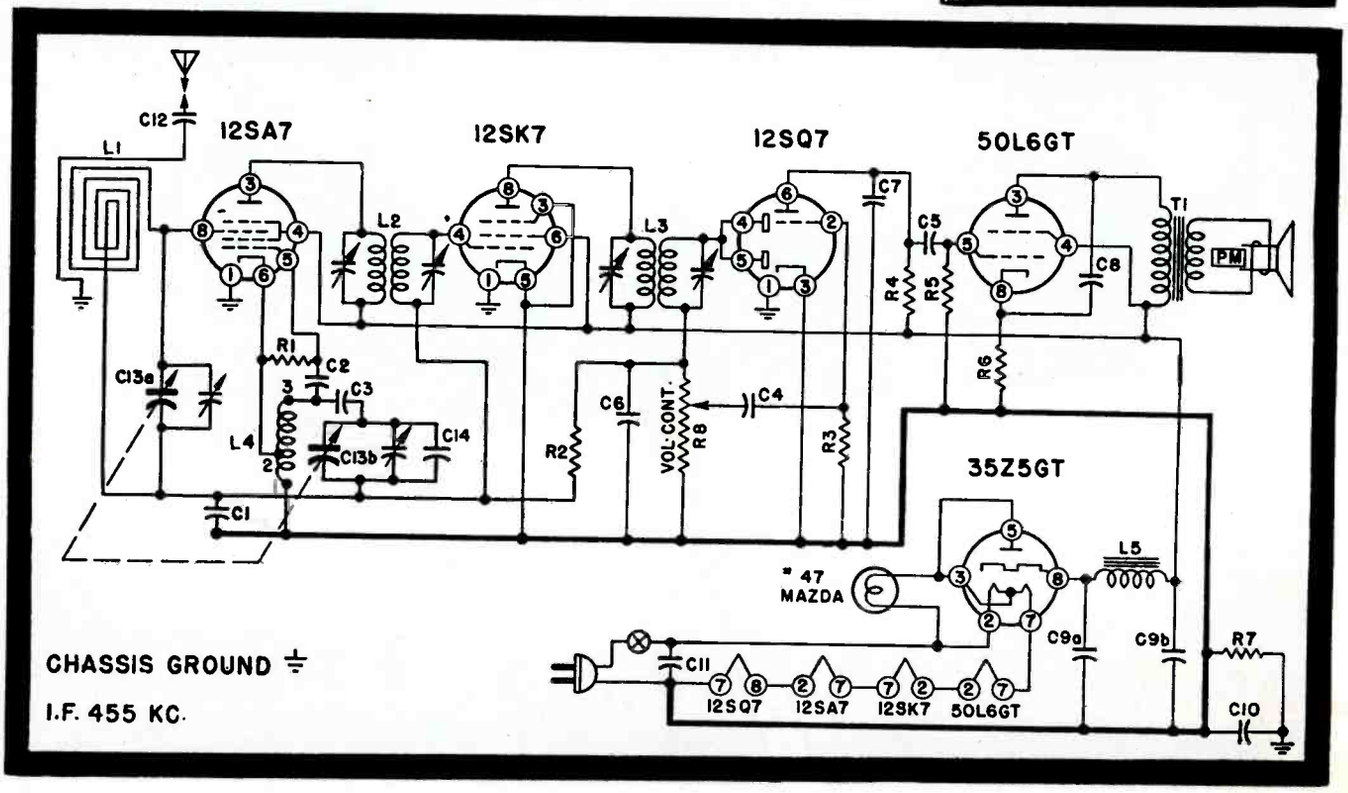


Fig. 1. Admiral 4-tube and rectifier a-c/d-c 150-mill receiver, 5B1. List of parts appears in Fig. 1 *a*.

TOOLS

(*Continued from page 22*)

100-watt size and having a ⅜" screw type tip is one of the most essential tools in the Service Shop. The iron should be of sturdy construction, contain a high-quality heating element that will stand up under constant use, and employ a screw-type tip that can be replaced as soon as it becomes pitted and worn from repeated trimming.

No sharp edges at the end of the handle of the iron that will cut away at the cord where it enters, is an important feature to look for in irons. This is one of the points of most wear, and a frequent source of trouble. Some manufacturers guard against it by surrounding the cord with a flexible coiled metal spring, where it enters the handle, Fig. 6.

A stand should be provided for the iron when it is not in use. Since the tinned tip of the iron tends to become coated with a film of oxide while it is heated, one manufacturer equips the stand with a cup filled with steel wool, (*C*) in Fig. 6. All oxide may be removed and the tip brightened up by simply inserting the tip into this steel wool and giving it a slight twist.*

The iron illustrated at (*B*) of Fig. 6 is an extra-hot iron designed for Service Men. It is provided with a series of circular heat dissipating fins which help to keep the handle cool. The more luxurious irons have a built-in thermostat for heat control; and certain stands are built to act in such a way that the heat to the iron is regulated automatically. Then, too, several entirely new forms of soldering irons have been devised. All these will be described in a later article of this series.

If one can afford two irons, a 100-watt size for all ordinary work, and one of the much smaller *pencil* type irons (drawing around 20-25 watts) for getting into tight places and for working on the extremely compact and crowded *personal* and *miniature* types of receivers now coming into vogue, are highly desirable. However, a single 80- or 100-watt iron will do for most purposes.

Drilling Tools

In the repair and replacement of faulty components in receivers, installation of auto receivers, outdoor antenna systems custom-built equipment, etc., the Service Man frequently finds

(*Continued on page 32*)

*For the Service Man who wants to incorporate this feature in his work bench a short ¾" pipe nipple screwed into a pipe cap and filled with steel wool will serve the purpose. The unit may be fastened to the service bench with an ordinary pipe clamp.

(*Continued from page* 31)

it necessary to drill holes in various kinds of metals and insulating materials. They are needed for the machine screws, self-tapping screws, rivets, eyelets, etc. Consequently, good hole-drilling equipment is very important in the Service Shop.

The Hand Drill

The hand drill is the hand-operated tool used for driving twist drills. Its chuck is of the 3-jaw type and is designed to hold twist drills having *round* shanks only. Hand drills are sized according to the maximum drill diameter the chuck is designed to accommodate, the ¼" and ⅜" sizes being the ones most commonly used. When purchasing a hand drill for the Service Shop it is usually best to select one which will take care of most of the drilling operations required—unless supplementary drilling tools such as an electric drill or a breast drill are also to be purchased for the heavier work. Usually the smallest well-built hand drill that will take a ¼" or ⅜" twist drill will be satisfactory. Holes up to these sizes can be drilled through thin steel, aluminum, copper and the usual chassis alloy metals by hand effectively with one of these drills.

Some hand drills are equipped with 2-speed adjustment for varying the twist drill speed to suit the size of the hole and hardness of the material being drilled. The high speed is used when drilling small holes, or soft material; the low speed is employed when drilling large holes, or hard material.

A continuous ratchet built into the hand drill permits it to be used in close quarters where it otherwise would be impossible to give the crank a complete turn.

The 2-speed adjustment and the ratchet are very desirable features and should be incorporated in the hand drill purchased—even though they add to the cost.

Portable Electric Drill

A portable electric drill is useful especially when a considerable amount of drilling is to be done, as in the modernization of receivers or making custom installations. It is useful also in auto-radio work, where relatively thick and hard sheet steel must be drilled for cable holes, mounting screws, etc., and where much of this drilling must be done in inaccessible, cramped locations that make it extremely difficult to drill by hand. The portable electric drill is practi-

cally indispensable in such work. By employing a suitable arbor, the drill can be used with a grinding wheel, wire brush wheel, or buffing wheel for a variety of grinding, cleaning, buffing and polishing operations.

The electric drill employs a 3-jaw chuck designed to accommodate round-shank twist drills. An electric drill that will take twist drills up to ⅜" or ½" diameter is preferable for auto radio work. In a subsequent article inexpensive bench drill stands will be discussed. These can be used to mount the portable electric drill to perform a number of useful jobs in the shop. If you plan to buy a drill stand, keep this fact in mind when purchasing your portable electric drill. When purchasing an electric drill be sure that it will accommodate a stand that you may want to buy later.

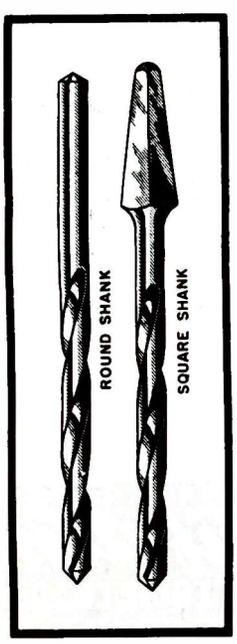
Twist Drills

A hand drill or an electric drill requires a *twist drill* to do the actual cutting of the hole. When the two cutting edges at the end of the twist drill are properly ground (or sharpened) it is a very efficient cutting tool.

