A MONTHLY DIGEST OF RADIO AND ALLIED MAINTENANCE

SERVICE

JULY
1942

RADIO — TELEVISION

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..but there's a silver lining

"War is hell", said General Sherman...and he didn't have to put up with today's shortages of essential materials. It's tough on manufacturers, tough on distributors, and tough on radio servicemen. Getting the right replacement for that balky set...Wow! What a job it can be!

Yes, sir, it's a tough situation. But it is all in today's work—and you can count on Mallory to help in every way possible. Here are three ways we're helping right now:

1. ***Standardized Parts:*** Many years ago, Mallory began developing standardized and interchangeable radio parts. Universal replacement condensers, for instance, make mighty useful ... and practical ... substitutes when the exact design used in an old receiver isn't to be had for love nor money. Nowadays, you can be glad that Mallory had the foresight to standardize the design of many components... because standardization saves you time and enables you to get along with a minimum inventory.

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3. ***Information Free:*** It's yours for the asking ... the help of Mallory radio engineers on your specific problems. Just write a letter or post card to our Application Engineering Section, Wholesale Division.

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EDITORIAL

MANY letters received from new service men in the field complain that it's virtually inpossible for them to purchase test equipment of any description. Test equipment manufacturers are operating "all out" on war production. That's as it should be. You ex-service men, who are now working in industrial plants or who are entering the armed service . . . why not sell your equipment to your local distributor. He, in turn, can dispose of it to good advantage. After hostilities are successfully concluded, chances are you'll need new and radically different test equipment to service the receivers which will be in vogue at that time. If you have equipment to dispose of, and you can't make arrangements with your distributor, send the facts to SERVICE. We'll make it known through our columns. Do your share to "KEEP 'EM PLAYING."

FROM J. C. Swanson, senior educationist of the U. S. Office of Education we learn that the vocational schools of the various States are giving two classes (Mechanic Learner-Radio and Junior Repairmen Trainee-Radio), to prepare radio maintenance personnel for the Signal Corps. About 2,000 instructors in about 40 of the States will be needed for the program. Instruction will be given in the schools 24 hours a day, in three shifts. The students will attend school 48 hours a week, and each course will take about 3 months. . . . Many instructors are being used who have never had teaching experience, but who can qualify on the basis of experience in radio servicing. Any person with radio servicing experience who would like to become an instructor should enroll at once. Salaries for the instructors vary with the location, but they usually will be around $60 a week. Here's an unusual opportunity. See your nearest U. S. Employment Service office, or contact the State Director of Vocational Training for War Production Workers, who is generally located in the State Department at the capitol city of your State.

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ALFRED G. GHIRARDI, Advisory Editor

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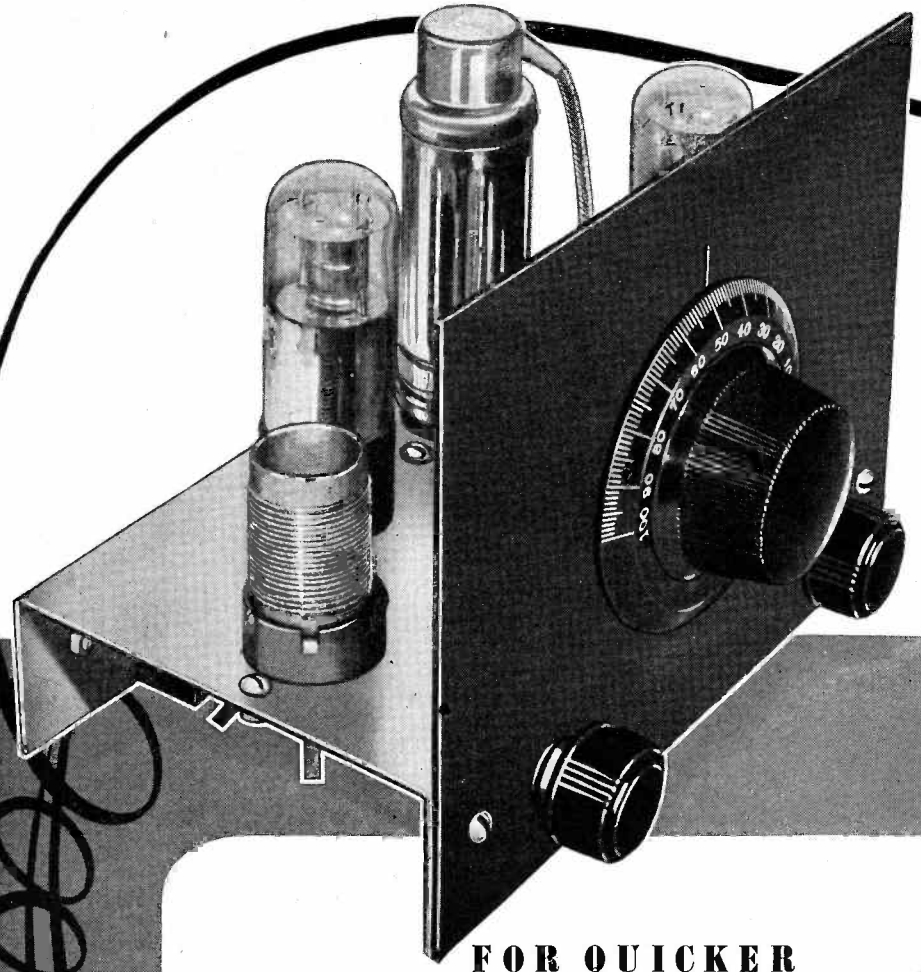

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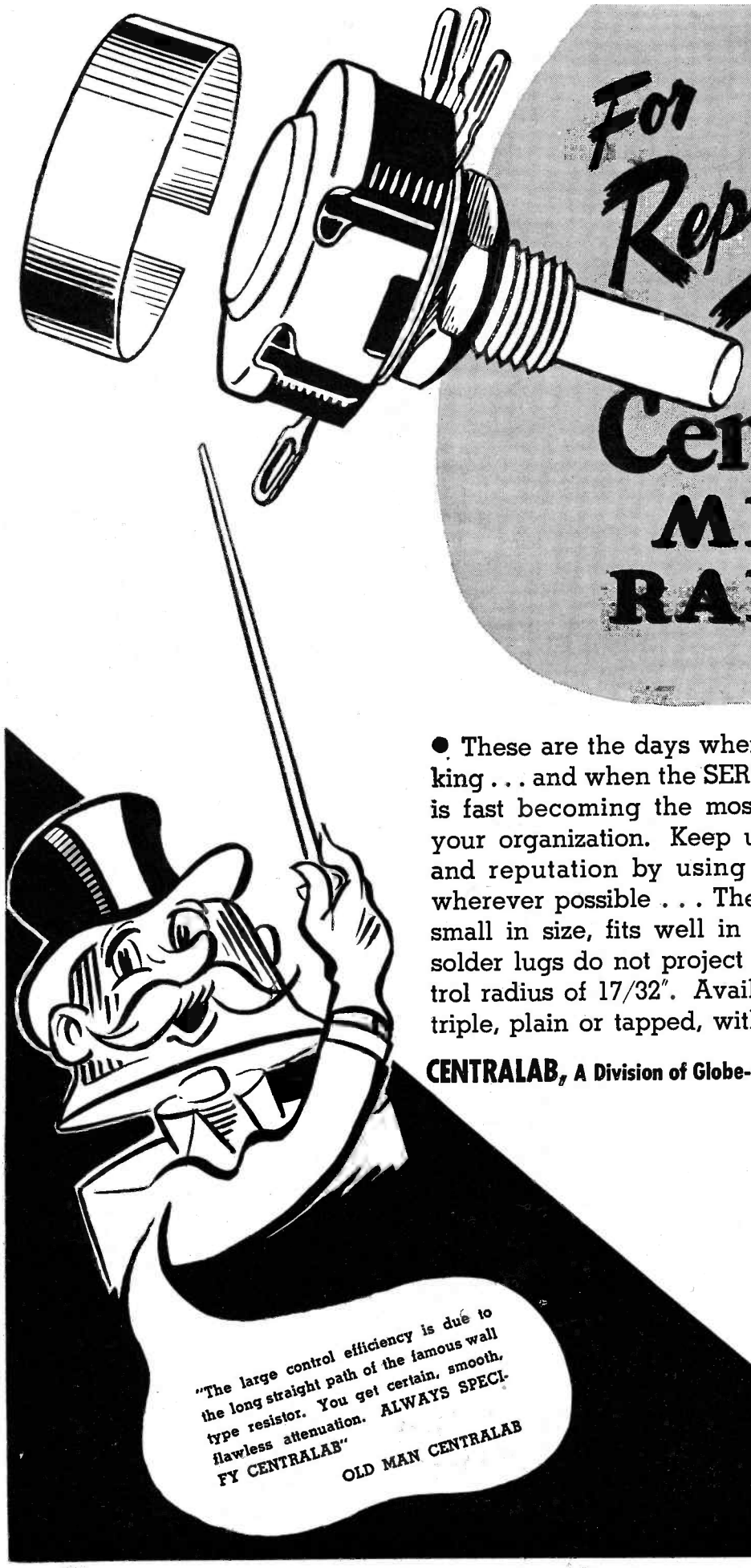