Twist drills, Fig. 7, for ordinary work are made of *carbon* steel; for high speed work (as when used with electric drills) and for production, twist drills made of *high speed* tool steel are used. These are somewhat more expensive than the carbon steel twist drills, but they are much more durable. Twist drills made of carbon steel will lose their hardness if they

(*Continued on page* 34)

Fig. 7. Round and square shank twist drills. The round or straight shank drill is used for most service work.



TOOLS

(*Continued from page* 33)

become heated excessively during use. On the other hand, twist drills made of high speed steel can be worked to a red heat without losing their hardness. Since only a few sizes of twist drills are actually needed in the Service Shop, it is good policy to purchase the high speed type whenever possible in order to obtain long cutting life. In the long run, it pays to pay the additional price asked for them. Besides, because great friction and heat are developed in drilling bakelite and some of the other insulating materials that frequently must be drilled, high-speed twist drills should always be used on these materials (more will be said about this in a subsequent discussion). A carbon steel drill, softened and dulled through overheating, is a nuisance and a time-waster.

The drill shank is the end of the twist drill that fits into the chuck of the hand drill or electric drill. Two shapes of shank are commonly used on twist drills intended for hand drilling. The round (or straight) shank, Fig. 7, is generally used in hand, breast, and portable electric drills; the square (or bit) shank is made to fit into the 2-jaw chuck of the familiar carpenter's brace. Round shank twist drills are employed almost exclusively by the Service Man.

When you purchase twist drills you will find that there are three series of twist drills made, each series being composed of a number of drills of various diameters; but (with one exception) no drill in one series is of the same diameter as any drill in either of the other two series. A different system* for designating and marking the size (diameter) of the drills is used in each of the three series.

Altogether, there are a total of 135 twist drills in the three series (from the No. 80 drill to the ½" drill) inclusive. Fortunately, it is not necessary for the Service Man to have a complete set of twist drills of all these sizes. How many he will actually need depends upon the type and scope of work done in the shop. Thus it is best to purchase at first only those required for usual tap-drill and clearance-drill uses common in receiver work, plus a few of the smaller and larger sizes that may seem useful. As the need for additional sizes arises, they may be purchased.

Table A provides the correct size twist drills (tap drills) to use when drilling holes that are to be tapped for the standard-size machine screws commonly used in radio equipment;

also the size drills (clearance drills) to employ when drilling clearance holes for these machine screws. Twist drills of these sizes should be on hand.

Machine Screw Size	Tap Drill Size*	Clearance Drill Size
3-48	No. 45	No. 39
4-36, 4-40	42	31
6-32	36	28
8-32	29	18
10-24	25	11
10-32	21	10

**These are the tap drill sizes for average use. The proper size drill to use for tapping really depends somewhat on the material to be tapped. When tapping bakelite, hard rubber or steel, we must use a tap drill about one size larger (lower drill number) than specified in this table.*

Table A

Tap drill and clearance drill sizes

In addition, the following larger size twist drills will undoubtedly be found useful if your hand drill or electric drill can accommodate them: ¼", 5/16", ⅜", 7/16", ½".

The size designation is usually stamped on the shanks of all but the very small drills.

[To Be Continued]

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*One of these series comprises mainly the smaller size twist drills ranging from 0.0135" dia. to 0.2280" dia. In this, the *number-size* series, the drills are numbered from 1 to 80 (80 drills in all); the *No. 1* drill being the largest (0.2280" dia.) and the *No. 80* drill being the smallest (0.0135" dia.). It will be noticed that for the drills in this series the *larger* the designating drill number, the *smaller* is the drill diameter. To find out the diameter of a drill bearing a certain *number size* designation (or vice versa) one must refer to a table of *number drill sizes* (see *Radio Troubleshooter's Handbook*, Alfred A. Ghirardi, Murray Hill Books, Inc., N.Y.C.), or to a drill gauge. Number-size drills are always specified when a tap-hole or a clearance-hole is to be drilled, as we shall learn later.

The next series, the *letter-size* series, continues with larger drills where the *number-size* series ends. The drills in the *letter-size* series are designated by letters from *A* to *Z*. The *A* drill is the smallest size in the series (0.234" diameter) which is slightly larger than the largest drill (*No. 1*) in the *number-size* series. The largest drill, *Z* size, is 0.413" diameter. There are a total of 26 drills in this series. To find out the diameter of a drill bearing a certain *letter-size designation* (or vice versa) one should refer to a table of *letter drill sizes*.

The third series, the *fractional-size* series, begins usually with a smallest-size drill of 1/16" diameter, the success sizes increasing in fractional steps of 1/64" up to the ½" drill. There are a total of 29 drills in this series. (In some sets made for use by machinists, the drills cover the larger range of sizes from 1/64" to 1" dia.). Since each drill in this series is designated by the fraction equivalent to its diameter, no chart or drill gauge is needed to determine the diameter of the drill. The *fractional-size* series provides twist drills of diameters that are intermediate between those of some drills in the *number-size* series; also between those of some drills in the *letter-size* series.

With the exception of the *A* drill and the ¼" drill (which are of the same diameter), no drill in any one of these three series is of exactly the same diameter as a drill in any of the other two series. Hence there is no duplication of drill diameters (with the one exception noted above) in the three series of twist drills.

THE SERVICE SHOP

(*Continued from page* 15)

get the prescription filled at the corner drug store. There's complete confidence now that Annie will soon get well. The doctor gets paid for 15 minutes of his precious time, without any argument whatsoever.

Now Service Men are very much in the same position. True, no life is at stake, but the family's routine entertainment is dead for the moment and you are the fellow to bring it back to life again. You're the doctor. You can make that radio play again. And you're entitled to your fair price.

Now how do you deport yourself before customers? That's the real test in getting fair prices. I'll assume of course that you are neatly dressed, polite, business-like, and speak convincingly. Those basic points must be taken for granted. But do you talk and talk and talk, while on the job and disclose all your know-how?

Suppose you were checking a set in front of the customer. Incidentally, that's bad business to start with; all sets should be checked at your convenience and when the customer isn't around to bother you. But this is one of those exceptional cases: you've got to check the set while the customer is around. Alright. You go to work with your test equipment. You soon find out that a tube has low emission; a capacitor is shot; a resistor is drifting excessively. Knowing what has to be replaced, you figure up the cost of materials, the amount of labor, that matter of overhead, and your fair net profit. You give the set owner the cost. *Period.*

But now there is the talkative Service Man who wants to show how smart he is. Or at least he wants to prove that the price is correct. He may point out that this tube, type XYZ, has to be replaced; that capacitor, an 8-mike 450-volt electrolytic, has to be replaced; and that carbon resistor, 1-watt 100,000 ohms, has to be replaced. He may even go so far astray as to quote net costs on those parts, rather than the full list to which he's entitled on resale. Whereupon foxy Mr. Set Owner says that the price seems kind of high and he'll have to think it over.

Mr. Set Owner in due course turns up at a jobber's store. In professional talk he asks for a type XYZ tube, an 8-mike 450-volt electrolytic, and a 1-watt 100,000-ohm carbon resistor. He gets them at your net cost, because he speaks the language of the trade, duly taught him by the talkative Service Man.

Don't talk! Don't give away valuable information. Be as concise as necessary to justify your estimate. That's enough. Remember, the doctor didn't go into lengthy explanations regarding Little Annie's ailment. Nor did he tell the family in plain English what those Latin words and numerals meant on the slip of paper. Nor does the druggist say that the $1.00 prescription could have been compounded at home from such common ingredients as baking soda and common salt at a cost of a couple of pennies, in many cases. No sir! The family is paying for *knowledge*. And that's mainly what you as a Service Man have for sale.

In your estimate or price, you are entitled to full list prices for parts and supplies. You are entitled to be paid for your time, even if it's only to check a set

and give an estimate away from your shop. You are entitled to charge for your time from the moment you leave your shop until you get back. Remember, doctors don't make many free calls.

Yes, get fair prices for your jobs. Make a decent profit. But this does not mean that you are licensed to cheat. Cheating is the other extreme of working for nothing. And one extreme is as bad as the other.

Some Service Men don't take any chances with the making of ample profits. They just work customers for all they can get. The *Reader's Digest* a few years ago, turned up some very flagrant cases of this sort and for a time made it pretty bad for all Service Men. We just cannot afford to have that sort of reputation.