● These are the days when the service man is king . . . and when the SERVICE DEPARTMENT is fast becoming the most important part of your organization. Keep up your good name and reputation by using CENTRALAB parts wherever possible . . . The MIDGET Radiohm, small in size, fits well in crowded chassis as solder lugs do not project far beyond the control radius of 17/32". Available single, dual or triple, plain or tapped, with or without switch.

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SERVICE
A Monthly Digest of Radio and Allied Maintenance

REPLACING DISCONTINUED A-B PACKS AND UNIT BATTERIES IN PORTABLES

By ALFRED A. GHIRARDI
Advisory Editor

BATTERY manufacturers are diverting an increasingly large proportion of their materials and production facilities into manufacturing the huge quantities of batteries needed to operate military radio equipment and expanding war industries' electrical equipment. With our present national emergency, it is to be expected that they will diminish battery variety and greatly curtail the number of batteries made for civilian replacement.

This has already been done by manufacturers having large war contracts. Others will certainly follow as their plants are similarly utilized. Manufacture of certain batteries—especially many A-B packs and those odd sizes of "A" and "B" batteries not widely used—is being discontinued for the duration. They will not be available at all. Others are being discontinued temporarily; possibly they will be later discontinued for the duration.

Batteries Being Discontinued

The table in Fig. 1 lists the voltages and type numbers of various *"A," "B"* and *"A-B"* batteries being discontinued at present. It was compiled from information obtained by direct communication with the various battery manufacturers shortly before this issue went to press. Any such list is inevitably subject to revision as conditions change, but for the present at least, it summarizes this important information for Service Men and dealers. In addition to those listed in Fig. 1, many batteries, though not formally

FIG. 1—BATTERIES NO LONGER AVAILABLE—OR DIFFICULT TO OBTAIN

Voltage	Make	Model No.
1½ "A"	Burgess	FX
		4FL
		6F
		8F
		8FL
	Eveready	741
	National Union	A833
		A832
	Ray-O-Vac	P245A
		P24A
		P98A
		P168A
6 "A"	Burgess	F4PIX
		2F4
		F4L
	Eveready	718
	National Union	A834
	Ray-O-Vac	P624A
	Usalite	636
30 "B"	Burgess	W20PI
45 "B"	Burgess	A30
		A30M
		A30X
	Eveready	727
	National Union	B861
		B850
	Ray-O-Vac	P3093
		P5933
		P5233
	Willard	WBM—1
	Winchester	6218
		6210
51 "B"	Burgess	W34
60 "B"	Burgess	W40
67½ "B"	Willard	WBM—2
90 "B"	Burgess	A60
	Ray-O-Vac	P260

Voltage	Make	Model No.
1½ "A"—62½ "B"	Burgess	4GA41
	Ray-O-Vac	AB419
1½ "A"—90 "B"	Burgess	2GA60
		4TA60
		3FA60
		4FA60
	Ray-O-Vac	AB94
		MB49
		AB28U
		AB839
	Willard	WZ—1
6 "A"—62½ "B"	Burgess	F4A41
6 "A"—75 "B"	Willard	WZ—2
6 "A"—90 "B"	Burgess	D4A60
		F4B60
		G4B60
		2F4A60
		2F4B60
	Ray-O-Vac	AB684
	Usalite	AB673
		AB674
7½ "A"—63 "B"	Burgess	G5A42
	Ray-O-Vac	AB794
7½ "A"—90 "B"	Burgess	D5A60
		F5A60
9 "A"—90 "B"	General	E60D12L6
	Willard	WZ—3
	Zenith	Z985

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"KEYED" CHART OF ELECTRICALLY COMPARABLE "A" & "B" BATTERIES *

"A" Batteries

ACME	123		114	123M			116		118	118FM	118S	118S6	114S					
ADVANCE	647		247			2476	147		147	547	817	747						
AIR CASTLE															2320			
BOND	4928		4826				4824		4829	4823	4827	4825			4828	1611 or #6	*	102
BRIGHT STAR	361	461	462	465	561	646	660	661	860	865	866	868			20-60	6A		10M
BURGESS	G3		4F	4FL	G5	F4PI	6F		8F	8FL	2F4	2F4L	F4PIX		20F	4FA	2F	2 Uni-cell
CROSLEY																		
EVEREADY	746		742				743		741*	745	718	747			740	7111 or #6		950
FIRESTONE																		
GAMBLE							1966											
GENERAL	3H3		4F1	3L1	5H5	4F4	6F1		8F1	8CF1	8F4	8CF4			12L1L	#6	2F1	D
MARATHON			491	3L			691		891						189			
MONTGOMERY WARD	5042		5021	5022		5008	5005		5020		5006				5016			
NATIONAL UNION	A835		A830				A831		A833		A834				A832	#6		D
PHILCO	P-100		P94						P8F1									D
RAY-O-VAC	P83A		P94A	P94L	P85A	P694A	P96A		P98A	P98L	P698A	P698L		P24SA	P9203	#6		2LP
SEARS ROEBUCK (old)			5063												5062			
SEARS ROEBUCK (new)	5085		5089	5077			5087			5077	5086	5078			5160			
USALITE	683		634	642	687	639	637		635	645	638	646	636			#6		75
WESTERN			D234			D216	D236											
WILLARD	3H3		4F1	3L1	5H5	4F4	6F1		8F1	8CF1	8F4	8CF4						D
WINCHESTER	4918		4816				4814		4819	4813	4817	4815			4818	#6		1511
ZENITH			Z10															

*Discontinued for the Duration. Replaceable by Eveready 743 (which is one size smaller)