Cheating just doesn't pay in the long run. I've seen one Service Man after another go out of business because customers were simply robbed.

Today there is enough legitimate work to go around. We can well afford to be honest. So why tell a set owner that the job will cost $10 when all that is necessary is to solder a broken connection or push a loose tube down into its socket or tighten the antenna binding post that has become loosened? Of course the Service Man is entitled to charge for the call, no matter how simple the trouble may prove to be. But between such a legitimate fee and the charging of many extra dollars on trumped-up defects, there is all the difference between an honest living and downright cheating.

The *right* price for a job is that which constitutes a real bargain to you and to the customer. If the customer thinks your price was reasonable, and you know you've made a fair profit, then it's really a bargain.

But to insure that bargain, it is necessary that your job stand up as it should. There are some Service Men who just don't care whether the job stands up or not, provided they have been paid. That's just another form of cheating, and leads to hard feelings and eventual exist from business.

If the set owner has paid your price without quibbling, he's entitled to have the repair job stand up for six months or a year. However—and this is a point I wish to emphasize—it is well to state in your bill, and even on a sticker fastened to the chassis, just what repairs have been made. I also like the idea of putting stickers on tubes that have been replaced, with the dates. If the set then breaks down from some other cause, the reasonable set owner can readily understand that you are not at fault. Also, when you estimate on a repair job, it may be well to specify what you are going to do in general terms, and also to mention other things that might be attended to for a 100% repair job, but which are not included in this particular estimate.

In connection with making those jobs stand up, I cannot emphasize too much the importance of using the best parts or components. There are many Service Men who are still penny-wise-pound-foolish. And that situation is even aggravated today with surplus war parts finding its way to the radio parts market. Of course, I realize the temptation it is to pick up 8-mike electrolytics for say a dime and power transformers for say a

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CAPACITORS

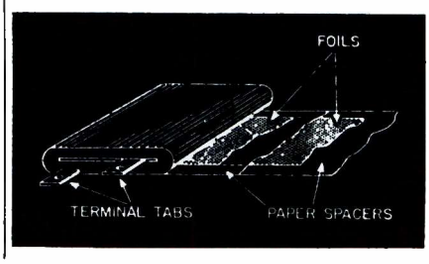
(*Continued from page 17*)

nated capacitor, but its processing and operation are very much different. The aluminum foils of the dry electrolytic capacitor are closely spaced with paper, the latter, however, is impregnated with a moderately conducting substance (of a glycerin or glycol base) instead of with a highly resistant oil. Furthermore, at least one of the foils is covered with an electrolytically formed film which constitutes the dielectric. The dry electrolytic capacitor excels all other types (including the wet electrolytic) in compactness. This feature is most striking when the voltage rating is low, say 6 to 100 v (a 20-mfd 6-v dry electrolytic capacitor can be accommodated in a tube smaller than a cigarette). These small capacitors are incorporated in some of the hearing aids, but is still very impressive up to about 600 v, which is the limit for single sections. The self-healing properties of the dry type are good, though inferior to those of the wet-electrolytic capacitor. In addition to its light weight and small bulk per unit capacitance, the dry type offers the convenience of mounting in any position and the possibility of a hermetic seal.

Wet capacitors ordinarily have a *breathing* vent to permit the escape of vapors and gases and they must be so mounted as to insure a free action for the vent and complete immersion of the anode in the electrolyte, to make the total capacitance of the device available. Like the wet type, dry electrolytic capacitors are used most extensively in filter circuits. However, the dry type lends itself also eminently to bypassing of audio-frequencies (and in some cases of r-f) and for the blocking of d-c in one direction. Where moderate alternating voltages (up to a couple of hundred rms volts) are applied intermittently and for very short periods of time, non-polarized dry electrolytic capacitors are most useful because of their low cost and small bulk for a given rating.

When used for starting single-phase induction motors, the capacitor re-

Fig. 5. Dry-electrolytic capacitor section.



mains in the circuit only for a second or so, until the motor comes up to speed, at which time the starting phase, including the capacitor, is cut off so that the latter remains idle until the next start occurs. The non-polarized capacitor used with low (non-rectified) a-c differs from the polarized, which is usable with pulsating d-c, since the former has both electrodes filmed or formed, while the latter has one electrode formed and the other unformed. The capacitance of a polarized unit is about twice as great as that of a non-polarized unit of the same voltage rating and the same bulk.

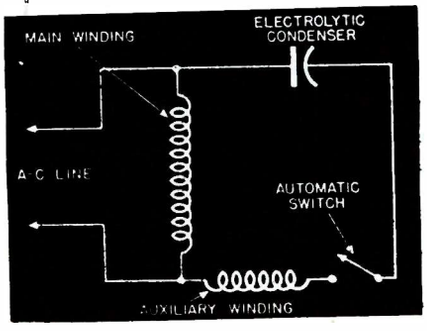
Etching

While the capacitance of electrolytic capacitors comprising plain filmed electrodes is very great (when compared with oil-impregnated paper capacitors of the same voltage rating and the same physical dimensions) it can be still increased by etching the electrodes prior to their forming or by producing electrodes of sprayed molten aluminum. In either case, the rough active electrode surface contacting the electrolyte is greatly increased over that of the smooth, plain electrode. This increase in active surface results in the corresponding augmenting of the capacitance of a capacitor of given physical dimensions. The etched and sprayed electrodes are particularly suitable in filter circuits and other applications where a comparatively small alternating voltage (ripple) is superimposed on a continuous or d-c potential. Where raw a-c is flowing in the capacitor the heating of the device resulting from the current is often the limiting factor for the bulk reduction and it therefore becomes debatable whether plain or etched (respectively sprayed) electrodes are preferable.

Electrolytic capacitors are inferior to oil- or wax-impregnated paper capacitors in insulation resistance, power factor, electrical stability (particularly with regard to the capaci-

(*Continued on page* 40)

Fig. 6. Capacitor start-induction motor circuit.



OSCILLOGRAPH TESTING

(*Continued from page 24*)

spect, it should be observed that the conventional a-c voltmeter is calibrated on an a-c voltage which is of nearly pure *sinusoidal* waveform. Hence, if the potential under measurement deviates considerably from the true sine wave form, a condition which often occurs in industrial electronic systems, the voltmeter no longer indicates the true rms value, and, therefore, fails to provide a true indication of the crest voltage attained in each cycle of the voltage under measurement.

The usefulness of the oscillograph in industrial electronic apparatus testing is further demonstrated in its application to the testing of the photoelectronic register regulator, used for the control of strip label printing and automatic package labelling machines. Here, the oscillograph is most useful in the testing of the photoelectronic camera, in which various operational defects, such as the development of circuit noises and the failure of resistors and capacitors, cause improper operation of the complete regulator.

In testing the photoelectronic camera for the presence of circuit noises, the vertical amplifier input terminals of the oscillograph are connected across the output circuit of the camera, as is shown in Fig. 1. To insure a match of the polarity of the screen pattern and the camera output, the ungrounded terminal of the vertical deflection amplifier input, which is often marked *high,* is connected to the plate of the pentode amplifier in the camera circuit, and the grounded terminal to the cathode of this tube. A rise in the pentode plate to cathode voltage results in the writing of a positive vertical component of the screen voltage graph.

The sweep oscillator system of the oscillograph is then adjusted to a low

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CAPACITORS

(*Continued from page 39*)

tance-temperature coefficient) and because of their inability to withstand a-c continuously even at moderate voltages (unless several sections are used in series, which in turn greatly reduces the capacitance of the assembly.) However, electrolytic capacitors do excel in self-healing properties, compactness and are much cheaper as referred to a given rating.

rate of relaxation, approximately 15 cps, by setting the *coarse* frequency control to the lowest frequency tap position and rotating the *fine* frequency control knob to approximately the center of its rotational scale. The horizontal amplifier *gain* control is then adjusted so that the horizontal straight line pattern appearing on the screen is at its maximum length. The vertical amplifier gain control is turned clockwise to approximately two-thirds of its maximum position. Then each noise impulse will write a fine vertical line on the screen.

Since the noise patterns appearing on the screen are of relatively low luminosity level, inasmuch as the noise potentials are of extremely short duration, the screen of the c-r tube must be shaded from all direct illumination, and the brilliance of the screen pattern increased by clockwise rotation of the *beam intensity* control until the vertical patterns are clearly visible. The clarity of the individual images is destroyed through the increase of the electron beam intensity. Hence, in order that the vertical noise lines appear sharp and distinct, it is necessary to re-position the setting of the *focus* potentiometer control knob.

Oscillographic noise testing of the camera must be conducted with extreme thoroughness so that all possible sources of erratic operation of the **register regulator** system are found and eliminated. Thus, if the screen bears no trace of aperiodic noise impulses, the shield should be opened or the cabinet cover removed and the amplifier pentode tapped sharply. If this tube is noisy or *microphonic,* definite noise patterns will appear on the screen.

Phototube exciter lamps are known to be noisy or microphonic, in many instances, since the filaments of these lamps are formed of crystallized tungsten. Therefore exciter lamps should also be subjected to the tapping procedure, to determine the exact degree of light modulation from this source. This test often gives rise to the presence of a comparatively high frequency voltage in the output voltage of the camera amplifier, and is detected by the presence of a *moving* a-c wave pattern on the screen. When this condition occurs, it is necessary to calibrate the screen against a known voltage to provide direct reading. The calibration of the vertical deflection system can be completed by connecting the vertical amplifier input terminals across a *stable* source of a-c, of known voltage, or this voltage may be measured with a conventional a-c voltmeter. Commercial or manufac-

(*Continued on page* 43)

OLD TIMER'S CORNER

by SERVICER

DROPPED into Joe's store the other evening, and found him with an extensive check list, and a look of wild despair in his eyes.

"What's cooking, my friend?" I asked.

"Going to the Parts and Equipment Show in Chicago", he answered, "and I don't know where to start and what to do about getting me some lines to handle."

"You're sure lucky to be able to go," I said. "Heard that the show is sure going to be a bang-up affair. Understand there'll be plenty of new parts and test equipment. Sure wish that the exchequer would allow my going."

"Got any suggestions?" Joe asked me, anxiously.

"Not that I know of," I said, "but I guess that I could give you some help on how to get the most out of a show, based on some ten years of going to radio shows and the like."

"Well, son, give!" Joe said.

"If I were you," I started, "I would go to the show with a very definite idea of who my customers were. I would know, just as you really do, that Mrs. Jones down the street is not going to buy a big console and that she wants a small set for the kitchen. Mrs. Rilstrum wants a nice console that should not cost over a hundred. Johnny Baxter wants some ham equipment and the fellows at his Boy Scout troop are going to be spending in the dollars and not in the hundreds of dollars. You know, from the type of repairs you have been doing, that most of the work involved burned-out transformers, bad tubes, a few shorted capacitors and the average run-of-the-mill odds and ends. You know that your transient trade is small, and that the advertising that you have had in the daily Journal and in some of the throw-aways mailed to dealers around town have brought you such-and-such results. All of this should give you a really clear picture of the business you are about to do, and what you will be able to do until another year comes around.

"Armed with those facts I would go to the show and find the answers to the facts I've just covered. But don't let the natural enthusiasm of a radio show, where everybody talks everything up and up and up run away with your common sense. If you do you will surely find that you will make enemies of the manufacturers, whom you sign up as your sources of supply, because you cannot deliver the customers and move the merchandise. In addition you will give your house a bad name because everything with you will being going down and down and down.

"There is no doubt that there will be temptation to buy and buy. Especially when you see the polished test equipment and the wealth of fine sets and parts. Extra-ordinary deals will be offered to you. All—or at least the majority—will be honest and well-founded . . . but they might not be the kind that would fit into your picture.

"Remember that it makes not a whit of difference what the *Tripple S* outfit down the county way buys. Don't be stampeded by tales of how they will be cutting into your profits, and how they will have the materials which you won't have. Just stick to your guns, and remember that you are a part of this community and that your batting average has been very good with your customers, many of whom have seen you grow from the day you went to grammar school!

"So when you get out there to the Windy City and are tempted to overbuy, just remember that those at home expect that you will be the same hard-headed businessman that you pride yourself on being here. They will be backing you to the hilt and you can expect that they will be buying from you.

"Remember that your customers have, for the most part been with you for more than just a few years. You have acquired them over a period of hard work, sweat and tears, and that you should by now know just what they will and what they will not buy.

"So when you hit that show, buy all that you think that you can sell. Don't get sold—but do a bit of selling yourself. Sell the manufacturers that you will give them fair and equitable representation for the merchandise. Show them that you have the reputation for square dealing—that you give and receive the neighbor-

(*Continued on page* 43)

OSCILLOGRAPH TESTING

(*Continued from page* 41)

turing plant power lines intended solely for illumination provide a suitable calibration voltage, and are conventionally regulated to an approximate 115-volt level. Since the crest value of this a-c potential is approximately 162.6 volts[4], and since its positive maximum approaches the top, and its negative maximum the bottom, of the screen, the maximum height of the pattern, with the horizontal *gain* control turned to zero or *minimum* position, represents a voltage of twice this value, or approximately 325 volts. Hence, if the *total* height of the compressed voltage pattern is adjusted to a maximum height of sixty-five millimeters, through adjustment of the vertical amplifier *gain* control, each *millimeter* of vertical deflection represents a potential of *five volts*. Once the screen is calibrated in this manner, the magnitude of the voltage due to exciter lamp modulation, may be readily subject to measurement. If this magnitude exceeds a level of five volts, the exciter lamp must be removed from its socket and replaced with another, since the condition is progressively aggravated with increasing lamp age.

[4]The root mean square value of an a-c voltage is taken as 70.7% of its crest value. Hence, the crest potential is taken as the ratio of the voltmeter reading to the factor 0.707, as

$$e_m = 115/0.707, \text{ or } 162.6 \text{ volts}$$

Here, the crest value e_m is obtained as the ratio of the voltmeter reading to the rms factor 0.707.

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OLD TIMER'S CORNER

(*Continued from page* 42)

hood's highest esteem, and that they would be doing themselves a good turn to accept your store as one of their valued dealers. In that way you will surely get the best lines to handle and establish good relations with the manufacturer.

"Last but not least, attend all the dealer meetings you can. Swap ideas with other men in the same circumstances as your own. Tell the other dealers and manufacturers your ideas on subjects which you know intimately.

"Don't be a knocker of new ideas. Listen, listen and listen. Ask questions. Then you can think it all over when you get home here and make any changes which mature thought indicates.

'If you follow these ideas you'll have a good business trip, get valuable some information, some new lines, and also have a good time."

"I think, my old friend, you have something there," was Joe's only remark as a broad grin spread over his face.

OHM'S LAW

(*Continued from page* 18)

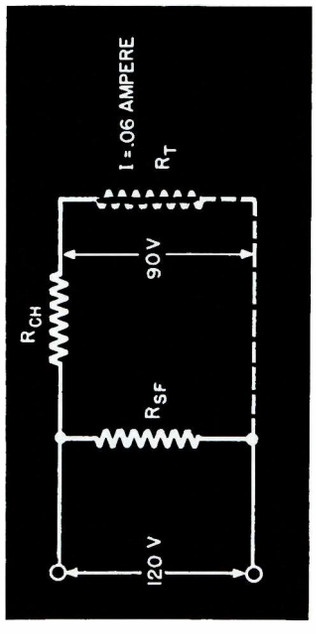
ampere; voltage to the plate and screen grid, 90. To solve this problem we must determine the required resistance of the choke and speaker field coil.

Solution: Since the tubes of the receiver require .060 ampere at 90 volts, the current through the choke will also be .060 ampere, since it lies in the same current path. If the required tube voltage is 90, and the supply voltage is 120, the voltage drop across the choke will be the difference, or 30. From Ohm's law,

$$R = \frac{E}{I} = \frac{30}{.060} = 500 \text{ ohms}$$

The speaker field is directly across the voltage supply, or 120 volts. Since the tubes require .060 ampere, and the rectifier can supply only .100 ampere, the maximum current which may be permitted to flow through the speaker field coil will be the difference, or .040 ampere. Applying Ohm's law as above, we find that the resistance of the field coil is 3000 ohms. If the field coil were connected at the far end of the choke, the problem would be changed entirely, since then the current through the speaker would first flow through the choke. In that case, the choke would be 300 ohms, and the required speaker-field coil resistance would be 2,250 ohms. We note that the voltage across the speaker field coil would be 90, instead of 120.

Fig. 3. A midget-receiver problem, involving the values of a filter choke, R_{ch}, and a speaker field coil, R_{sf}. The known factors are: input source, 120; maximum current, .100 ampere; R_t, equivalent resistance of tube components, which require a current of .060 ampere at a voltage of 90.