"B" Batteries

ACME	330	830		430		(Two)530								
ADVANCE	267	284		237										
AIR CASTLE														
BOND	3017	6220						3044		4044				
BRIGHT STAR	30-03	30-33	30-50	30-55				30-95						
BURGESS	B30	M30	A30M	Z30	XX45	A60	Z59	2308 or 22308	A30X	2308	W30PI	XX30		
CROSLEY														
EVEREADY	762	482		738	467			485	727*	585	733			
FIRESTONE														
GAMBLE	5130							2130		1203				
GENERAL	V30B	W30B		V30AA	W45A			V30D1	F30A	V30D	V30AAA		4IAAA	
MARATHON	350			340				3020		230				
MONTGOMERY WARD	4-949	4952		4951				5777		5804				
NATIONAL UNION	B860	B861**						B850						
PHILCO	P305	P200								P30D				
RAY-O-VAC	P5303	P5S30		P7R30	P4367	BB60P-IMP		P2303	BB30P	P5233	P3A30			
SEARS ROEBUCK (old)														
SEARS ROEBUCK (new)	5090	5079						5150		5093				
USALITE	624	640	622	621						632				
WESTERN	D213			D214						D212				
WILLARD	V30B	W30B		V30A		(Two)V30AA		V30DL		V30D				
WINCHESTER	6218	6210						6518		6568				
ZENITH														

*Note: This battery now Discontinued **Discontinued for the Duration. Replaceable by National Union B862

Fig. 2. In the two charts above, electrically comparable batteries are listed in the same vertical columns. The top chart lists "A" batteries and the bottom chart lists "B" batteries.

In Fig. 3 below (and continued on following page) we have the physical dimensions and electrical specifications of leading makes of batteries for "A" use in portable receivers. This information will prove invaluable in making substitutions and changes during the present emergencies.

CHART OF PHYSICAL DIMENSIONS & ELECTRICAL SPECIFICATIONS OF 12 LEADING MAKES OF DRY "A", "B" and "A-B" BATTERIES AND PACKS FOR "PORTABLE" & "FARM" RADIO

"A" BATTERIES FOR PORTABLE RECEIVERS

Make	Battery Catalog Number	Voltage	Terminals	Dimensions in Inches	Std. Pkg. Quantity	Std. Pkg. Wt. Lbs. (Total)
Bond	102	1½ V. "A"	Flashlight	1¼ Dia. x 2¼	480	114
Bright Star	10M	"	"	1⅜ Dia. x 2⅜	480	110
Burgess	2 Unicell	"	"	1⅛ Dia. x 2⅛	50	11
Eveready	950	"	"	1-31/64 Dia. x 2-37/64	384	85
General	D	"	"	1¼ Dia. x 2⅜	250	60
Philco	D	"	"	1¼ Dia. x 2⅜	240	58
Ray-O-Vac	2LP	"	"	1⅛ Dia. x 2⅜	480	112
Usalite	75	"	"	1¼ Dia. x 2¼	240	55
Winchester	1511	"	"	1¼ Dia. x 2¼	48	
Ray-O-Vac	P24SA	1½ V. "A"	2-prong Socket	2⅛ x 2⅛ x 3	6	6
Bright Star	461	1½ V. "A"	2-prong Socket	3⅛ x 2⅛ x 2⅜	1	1½
Burgess	2F	1½ V. "A"	2-prong Socket	2⅝ x 1⅜ x 4⅛	6	4½
General	2F1	"	"	2½ x 2 x 4	10	8
Acme	114	1½ V. "A"	2-prong Socket	2⅛ x 2½ x 4	6	8½
Bond	4826	"	"	2⅛ x 2⅛ x 4	10	15
Bright Star	462	"	"	2⅛ x 2⅛ x 4	1	1½
Burgess	4F	"	"	2⅝ x 2⅝ x 4⅛	10	14
Eveready	742	"	"	2⅛ x 2⅛ x 4	1	1¾
General	4F1	"	"	2½ x 2½ x 4	10	16
Philco	P94	"	"	2½ x 2½ x 4½	1	2
National Union	A830	"	"	2⅝ x 2⅝ x 4	6	8
Ray-O-Vac	P94A	"	"	2⅝ x 2⅝ x 4	6	8
Usalite	634	"	"	2⅛ x 2⅛ x 4	48	66
Willard	4F1R	"	"	2½ x 2½ x 4	10	16
Winchester	4816	"	"	2⅛ x 2⅛ x 4	10	15
General	4H1	1½ V. "A"	2-prong Socket	2½ x 2½ x 4½	10	19
Willard	4H1	"	"	2½ x 2½ x 4½	10	19
Acme	116	1½ V. "A"	2-prong Socket	3⅜ x 2⅛ x 4	6	12
Bond	4824	"	"	3⅜ x 2⅛ x 4	6	13
Bright Star	660	"	"	3⅛ x 2⅛ x 4⅛	1	2
Burgess	6F	"	"	3⅛ x 2⅝ x 4⅛	6	13½
Eveready	743	"	"	3⅜ x 2⅛ x 3⅛	1	2¼
General	6F1	"	"	3⅜ x 2⅝ x 4	5	12
National Union	A831	"	"	3⅜ x 2⅝ x 4	4	8
Ray-O-Vac	P96A	"	"	3⅜ x 2⅝ x 4	4	8
Usalite	637	"	"	3⅛ x 2⅛ x 3⅞	12	24
Willard	6F1	"	"	3⅜ x 2½ x 4	5	12
Winchester	4814	"	"	3⅜ x 2⅛ x 4	6	13
Willard	3L1	1½ V. "A"	2-prong Socket	3⅞ x 2½ x 4	5	12
Acme	123M	1½ V. "A"	2-prong Socket	3⅞ x 1¼ x 4⅞	6	9
Bright Star	465	"	"	3⅛ x 1⅝ x 5⅜	1	1½
Burgess	4FL	"	"	3⅞ x 1⅛ x 5½	6	5
General	3L1	"	"	3⅞ x 1⅛ x 6⅛	10	21
Ray-O-Vac	P94L	"	"	3⅛ x 1⅛ x 5⅛	6	8
Usalite	642	"	"	3⅜ x 1⅞ x 5⅛	48	66
Acme	118	1½ V. "A"	2-prong Socket	3⅛ x 2⅝ x 5½	6	14½
Bond	4829	"	"	3⅛ x 2⅛ x 5⅛	6	18
Bright Star	860	"	"	3⅛ x 2⅛ x 5⅜	1	2¾
Burgess	8F	"	"	3⅛ x 2⅝ x 5⅛	6	17
Eveready	741*	"	"	3⅛ x 2⅛ x 5⅛	1	3¼
General	8F1	"	"	3⅜ x 2¾ x 5⅜	5	16
National Union	A833	"	"	3⅜ x 2⅝ x 5⅛	6	16½
Philco	P8F1	"	"	3⅜ x 2¾ x 5⅜	5	16
Ray-O-Vac	P98A	"	"			
Usalite	635	"	"	3⅜ x 2⅛ x 5⅜	25	68¾
Willard	8F1	"	"	3⅜ x 2¾ x 5⅜	5	16
Winchester	4819	"	"	3⅛ x 2⅛ x 5⅛	6	18
Bond	1611 or #6	1½ V. "A"	Screw	2½ Dia. x 6	1	2
Bright Star	6A	"	Clip or Screw	2½ Dia. x 6	25	57
Burgess	4FA	"	Screw	2⅝ Dia. x 4⅛	20	29
Eveready	7111 or #6	1½ V. "A"	Screw	2⅝ Dia. x 6⅝	12	27
General	#6	"	Screw	2⅛ Dia. x 6⅛	25	60
Ray-O-Vac	#6	"	Screw	2⅝ Dia. x 6	25	58½
Usalite	#6	"	Clip or Screw	2 Dia. x 6	25	55
Winchester	#6	"	Screw	2½ Dia. x 6	25	58
General	4L1	1½ V. "A"	2-prong Socket	2½ x 2½ x 6⅜	6	17
Willard	4L1	"	"	2½ x 2½ x 6⅜	6	17
Acme	118FM	1½ V. "A"	2-prong Socket	10¾ x 3¾ x 1⅝	6	14½
Bond	4823	"	"	10⅛ x 3⅛ x 1⅝	6	20
Bright Star	865	"	"	10¾ x 3⅛ x 1⅝	1	2¾
Burgess	8FL	"	"	10⅛ x 3⅛ x 1⅞	6	18½
Eveready	745	"	"	10¾ x 3⅛ x 1⅛	1	3¼
General	8CF1	"	"	8½ x 3¾ x 1⅞	5	10½
Ray-O-Vac	P98L	"	"	10¾ x 5⅞ x 1⅞	6	16
Usalite	645	"	"	10¾ x 3⅛ x 1⅛	12	33
Winchester	4813	"	"	10⅛ x 3⅛ x 1⅝	6	20
Acme	123	4½ V. "A"	2-prong Socket	3⅞ x 1¼ x 4⅞	6	9
Bond	4928	"	"	3⅞ x 1⅛ x 4⅛	10	13
Bright Star	361	"	"	3⅛ x 1⅞ x 4⅛	2	2¾
Burgess	G3	"	"	4 x 1⅜ x 4⅛	6	7½
Eveready	746	"	"	3⅛ x 1⅞ x 4⅛	2	2½
General	3H3	"	"	3⅞ x 1⅞ x 4¾	6	9
Philco	P-100	"	"	3⅞ x 1⅞ x 4¾	2	7
Ray-O-Vac	P83A	"	"	4 x 1⅝ x 4⅛	8	9½
Usalite	683	"	"	3⅞ x 1⅜ x 4⅞	12	15
Willard	3H3	"	"	3⅞ x 1⅞ x 4¾	6	9
Winchester	4918	"	"	3⅞ x 1⅞ x 4⅛	10	13
Bright Star	661	6 V. "A"	2-prong Socket	3⅛ x 2⅝ x 2⅛	1	1½
Bright Star	646	6 V. "A"	2-prong Socket	2⅝ x 2⅝ x 4⅜	1	1¼
Burgess	F4PI	"	"	2⅝ x 2⅝ x 4	6	8½
General	4F4	"	"	2½ x 2½ x 4	10	16
Ray-O-Vac	P694A	"	"	2⅝ x 2⅝ x 4¼	6	8
Usalite	639	"	"	2⅞ x 2⅞ x 4	12	18
Willard	4F4R	"	"	2½ x 2½ x 4	10	16
Acme	114S	6 V. "A"	Std. 6V. Socket	2½ x 2½ x 4½	6	8¼
Burgess	F4PIX	"	"	2⅝ x 2⅝ x 4	6	8½
Usalite	636	"	3-prong Socket	2⅞ x 2⅞ x 4	50	87½
Acme	118S	6 V. "A"	2-prong Socket	3⅛ x 2⅝ x 6½	6	14½
Bond	4827	"	"	3¾ x 2⅛ x 5⅝	10	30
Bright Star	866	"	"	3⅛ x 2⅝ x 5⅛	1	2¾
Burgess	2F4	"	"	3⅞ x 2⅛ x 5½	6	18
Eveready	718	"	"	3⅛ x 2⅛ x 5½	1	3¼
General	8F4	"	"	3⅞ x 2¾ x 5⅜	5	16
National Union	A834	"	"	3⅛ x 2⅛ x 5⅜	6	12
Ray-O-Vac	P698A	"	"	3⅞ x 2¾ x 5½	6	12
Usalite	638	"	"	3¾ x 2⅛ x 5⅜	12	33
Willard	8F4	"	"	3⅞ x 2¾ x 5⅜	5	16
Winchester	4817	"	"	3¾ x 2⅛ x 5⅜	10	30
Acme	118S6	6 V. "A"	2-prong Socket	10¾ x 3¾ x 1⅜	6	14½
Bond	4825	"	"	10⅛ x 3⅛ x 1⅜	6	20
Bright Star	868	"	"	10¾ x 3⅛ x 1⅝	1	2¾
Burgess	2F4L	"	"	10⅛ x 3⅛ x 1⅛	6	18½
Eveready	747	"	"	10¾ x 3⅛ x 1⅛	1	3¼
General	8CF4	"	"	8⅞ x 3¾ x 1⅜	5	10½
Ray-O-Vac	P698L	"	"	10¾ x 3⅞ x 1⅞	6	16½
Usalite	646	"	"	10¾ x 3⅛ x 1⅛	12	33
Winchester	4815	"	"	10⅛ x 3⅛ x 1⅜	6	20
Bright Star	561	7½ V. "A"	2-prong Socket	3⅞ x 2⅝ x 4⅛	1	2
Burgess	G5	"	"	3⅝ x 2⅛ x 4⅛	6	12¾
General	5H5	"	"	3⅞ x 2⅛ x 4⅝	5	11½
Ray-O-Vac	P85A	"	"	3⅞ x 2⅝ x 4⅛	4	8

*Discontinued for the Duration. Replaceable by Eveready 743 (which is one size smaller)

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discontinued by their manufacturers, can be had only after serious delay in certain parts of the country. So far as the Service Man is concerned, these batteries may also be considered unavailable; a customer whose portable needs new batteries usually is unwilling to wait indefinitely for them.

Battery Substitution

This situation, especially as civilian curtailment becomes acute, bids fair to tax the ingenuity of the service man. He must devise satisfactory substitute battery arrangements to keep the nation's battery portables operating, in spite of lack of "original battery" replacements. There are several simple approaches to the solution of this problem, the best always depending on the specific battery replacement conditions encountered. *Every* substitute battery selection, however, has two important factors: the battery *voltage* and its *physical dimensions* (width, depth and height).

If the receiver employs separate *"A"* and *"B"* batteries, and exact replacements for either or both are difficult or impossible to obtain, perhaps the first effort should be to obtain electrically comparable batteries (of similar physical dimensions) made by some other manufacturer. The chart of Fig. 2* is an excellent guide for this. All the batteries listed in any one *vertical* column deliver similar voltages and are of practically the same physical dimensions. To illustrate the use of this chart, let us suppose that a portable, containing a Burgess 4FL 1½-volt *"A"* battery comes in for battery replacement and a new 4FL battery is not available. Reference to the vertical column in which the Burgess 4FL is listed in Fig. 2 (fourth column from the left, in the "A" battery section), indicates the model numbers of all the batteries of other makes that can be substituted for it—for example, a Bright Star 465, Ray-O-Vac P94L, etc. Whether or not these last named batteries have been discontinued can be determined by referring to Fig. 1 or to up-to-the-minute jobbers' lists.