Problem: Connection of 5 tube filaments (three tubes require 12 volts, and other two require 35 volts, all drawing .150 ampere) in a series circuit, where the input voltage is 115, Fig. 4. In this problem we must determine the size resistor to be used in series with the filaments so that the proper voltage can be supplied to each tube.

Solution: This is one of the simplest problems, yet one where numerous errors are often made. The tube filaments in this type of circuit are actually resistances in series, and may therefore be designated by their voltage drops. In this case the voltage drop across the tube filaments is the sum of their individual voltage drops, or $12 + 12 + 12 + 35 + 35 = 106$ volts. Since the resistor is in series with the filaments, the voltage drop across the resistor must be $115 - 106$ or 9 volts. The current through the resistor will be the same as that

through the tube filaments, or .150 ampere. Therefore,

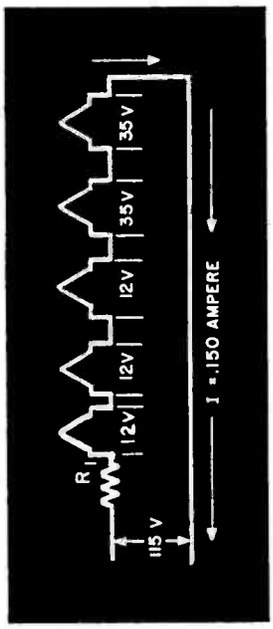
$$R = \frac{E}{I} = \frac{6}{.150} = 40 \text{ ohms}$$

Here, a fundamental of Ohm's law is observed. If the resistor were not inserted in the circuit, the voltage across the tube filaments would be 115. The tubes would then draw an increased current, since the voltage drops across the tubes would increase. The new current could be determined by substituting the equivalent resistance value for each tube, which can be found by dividing its rated voltage by its rated current. For the 12-volt tubes this would be 80 ohms, and for the 35-volt tubes the equivalent resistance would be 233 ohms. Adding the resistances, the total resistance of the tube filaments in series would be 706 ohms. The current in the circuit would then be

$$I = \frac{E}{R} = \frac{115}{706} = .163 \text{ ampere}$$

The tubes would therefore be operating above rated current, and their filaments would possibly burn out.

Fig. 4. A series-resistance problem, where we have to determine the proper size resistor to insert in the circuit, R_1, so that the voltage drop across the tubes will be correct. Known factors are: voltage drop across each tube, current in the circuit and supply voltage.



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SER-CUITS

(*Continued from page* 30)

two taps and equalizer circuits connected from these taps to $B-$. The taps are taken at 1/3 and 2/3 of the arc of rotation, which corresponds to 100,000 and 200,000 ohms, due to the taper.

SERVICING HELPS

by FRANK C. KEENE

I RECENTLY constructed a record amplifier similar to that shown on the April, 1945 SERVICE *cover, using however a 117N7, instead of a 70L7, which I was told would work just as well. Unfortunately I cannot get the unit to operate. Can you help? —Lawrence Mandl.*

Two changes are needed, Fig. 1*b*. The cathode bias resistor must be changed from 325 to 110 ohms, and the filament series dropping resistor must be removed.

Since the 117N7 requires a load resistance of 3000 ohms, as compared to

(*Continued on page* 53)

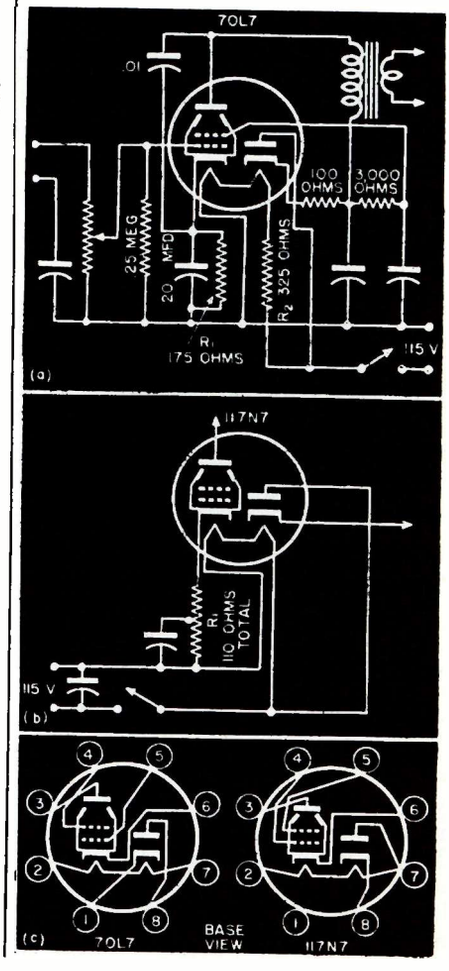


Fig. 1 (*Mandl query*). **In** *a* **appears the original record amplifier circuit using a 70L7;** *b* **shows the circuit adapted to the 117N7; and** *c* **shows the base diagrams of the 70L7 and 117N7 with the necessary changes.**

NEWS

SYLVANIA WINDOW DISPLAY

A window display featuring the returning serviceman theme has been announced by the radio tube division of Sylvania Electric Products Inc.

* * *

KAHN ELECTED TO AEROVOX CANADA BOARD

Louis Kahn, assistant chief engineer of Aerovox Corporation, New Bedford, Mass., has been elected to the board of directors of its affiliate, Aerovox, Canada, Ltd., Hamilton, Ont.

* * *

KAMIN BECOMES N. Y. MOTOROLA MANAGER

Lt. Colonel Vernon A. Kamin has been named regional sales manager for the New York area of the Galvin Mfg. Corporation, Chicago.

Col. Kamin served in the Signal Corps as Chief of the Radio Branch of the Engineering and Technical service. He was formerly general manager of the Goodyear Tire & Rubber Company's radio division.

* * *

HYTRON BUYS AIR KING

Hytron Radio and Electronics Corp., Salem, Mass., has acquired all the outstanding capital stock of Air King Products Co., Inc., Brooklyn, N. Y. J. P. Lieberman will continue as president of Air King which will operate as a Hytron division.

Air King will soon occupy a new building at 15th Ave. and 63rd St., Brooklyn, N. Y.

Left, above: L. H. Coffin, Hytron president. Above: B. A. Coffin, Hytron treasurer. Left: J. P. Lieberman, Air King president.

NEWS OF THE REPRESENTATIVES

The Missouri Valley chapter has accepted the membership applications of Matthew H. Zimmermann, 5520 Westover Road, Kansas City, Mo., and Fred H. Larrabee, 6300 Main St., Kansas City, Mo.

J. M. Landfear, 1223 Sylvania Road, Cleveland Heights 21, Ohio has joined the Buckeye chapter. Paul Aaron, 74 Arlington Ave., Brooklyn 7, N. Y., has become a member of the New York chapter.

D. E. Bursell, 2233 University Ave., St. Paul 4, Minn., and Art Nelson, Box 2244, Denver, Colo., are now members-at-large.

Fred Ellinger, Harry Halinton, and L. W. Beier of the Chicago chapter have been named delegates to the Parts Show in May. Russ Diethert is alternate.

The New York chapter named Sam Egert, Art Cerf, LeRoy Schenck, David Tobias, Irv Nevins and Dan Bittan as show delegates with Ben Joseph and Jules Sussman as alternates.

C. L. Pugh has been elected president of the Buckeye chapter. L. H. Jackman is vice president and E. C. Edwards, secretary-treasurer.

C. L. Pugh, George Tanner and Earl Dietrich have been named show delegates, with L. H. Jackman, John Olson and E. C. Edwards as alternates.

* * *

LANG NOW G. E. TUBE MANAGER

J. M. Lang has been appointed manager of the tube division of the G. E. electronics department. Mr. Lang formerly was manager of the Ken-Rad division.

* * *

WARD LEONARD RELAY BULLETIN

An 8-page booklet, 130, describing double-throw relays, latching relays.

(*Continued on page* 48)

NEWS

(*Continued from page 47*)

heavy-duty relays, single pole (single and double-break) relays, three and four-pole relays, etc., has been announced by Ward Leonard Electric Co., 31 South Street, Mount Vernon, New York.

* * *

J. H. ROBINSON BECOMES KINGS ELECTRONICS V-P

J. H. Robinson has been appointed vice president and general sales manager of Kings Electronics Co., 372 Classon Ave., Brooklyn, N. Y.

Kings Electronics manufacturers coaxial cable connectors, wave traps, wave guides, microphone plugs and jacks.

* * *

DUBUQUE NAMED LEAR AD MAN

Jean H. DuBuque has been appointed advertising and public relations director of Lear, Inc., Grand Rapids.