The situation becomes a little more difficult when even the electrically comparable batteries of other manufacturers are not available. Recourse must then be made to substitution of an available *most suitable* next smaller size unit of the *same voltage*, although this is not good practice from the viewpoint of economical battery operation; the smaller battery, usually operating under a heavier load than its *economy factor* dictates, has a much shorter life. In the present emergency, however, such drawbacks, and technical niceties will frequently have to be disregarded in the interest of practicality. *Most suitable* is purposely specified here; the next smaller size battery certainly has smaller *cubical* dimensions, but it may be proportioned differently—one of its dimensions may be perhaps too large to fit

*Reproduced from the *Radio Troubleshooter's Handbook* and the *Replacement Battery Chart* by A. A. Ghirardi, by courtesy the Radio and Technical Publishing Company.

"B" BATTERIES FOR PORTABLE RECEIVERS

Make	Battery Catalog Number	Voltage	Terminals	Dimensions in Inches	Std. Pkg. Quantity	Std. Pkg. Wt. Lbs. (Total)
Burgess	W30PI	45 V. "B"	Socket	2⅛ x 1⅞ x 3⅛	6	4
Eveready	733	"	"	2⅛ x 1⅞ x 4⅝	5	4
General	V30AAA	"	"	2⅛ x 1¼ x 4⅛	10	8½
Ray-O-Vac	P3A30	"	"	3 x 1⅜ x 4	4	6
Burgess	XX30	45 V. "B"	Snap-On	2⅞ x ⅛ x 3¾	6	2½
Eveready	455	"	"	2⅝ x ⅜ x 3⅝	12	6½
Bright Star	30-50	45 V. "B"	Duplex Socket	4⅛ x 3½ x 2⅞	2	3½
Burgess	A30M	"	"	4⅛ x 3½ x 2⅛	6	11
Usalite	622	"	"	4⅛ x 3⅜ x 2⅝	24	33
Acme	330	45 V. "B"	Duplex Socket	4⅛ x 2½ x 5⅜	6	16½
Bond	3017	"	"	4⅛ x 2½ x 5¼	6	18
Bright Star	30-03	"	"	4⅛ x 2⅛ x 5⅜	2	5½
Burgess	B30	"	"	4⅛ x 2⅛ x 5⅛	6	16
Eveready	762	"	"	4⅛ x 2⅛ x 5⅛	2	6
General	V30B	"	"	4¼ x 2½ x 5⅜	10	29
National Union	B860	"	"	4⅛ x 2⅛ x 5⅛	6	16
Philco	P305	"	"	4⅛ x 2½ x 5¼	10	29
Ray-O-Vac	P5303	"	"	4⅛ x 2⅛ x 5⅛	6	16
Usalite	624	"	"	4⅛ x 2⅛ x 5⅛	24	60
Willard	V30B	"	"	4¾ x 2½ x 5⅜	10	29
Winchester	6218	"	"	4⅛ x 2½ x 5¼	6	18
Acme	430	45 V. "B"	Duplex Socket	3½ x 2¼ x 4½	6	9
Bright Star	30-55	"	"	3½ x 2¼ x 4⅝	2	3½
Burgess	Z30	"	"	3⅛ x 2¼ x 4	6	8¼
Eveready	738	"	"	2⅛ x 5⅛ x 4⅛	1	1½
General	V30AA	"	"	3 x 2¼ x 4⅛	10	15
Ray-O-Vac	P7R30	"	"	3 x 2⅜ x 4	6	7
Usalite	621	"	"	3⅜ x 2¼ x 4½	24	33
Willard	V30A	"	"	3⅜ x 2¼ x 4½	10	18½
Acme	830	45 V. "B"	Duplex Socket	3½ x 1⅛ x 5⅜	6	10½
Bond	6220	"	"	3½ x 1⅜ x 5⅛	6	11
Bright Star	30-33	"	"	3⅛ x 1⅜ x 5⅛	2	3½
Burgess	M30	"	"	3⅛ x 1⅞ x 5⅜	12	20
Eveready	482	"	"	3½ x 1¾ x 5⅛	2	4 lb. 3 oz.
General	W30B	"	"	3⅛ x 2⅛ x 5⅜	10	22
National Union	B861*	"	"	3½ x 1⅜ x 5⅛	6	11
National Union	B862	"	"	3⅛ x 1⅛ x 5⅛	6	13
Ray-O-Vac	P5S30	"	"	3⅛ x 1⅛ x 5½	6	11
Usalite	640	"	"	3½ x 1¾ x 5⅛	24	48
Winchester	6210	"	"	3½ x 1¾ x 5⅛	6	11
Burgess	A30X	45 V. "B"	Socket	4½ x 1½ x 5⅛	6	11
Eveready	727	" Discontinued				
General	F30A	"	"	4⅛ x 1½ x 5⅜	10	18½
Philco	P-200	"	"	4⅛ x 1½ x 5⅜	2	7
Ray-O-Vac	BB30P	"	"	4⅛ x 1⅜ x 5⅛	6	10¼
Burgess	XX45	67½ V. "B"	Snap Fastener	1⅜ x 2⅛ x 3⅛	6	4
Eveready	467	"	"	1⅝ x 2⅛ x 3⅝	12	10
General	W45A	"	"	1⅜ x 2⅜ x 3⅝	6	5½
Ray-O-Vac	P4367	"	"	1⅛ x 2⅛ x 3⅛	12	9½
Burgess	Z59	88½ V. "B"	.....	3½ x 2¼ x 5⅞	6	14
Acme	530	(Two) 45 V. "B"	Duplex Socket	4½ x 1⅞ x 3	8	10½
Burgess	A60	90 V. "B"	"	4½ x 2¼ x 4⅜	4	14
Ray-O-Vac	BB60P-IMP	90 V. "B"	Socket	5 x 3⅛ x 4⅜	3	11
Willard	V30AA	(Two) 45 V. "B"	Duplex	3 x 2¼ x 4⅛	10	15

*Discontinued for the Duration. Replaceable by National Union B862 battery.

"A-B" PACKS FOR PORTABLE RECEIVERS

Make	Battery Catalog Number	Voltage	Terminals	Dimensions in Inches	Std. Pkg. Quantity	Wt. Lbs. Std. Pkg. (Total)
Philco	P89	1½V."A"—58½V. "B"	Socket	9 x 2½ x 1⅜	6	10½
Usalite	AB672	1½V."A"—61½V. "B"	Socket	9⅞ x 3⅞ x 2⅞	10	42½

"A-B" PACKS FOR PORTABLE RECEIVERS (Cont'd)

Make	Battery Catalog Number	Voltage	Terminals	Dimensions in Inches	Std. Pkg. Quantity	Wt. Lbs. Std. Pkg. (Total)
Burgess	4GA41	1½V."A"—61½V. "B"	Socket	9⅞ x 3⅞ x 2⅛	1	4¼
Philco	P41A4G	1½V."A"—62½V. "B"	"	9⅞ x 3⅜ x 2⅝	6	28
Burgess	4GA42	1½V."A"—61½V. "B"	4-prong Socket	9 x 2 x 4⅜	1	4½
General	41A4FL	"	"	9⅜ x 1⅞ x 4⅜	6	26½
National Union	N802	"	"	9⅜ x 2 x 4⅜	1	4¼
Philco	P41A4FL	1½V."A"—60V. "B"	"	9⅜ x 2 x 4⅜	6	26½
Ray-O-Vac	AB419	1½V."A"—61½V. "B"	"	9½ x 2⅛ x 4⅞	1	4¼
Usalite	AB669	"	"	9⅜ x 2 x 4⅜	10	40
Willard	.....	"	"	9⅜ x 1⅞ x 4⅜	6	26½
Acme	460-15	1½V."A"—90V. "B"	4-prong Socket	7 x 5⅛ x 2¼	6	27
Burgess	5DA60	"	"	6⅞ x 5⅛ x 2⅛	1	5
General	60A2L	"	"	7 x 5⅛ x 2⅜	1	5½
Usalite	AB665	"	"	6⅛ x 5⅛ x 2⅜	10	40
Willard	60A2L	"	"	7 x 5⅛ x 2⅜	1	5½
Acme	860-41	1½V."A"—90V. "B"	8-prong Socket	7 x 3¼ x 4⅛	6	28½
Burgess	4FA60	"	.....	7 x 3½ x 4⅜	1	5¼
Burgess	4TA60	1½V."A"—90V. "B"	Socket	8⅛ x 2⅜ x 4¾	1	4¾
Acme	460-15S	1½V."A"—90V. "B"	8-prong Socket	9⅜ x 4½ x 2½	6	28½
Burgess	6FA60	"	"	11⅛ x 6¼ x 1⅝	1	5½
General	60A4L	"	4-prong Socket	12 x 6⅜ x 1⅞	6	39¾
National Union	N803	"	"	12 x 6⅜ x 1⅞	6	30
Philco	P60A4L	"	"	12 x 6⅜ x 1⅞	6	39¾
Ray-O-Vac	AR84	"	"	11⅞ x 6⅜ x 1½	6	30
Usalite	AB667	"	"	12 x 6⅜ x 1⅞	10	45
Acme	460-15MS	1½V."A"—90V. "B"	4-prong Socket	9⅜ x 2½ x 4½	6	28½
Burgess	6TA60	"	"	9⅛ x 2¼ x 4⅜	1	5¼
Burgess	2GA60	1½V."A"—90V. "B"	Socket	9½ x 2¼ x 4⅞	1	4¾
Burgess	3FA60	1½V."A"—90V. "B"	4-prong Socket	10½ x 4⅞ x 2⅜	1	4½
Ray-O-Vac	MB49	"	"	10⅛ x 4¼ x 2⅜	6	28½
General	60A4H	1½V."A"—90V. "B"	One 2-prong, two 3-prong Sockets	12½ x 2⅜ x 3½	6	35½
Willard	60A4H	"	"	12½ x 2⅜ x 3½	6	35½
Burgess	F4A4I	6V."A"—61½V. "B"	4-prong Socket	5⅛ x 4⅞ x 2⅛	1	4
Ray-O-Vac	AB648	"	"	9⅜ x 4⅛ x 2¼	1	4½
Burgess	G4B50	6V"A"—75V. "B"	Special Zenith Socket	4½ x 12⅜ x 2⅛	1	6¼
General	Z50B4H4	"	"	4¼ x 12⅜ x 2¾	1	7
Usalite	AB670	"	"	4 x 12½ x 2¾	10	55
Zenith	Z675	"	"	4¼ x 12⅝ x 2¾	...	...
Burgess	D4A60	6V."A"—90V. "B"	4-prong Socket	6⅛ x 5½ x 2⅝	1	5
Usalite	AB664	"	"	6⅛ x 5⅛ x 2⅜	10	40
Acme	460-14S	6V."A"—90V. "B"	Special 4-prong Socket	5½ x 2¼ x 7	6	27
Burgess	2F4B60	6V."A"—90V. "B"	Socket	10⅞ x 4⅜ x 4⅛	1	8¾
Acme	360-4FS	6V."A"—90V. "B"	Special Zenith Socket	10⅛ x 2½ x 4⅛	1	6¾
Burgess	F4B60	"	.....	10⅜ x 2¾ x 5	1	6½
Burgess	G4B60	6V."A"—90V. "B"	4-prong Socket	10⅜ x 2⅛ x 5	1	7
General	60B4H	"	Socket	10⅜ x 2¾ x 5	1	8
Usalite	AB673	6V."A"—90V. "B"	3-prong Socket	11⅞ x 4¼ x 2⅝	10	50
Burgess	2F4A60	6V."A"—90V. "B"	3-prong Socket	11⅞ x 2⅛ x 4⅜	1	6½
General	{60A4F4 / 60A4FL4}	"	"	10⅛ x 2⅛ x 4⅞	6	33½
Philco	P60A8F4	"	"	11⅞ x 2⅝ x 4¼	6	42
Ray-O-Vac	AB694	"	"	10⅜ x 2⅛ x 4	1	4¾
Usalite	AB668	6V."A"—90V. "B"	{1 "A" Socket / 2 "B" Sockets}	10⅝ x 2½ x 4⅞	10	50
General	60A110	6V."A"—90V. "B"	4-prong Socket	12¼ x 1⅞ x 6⅜	6	39¾
Philco	P60A110	"	"	12¼ x 1⅞ x 6⅜	6	39¾
Burgess	G5A42	7½V."A"—63V. "B"	4-prong Socket	9⅞ x 4⅜ x 2¾	1	4¾
Emerson	AB749	"	"	9¼ x 4 x 2⅞	1	4
Philco	P87	"	"	9½ x 4 x 2⅝	6	30
Ray-O-Vac	AB794	"	"	8⅝ x 4 x 2⅝	6	26½
Usalite	AB676	7½V. "A"—67½V "B"	"	9⅞ x 4 x 2⅝	6	—
Burgess	F5A60	7½V."A"—90V. "B"	Socket	11⅛ x 2⅛ x 4⅜	1	5½
Philco	P841	"	"	11⅞ x 2⅝ x 4¼	6	36
Burgess	G6B60	9V."A"—90V. "B"	Socket	13⅞ x 4⅛ x 2⅛	1	8¼
Usalite	AB677	"	"	13⅞ x 4⅛ x 2¾	5	42.5

Fig. 3 (Continued). Above we have the physical and electrical specs of leading makes of batteries for "B" use in portable receivers and "A-B" use in portable receivers. As in the chart on page 6, twelve representative makes of batteries have been selected.