Mr. DuBuque was previously with Beech Aircraft Corporation as assistant to the sales manager. During the war, he was a Lieutenant-Colonel in the AAF.

* * *

BLUMBERG AND LYONS HEAD TAB

M. C. Blumberg, naval reservist during the war, and formerly with De Jur Amsco as applications engineer, and Robert A. Lyons, recently with the United States Signal Corps, now head Tab (Technical Apparatus Builders), 6 Church Street, N. Y.

M. C. Blumberg

R. A. Lyons

* * *

BUTLER BECOMES IRC MERCHANDISE DIV. SALES ENG.

Robert Butler, former manager of the customer service department of International Resistance Co., 401 N. Broad St., Phila. 8, Pa., has succeeded Victor Nicholson as mechandise division sales engineer and will serve distributors in the Philadelphia office territory, comprising Eastern Pennsylvania, New Jersey, Delaware, Maryland, Virginia and Washington, D. C.

Mr. Nicholson moves to the Harry B. Segar Co., manufacturers' representatives,

Buffalo, N. Y., to assist Frank Taylor, Segar manager, in handling sales of IRC and other products to manufacturers and distributors in the upper New York State territory.

[*In photo: Bob Baggs (center), sales manager of the merchandise division, with R. Butler (left) and V. Nicholson (right)*].

* * *

MEDAL FOR MERIT TO DAVID SARNOFF

The Medal for Merit was presented recently to Brig. General David Sarnoff, president of Radio Corporation of America, by Maj. General H. C. Ingles, Chief Signal Officer of the United States Army, for . . . "exceptionally meritorious conduct in the performance of outstanding services to the United States as president, Radio Corporation of America, from October 1942 to March 1944."

* * *

ANDREWS BECOMES MERCHANDISING MANAGER FOR SYLVANIA RADIO DIVISION

Raymond W. Andrews, former Commander in the Navy, has been appointed merchandising manager in the radio division of Sylvania Electric Products Inc. His office at present is in Williamsport. Pennsylvania.

* * *

INTERSTATE AT SHOW

Interstate Manufacturing Corp., 125 Sussex Ave., Newark, N. J., will be represented at the Stevens Hotel during the parts show, by Alex Norden and others.

* * *

F. FRANKE BECOMES HALLICRAFTERS ASS'T S-M

Fritz Franke, former chief engineer in charge of research and design, has been appointed assistant sales manager of the Hallicrafters Company, Chicago.

Mr. Franke joined Hallicrafters in 1940, and was one of the original group of engineers who produced the SCR-299.

CENTRALAB SWITCH CATALOG

A 36-page switch catalog covering selector types, tone switches, lever action switches, medium duty power switches, stock and special switches, has been announced by Centralab, 900 East Keefe Avenue, Milwaukee 1, Wisconsin.

* * *

OHMITE RITEOHM RESISTOR BULLETIN

A 4-page bulletin, No. 126, offering detailed information on Riteohm ½-watt and 1-watt non-inductive, pie-wound, ± 1% precision resistors, has been announced by Ohmite Manufacturing Company, 4835 W. Flournoy St., Chicago 44, Illinois.

DU MONT C-R TUBE AND OSCILLOGRAPH BULLETINS

Two catalogs, one covering eight of the most popular cathode-ray tubes, the other describing six oscillographs, has been released by Allen B. Du Mont Laboratories, Inc., Passaic, N. J. Copies may be had from the Du Mont distributors or direct from the company.

CORRECTION

In Figure 5, page 36, February SERVICE, the cathode of the rectifier was shown returning to one side of the line and the rectifier plate was returned to B—. There should be no connection from the line to the rectifier cathode nor should the rectifier plate be returned to B—. The side of the line not connected to the rectifier plate is the B— return.

NEW PRODUCTS

TRIPLETT SIGNAL GENERATOR

A 6-band signal generator, model 2432, of the *square-line* type has been announced by the Triplett Electrical Instrument Co., Bluffton, Ohio.

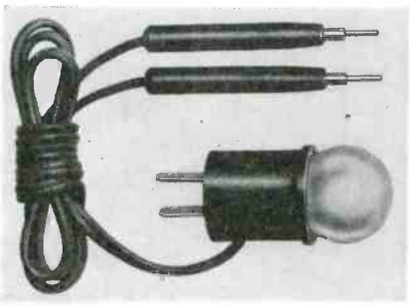
Frequency coverage is said to be continuous and overlapping, 75 kc to 50 mc, in six bands; all fundamentals. Uses a six-position turret type coil switching system. Coil assembly rotates inside a copper-plated steel shield. Has an electron-coupled oscillator circuit, and permeability adjusted coils.

Internal modulation, approximately 30% at 400 cycles. Voltage regulated. Operates on 115 volts, 50-60 cycles.

* * *

HANLAN TEST LAMPS

A plug-in test lamp for checking of switches, relays, coils, resistors, fuses, and lamps for shorts, open circuits, and grounds, has been announced by the Hanlan Company, 1419 West Jefferson Blvd., Los Angeles 7, California.



Supplied with 4' of rubber-covered wire, plastic insulated test prods, socket, and indicator lamp.

* * *

WEBSTER-CHICAGO RECORD CHANGERS

Automatic record changers, model 50, designed for use in the smaller radio-phonograph combinations, and as a replacement for outmoded changers, have

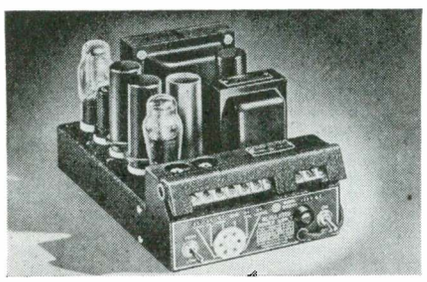
been produced by Webster-Chicago Corporation.

Overall dimensions are 12" x 12 7/8" x 9", 6½" above the main plate, 2½" below.

* * *

MILLEN POWER PACKS

Regulated power supplies, 90201, providing regulated voltage up to 200 volts at 85 ma and unregulated voltages up to 350, have been developed by James Millen Manufacturing Company, Inc., 150 Exchange St., Malden, Mass.



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JFD SOCKETTES FOR MINIATURE-TUBE CONVERSION

Sockette tube adapters for miniature tubes have been announced by the JFD Manufacturing Company, 4117 Ft. Hamilton Parkway, Brooklyn, New York.

Thirty-five adapter types are available. Provides substitution of 6AT6 for 6SQ7, 6AU6 for 6SH7, 6BA6 for 6SG7, etc.

Bulletin 502 contains listing of tube conversions possible with sockettes.

* * *

AIREON ELECTRONIC PHONOGRAPHS

An electronic automatic juke-box-type phonograph featuring avc has been announced by Aireon Manufacturing Corp., Kansas City, Mo.

The automatic volume control feature provides for adjustment of the noise in the room, with volume going upward or downward accordingly.

Unit also has a miniature transmitting record-selector station in remote coin boxes which sends electrical pulses over a single wire. These pulses are sorted out by receiver in the phonograph, providing selection of the right record.

* * *

WARD ANTENNAS

Antennas for a-m, f-m, television and commercial applications are now being developed by Ward Products Corporation, Cleveland, Ohio.

* * *

ELECTRONIC LAB. AUTO RADIO VIBRATORS

A 180-cycle vibrator for auto radio service has been announced by the Electronic Laboratories, Indianapolis, Ind.

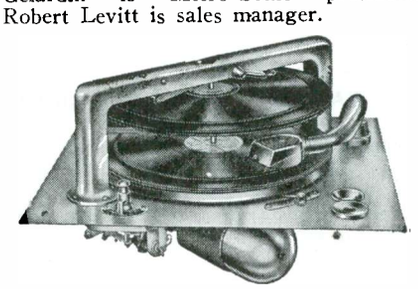
* * *

MICRO-SONIC RECORD PLAYERS

British-made record changers, record players, and phonograph motors will be distributed by the Micro-Sonic Corporation, 44 West 18th Street, N. Y. C.

Record player provides for loading and intermixing of 10" and 12" records. Tone-arm is said to automatically compensate for the differences in diameters.

The Micro-Sonic Corporation is an affiliate of the Micro-Lite Company. Al Gelardin is Micro-Sonic president. Robert Levitt is sales manager.



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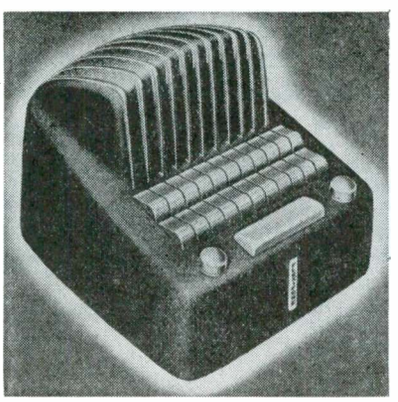
OPERADIO INTERCOMMUNICATIONS

A line of Flexifone intercommunication equipment featuring a 10-station master,

(*Continued on page 52*)



NEW PRODUCTS

(*Continued from page* 51)

a 20-station master, a 6-station supervisor master, and remote speaker station with or without call-switch, has been developed by Operadio Manufacturing Company, St. Charles, Ill.

Executive 10-station master unit has plastic station selector keys and control knobs. Size, 9 1/4" wide, 7 3/4" high, 11 5/16" deep. The 9-station master has a paging key.

Units are for 105-125, 50-60 cycle, a-c.

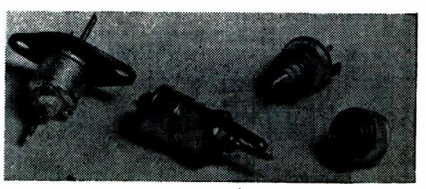
* * *

SILVER TO DISTRIBUTE PHILIPS (EINDHOVEN) AIR TRIMMERS

High-Q air-dielectric capacitors that are said to be useful to 500 mc, produced at the Philips works in Holland, will be distributed by the McMurdo Silver Co., Hartford, Conn.

Model 619 provides 3 to 30 mmfd, at insulation resistance above 10,000 megohms. Power factor at 1 mc said to be .007. Both rotor and stator are of one-piece, multiple aluminum cup construction. The rotor meshes with the stator to give a linear capacitance range of 27 mmfd over 108° (three turns of rotation).

About ½" diameter, 1 7/16" length.



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HEXACON 32-VOLT SOLDERING IRONS

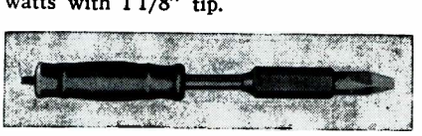
Soldering irons, 32 volt, for use on farm or home generating systems, have been developed by Hexacon Electric Company, 173 West Clay Avenue, Roselle Park, N. J.

Features include replaceable elements and tips; heating elements housed in hexagonal barrels which permit vise clamping for tip removal, and 6' heater cord.

Plug and screw-tip irons are available.

Screw tip range: 90 watts with ½" tip; 120 watts with 5/8" tip; 130 watts with 7/8" tip; 175 watts with 1" tip; 250 watts with 1 1/8" tip; 350 watts with 1 3/8" tip; 500 watts with 1 5/8" tip.

Plug tip range: 100 watts with 3/8" tip; 130 watts with 5/8" tip; 150 watts with 3/8" tip; 175 watts with ½" tip; 200 watts with 5/8" tip; 250 watts with 5/8" tip; 300 watts with 7/8" tip; 550 watts with 1 1/8" tip.



* * *

CALTRON 145-MC RING TUNER

A variable tuning unit with a range of 140 to 160 mc and 3.5-mmfd tube capacity for single hole mounting on receivers, wave meters, frequency meters, low power transformers, and oscillators has been developed by The Caltron Company, 11916 West Pico Blvd., Los Angeles 34, Calif.

* * *

AEROVOX U-H-F BAKELITE-MOLDED MICA CAPACITORS

Ultrahigh frequency molded-in-bakelite mica capacitors, series 1690, have been released by Aerovox Corporation, New Bedford, Mass.

Dimensions are: 2⅜" wide x 2 3/16" deep x 1⅜" high, and 4¾" overall between rounded terminal tips. Units are available in ratings up to 20,000 volts d-c test or 10,000 volts operating, and in capacitance values up to .001 mfd at the highest vltage rating.

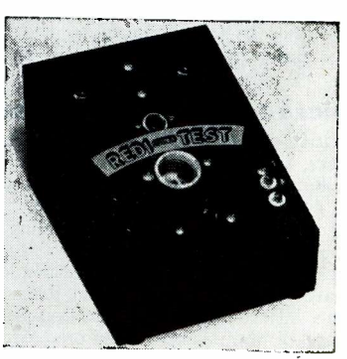
Capacitor has been developed specifically for lower r-f resistance and impedance.

* * *

REDI-TEST ELECTRICAL TESTER

A tester, Redi-test R1 for instant checking of radios, toasters, irons, mixers, fans, etc., has been announced by Nu-Sonic Corporation, 230 Fifth Avenue, New York 1, N. Y.

Twin signals light up instantly to show that appliance is alright.



SERVICING HELPS

(*Continued from page* 46)

2000 ohms for the 70L7, it is suggested that the bias resistor be only partially bypassed so as to achieve some negative feedback. This may be done by connecting a 50-ohm and 60-ohm resistor in series, and bypassing the 50-ohm section. Or the 20-mfd cathode unit may be eliminated entirely. This will improve the impedance match of the 117N7 to the 2000-ohm impedance output transformer, but will cause a slight drop in volume.

In Fig. 1*c* appears the basing diagrams of both the 70L7 and the 117N7 with the necessary wiring changes. Note that the rectifier plate of the 117N7 is connected internally to one side of the filament, terminal 7. This terminal should therefore be connected to the switch side of the line cord.

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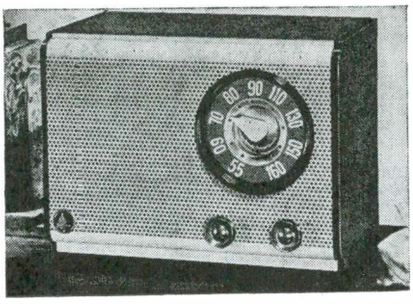
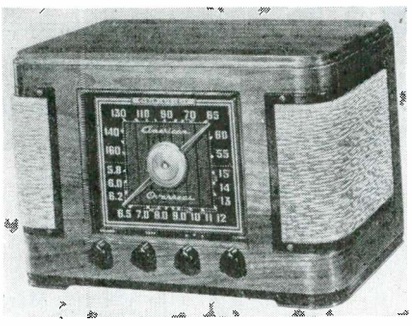
CURRENT RECEIVERS

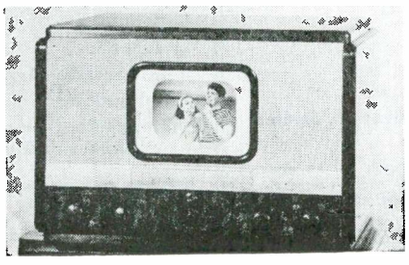


Above, Emerson 503 a-c/d-c receiver.



Above, Crossley farm-battery receiver, 56FB, featuring two-bands and continuous-tone control.

Below, direct viewing Belmont television receiver, using a 7" picture tube. Model is 14½" high, 21" wide and 16" deep.



THE SERVICE SHOP

(*Continued from page 37*)

half-dollar. But you usually get just what you pay for. Most of the war surplus items were made several years ago. Much of it has been stored under questionable conditions. Some of it has been used and even abused. You certainly take an awful chance when you install such unknown parts.

I cannot warn you too much on this point. If you would play safe and sound, continue to buy branded merchandise in original packages, carrying the manufacturer's original guarantee and not an outdated guarantee either. Don't be misled by those so-called war surplus bargains.

Lastly, keep your knowledge and equipment up to date. I cannot urge too much the importance of sound training in this servicing business. Radio sets are becoming increasingly complicated. Already we see signs of more expensive and more complicated sets coming on the market. To the original broadcast receiver there is now being added the all-wave or shortwave feature, f-m, phonograph and the record changer. Soon we shall have television in most metropolitan areas. Television receivers are really complicated. It will take a lot more knowledge and experience to install and service television sets. Likewise a lot more equipment than even the better Service Shops boast of today.

I'd urge you to maintain a good working library of reference books, service manuals, informative house organs, catalogs, and radio publications.

BEAM POWER 5-TUBE RECEIVER

(See Front Cover)

THE i-f, second detector and audio system of a recently-released 5-tube and rectifier a-c/d-c external antenna-loop receiver, Ward Airline 64WG-1804A, is shown on the cover this month.

The input section contains a 12SK7 r-f amplifier resistance coupled to a standard 12SA7 mixer. A 12SF7 is used as an i-f amplifier and second detector, while a 12SJ7 serves as a pentode audio amplifier. The 12SF7 is a little-used old timer, among the super-control pentodes, that has a slightly lower plate impedance than the 12SK7. It is, however, very similar to it and, in addition, contains a single diode.