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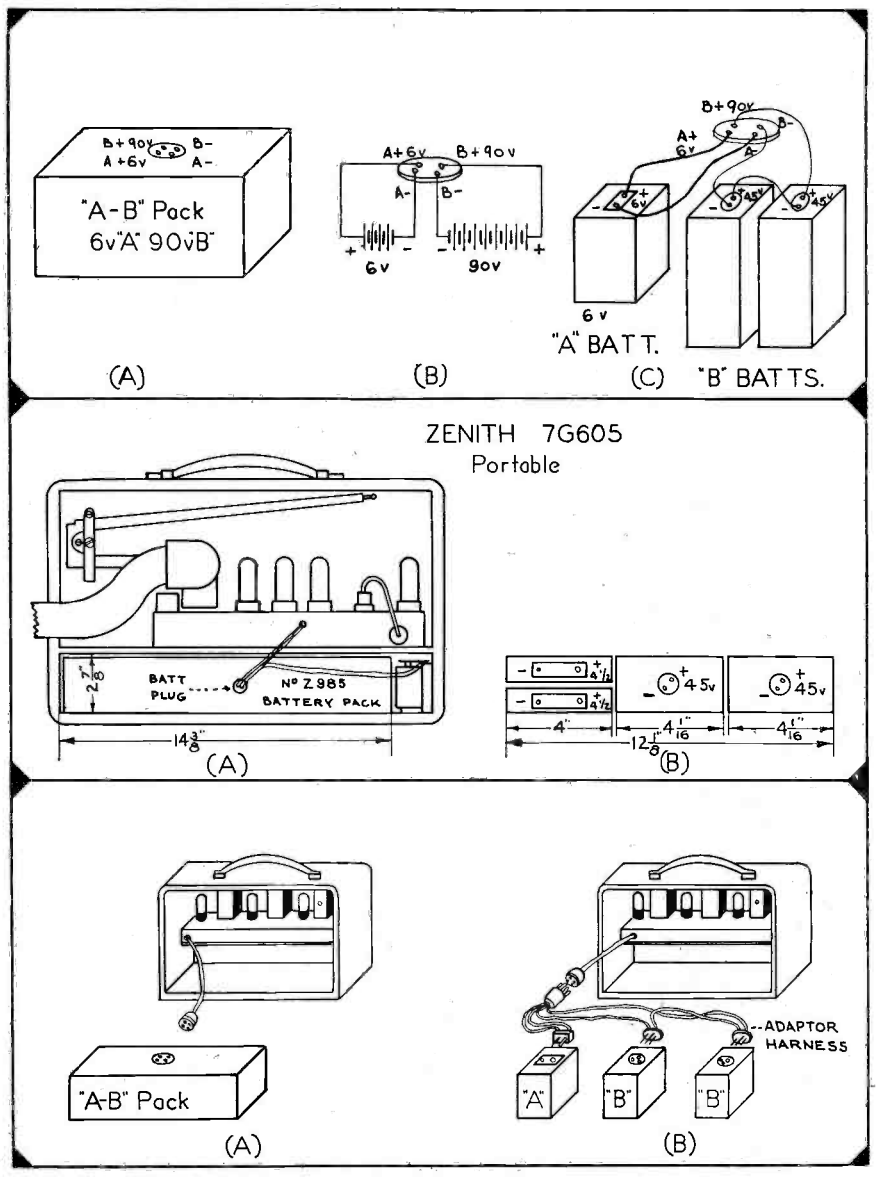

Fig. 4 (top). An "A-B" pack (*A*) whose internal circuit arrangement is as shown at (*B*) is electrically equivalent to individual "A" and "B" batteries of proper voltage and size, properly connected together as shown at (*C*).

Fig. 5 (center). "A-B" pack and equivalent individual "A" and "B" batteries for a Zenith DeLuxe Model 7G605 receiver.

Fig. 6 (bottom). The portable with its original "A-B" pack is shown at (*A*). At (*B*) the pack has been replaced by individual "A" and "B" batteries connected to the receiver battery plug by a suitable adapter harness.

into the existing battery compartment. The troublesome dimension is usually the *depth*.

If the service man stocks a fairly large variety of batteries, he can usually get hold of the substitute battery decided upon and determine at once, by trial, whether it fits into the battery compartment. However, when the substitute battery decided upon is not in stock, the chart in Fig. 3** is helpful. It lists the exact physical dimensions, electrical specifications, terminal arrangements, and other data for all the "A," "B" and "A-B" batteries made by leading battery manufacturers. By referring to the *Dimensions in Inches* column of this chart before ordering, exact dimensions of substitute replacement batteries can be ascertained beforehand. Then by making a simple arithmetical check it is possible to determine whether the batteries decided upon, when they arrive, will fit into the available space. This precaution will eliminate situations where replacement batteries decided upon and ordered are later found to be too large in at least some one dimension to fit into the battery compartment.

The data in the chart of Fig. 3 are helpful, too, in the preliminary selection of substitute batteries; it tells at a glance just what battery sizes are available for any one voltage group. Notice that for quick reference the batteries have been grouped according to *voltage* and *physical dimensions*.

When batteries are replaced by smaller substitutes, the substitutes cannot completely fill the battery compartment. After they are installed, the extra space should be filled with pieces of corrugated or other stiff paper, cut to proper size. This prevents the batteries from banging into each other or the receiver case when the receiver is carried. Be careful not to stuff too much paper into the space, however. Batteries swell slightly when they become discharged; if they become too tightly wedged it is difficult to pull them out for later replacement.

Reference to the chart of Fig. 1 shows that the battery type most affected by emergency production curtailment is the combination "A-B" pack. This has become so popular that it is now used in most portables. Present indications are that eventually practically all "A-B" packs will have to be replaced by suitably installing individual "A" and "B" battery units which supply A and B voltages and operating life equivalent to those of the pack. These must have such dimensions that they can be installed in the space formerly occupied by the pack.

When selecting the proper individual "A" and "B" replacement batteries and making their correct electrical connection, one fact should be kept clearly in mind. An "A-B" pack is nothing more than a convenient arrangement of the proper dry "A" battery and proper dry "B" battery, wrapped and encased as a single unit, equipped with a terminal plug or socket (sometimes a special type) into which the receiver battery cable is plugged. There is nothing mysterious about the internal arrangement or electrical connections in "A-B" packs. The illustrations in Fig. 4 make this very apparent. (A) is an external view of a typical A-B pack, its terminals coming out to the socket at the top. The internal connections are shown in schematic form at (B). This particular battery supplies 6 volts "A" and 90 volts "B." There is no reason in the world why an individual 6-volt "A" battery and two standard 45-volt "B" batteries connected in series cannot be substituted for it as shown at (C). Electrically, the arrangement of (A) and that of (C) are equivalent.

It is evident, then, that proper substitution of individual "A" and "B" batteries for "A-B" packs must fill the following two important requirements:

1.—The individual "A" and "B" batteries selected must:
(a) supply "A" and "B" voltages equivalent to those of the pack,
(b) have as nearly as possible the

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same operating life as the pack under the current drain imposed by the set, (c) fit into the space formerly occupied by the pack.

2.—The basic electrical circuit arrangements in the "A-B" pack must be duplicated in the individual "A" and "B" battery arrangement.

How to Select Proper "A" and "B" Batteries for "A-B" Pack Conversion

For proper selection of replacement batteries, first determine the nominal voltages of the "A" and "B" sections of the "A-B" pack; then select proper individual "A" and "B" batteries for replacement. To illustrate, consider the typical replacement problems for the Zenith Z985 "A-B" pack in the Zenith De Luxe Model 7G605 portable. This particular battery is now practically unprocurable anywhere. The installation conditions for the pack are illustrated at (A) of Fig. 5.

Inspection of the battery terminal markings reveals that it is a 9 volt "A" —90 volt "B" pack. This should therefore be replaced by two 4½-volt "A" batteries and two 45-volt "B" batteries; the latter, when connected in series, will deliver the required 90 volts.

If the receiver is at hand, measure the maximum demensions of the battery space available in the battery compartment. For this particular receiver it is 14⅜" x 5¾" x 2⅞". Always check this space if possible; frequently, even though the "A-B" pack did not occupy the full space, one or more of the compartment dimensions must be utilized in *full* in order to get certain *available* batteries into the compartment.

When, as sometimes rarely does occur, the receiver is not at hand and replacement "A" and "B" batteries must be ordered, the make, model number and voltage of the "A-B" pack can be determined by referring to the proper *Rider Manual* for its service sheet covering the particular set. When the make, model number and voltage of the pack are known, its dimensions can be ascertained by referring to the chart of Fig. 3. Under these circumstances, assume the very worst conditions, that is, that the battery compartment space is *equal* to that occupied by the pack (although it may actually be somewhat larger along one or more dimensions).