The detector has a 47,000 ohm r-f filter element and anti-overload resistor in series with a tapped ½-megohm volume control. A 47-mmfd capacitor shunts the top (high) section of the control, while a .04-mfd capacitor in series with 15,000 ohms shunts the low section for bass compensation.

The control grid of the 12SJ7 picks up the volume control output through a .006-mfd unit and across a leak of 4.7 megohms. A .47-megohm screen-voltage dropping resistor is used with a .1-mfd bypass capacitor. An R/C filter of 82,000 ohms and .025 mfd supplies the plate through a 33,000-ohm load resistor with a 470-mmfd bypass to ground. A standard 35L6 output amplifier uses a 20-mfd cathode bypass.

The speaker is a 4"x6" p-m with a 3.2-ohm impedance at 400 cycles.

A surge limiting resistor of 27 ohms is placed in series with the 35Z5. The power tube plate is supplied direct from the rectifier output, the screen and the remainder of the tubes from the filter output. The filter is composed of a pair of 50 mfd and 1500-ohm units.

CURRENT RECEIVERS

Above, Hoffman Radio A-300, 6-tube superheterodyne table model, featuring avc and a 6" electrodynamic speaker.

JOTS AND FLASHES

F-M stations are now swinging to the new 88-108 mc bands. And the recent FCC grants of construction permits indicate that we will soon have many new f-m stations on the air. . . . John Meck has appointed the Sacramento Electric and Supply Company, Sacramento, Calif., and the Nebraska Radio Distributing Company, Lincoln, Neb., distributors. . . . Vertrod Corp., 60 E. 42nd Street, N. Y. C., now have representation throughout this country and in Canada. . . . Gustav Marx, Centralab's advertising agent, has moved to 740 N. Plankinton, Milwaukee 3, Wis. . . . The sales office of the Lear Home radio division is now in Grand Rapids, Michigan. It formerly was in the Furniture Mart Building in Chicago. . . . Allen B. Du Mont Labs have purchased the four-story Doherty Building at 1000 Main Avenue, Clifton, N. J. . . . Sun Radio and Electronics Co., Inc. are now located at 122-124 Duane Street, N. Y. C. A dealer sales department has been installed under the supervision of Lou Selonek. . . . Fritz Franke, former chief engineer in charge of Hallicrafters research and design has been named assistant sales manager at Hallicrafters. . . . A. R. Morton has joined the Insuline Corporation of America as chief engineer of the electronics division. Mr. Morton was formerly chief engineer of Ansley Radio Corp. . . . Lester R. Belmuth has been appointed sales representative for Insuline and will cover the New York-Eastern Pennsylvania-Virginia area. . . . Lt. Commander Michael Scott has returned to Radio Wire Television Inc., Boston, Mass. Commander Scott served as Officer in Charge of the Electronics Division of the Navy's Disposal Administration. . . . R. T. Schottenberg and J. K. Poff, Astatic's jobber sales manager and service engineer, respectively, recently attended Hughes-Peters' 25th anniversary radio parts show at the Miami Hotel in Dayton. . . . Merit Coil and Transformer Corp. will exhibit replacement transformers at the Radio Parts and Electronic Show at the Stevens Hotel in Chicago. . . . Walter Schott Company, Beverly Hills, Calif., will exhibit a new line of hardware items for the Service Shop. . . . Walter L. Schott and Donald J. Terwilliger will be at the show. . . . RCA will display merchandising store fixtures and Service Shop setups at the Show in May. Among those who plan to be at the Show are: D. J. Finn, manager of the renewal sales department and L. A. Goodwin, Jr., manager of the test and measuring equipment department . . . See pages 26 and 27 of this issue for a complete listing of all of the parts and equipment show exhibitors. . . . A location chart of the exhibition floor also appears on these pages. . . . A replacement parts line will be exhibited by the G. E. specialty division at the show. . . . There will be a drawing for a free Hollywood trip at the Schott booth on Thursday, May 16, at noon. . . . For some sound advice on the running of a Service Shop read Charley Golenpaul's timely article in this issue. It's on page 15.

VISIT
BOOTH 64
AT THE RADIO PARTS SHOW

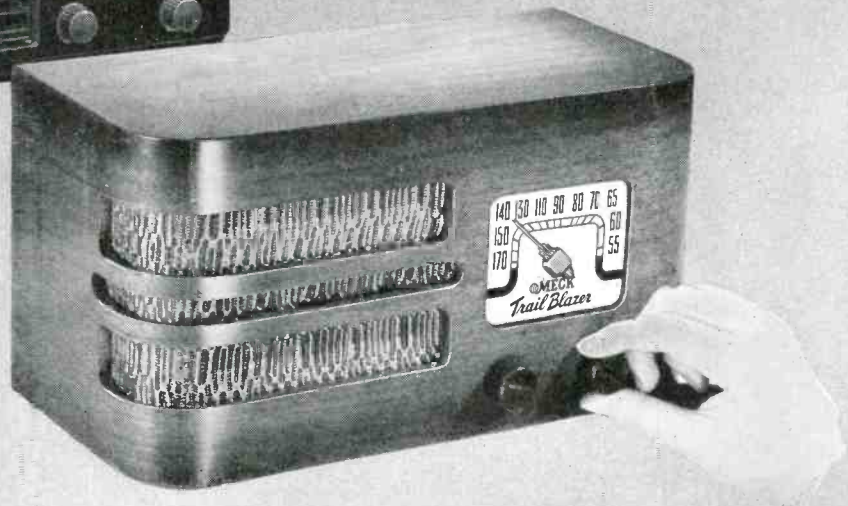
ADVERTISERS IN THIS ISSUE

SERVICE INDEX—APRIL 1946

Meck Trail Blazers

Model No. 5C5-P12

Model No. 5C5-PB12

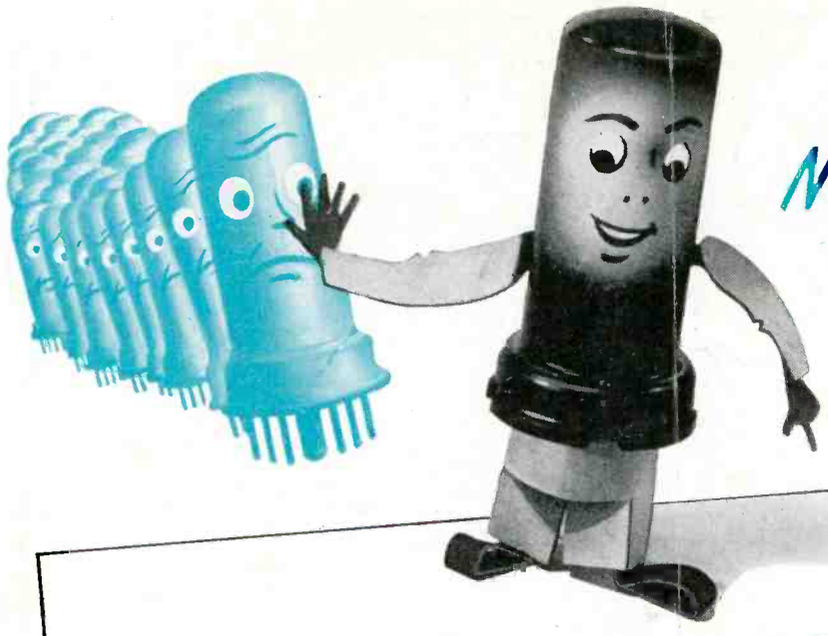


Model No. 5C5-DW9

Forerunners of the Meck complete line, these Trail Blazers are proving the superiority of Meck performance—the popularity of Meck Design. They are the logical choice of the independent dealer because of his appreciation of the value of sound radio engineering and because of the exclusive Meck Dealer Policy. The dominating theme of Meck national advertising will continue to be "Buy from the man who knows radio best—your *radio dealer*."

MECK RADIOS

JME Sales Corporation, 35 E. Wacker Drive • Chicago 1, Ill.



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- Uniballast—the universal ballast tube—small—compact—easy, quick installation.
- Metal envelope is excellent heat radiator. "Plug-in" simplicity.
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- Even if one or more pilot lights burn out Uniballast continues to operate the tube filaments in the string, at efficient current range.
- Resistance is self-compensating—adjusts itself automatically—true ballast action. Voltage dropping range is indicated on every Uniballast.

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Transmitting, Cathode Ray, Receiving, Special Purpose Tubes • Condensers • Volume Controls • Photo Electric Cells • Panel Lamps • Flashlight Bulbs

Actual size
Ov. Length 3⅛"
Seated Ht. 2 1/16"
Diameter 1"

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