With this information at hand, the quickest way to determine the proper "A" and "B" replacement batteries depends, as has been said, on whether a fairly complete variety of replacement batteries and the receiver itself are at hand. If they are, select the batteries by actually fitting various ones into the

Fig. 7 (right). An assortment of typical lugs and connectors employed for making proper electrical connections to the individual portable "A" and "B" batteries substituted for "A-B" packs. (A) is a 2-prong small plug for 1½-volt "A" batteries; (B) is a 2-prong plug for 4½-volt "A" batteries; (C) is a 2-prong plug for 6-volt "A" batteries; (D) is a 2-prong plug with guide pin for 7½-volt "A" batteries; (E) is a 3-prong small plug for 45-volt "B" batteries; (F) is a 3-prong large plug for 45-volt "B" batteries; (G) is a male snap fastener for connecting to negative terminal of miniature 67½-volt "B" batteries; (H) is a female snap fastener for connecting to the positive terminal.

Courtesy J. F. D. Mfg. Co.

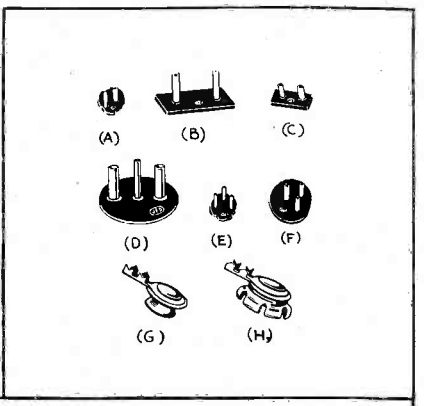
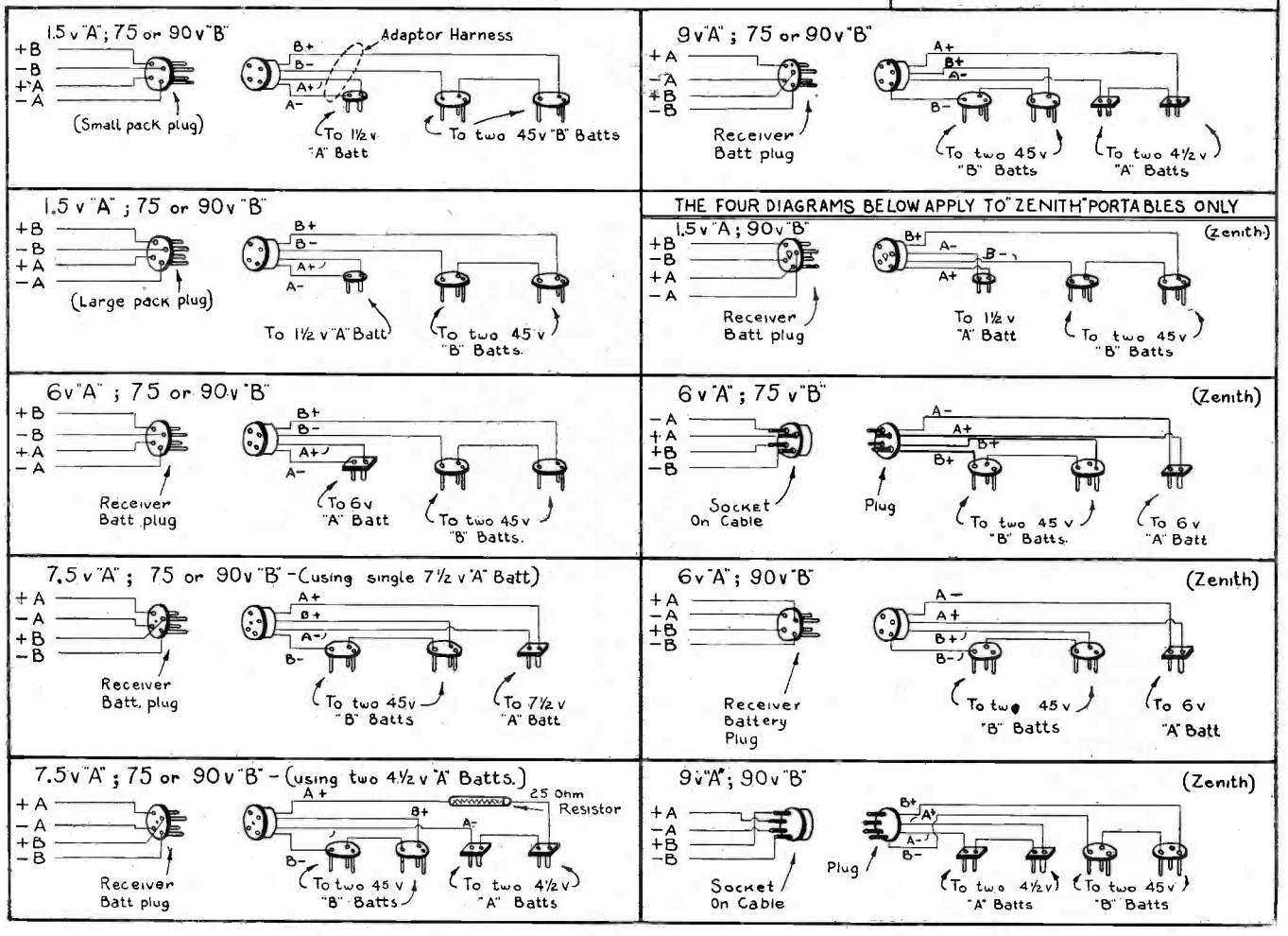


Fig. 8 (bottom). Connection diagrams for adapter harnesses which cover the majority of conversions from "A-B" packs to individual "A" and "B" batteries.



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battery compartment, choosing those which fill the space as completely as possible.

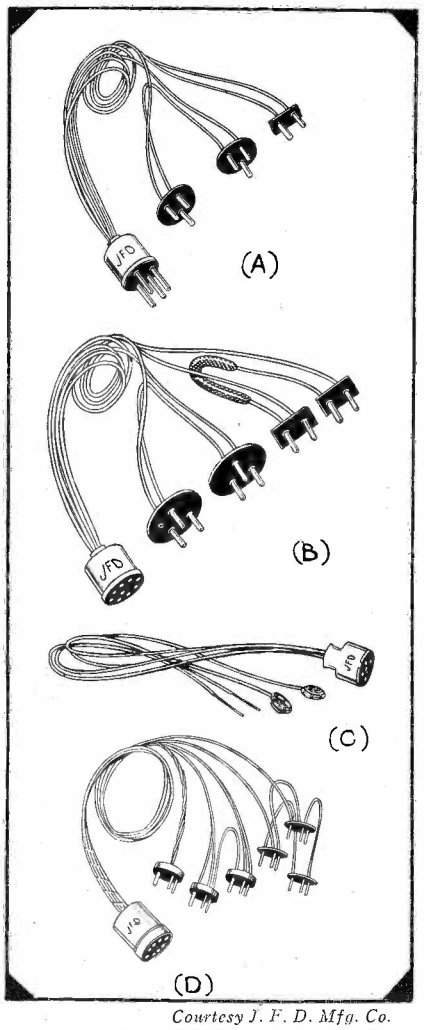
If the replacement batteries are not at hand but must be ordered, a different procedure must be followed. For size refer to the proper sections of the battery-dimension chart of Fig. 3. In the case of the Zenith receiver previously mentioned, for instance, the 9 volts "A" and 90 volts "B" in a maximum total space of 14⅜" x 5¾" x 2⅞" can best be supplied by two 4½-volt "A" batteries of the Burgess G3 size (measuring 4" x 1⅜" x 4 15/16" each) and two 45-volt "B" batteries of the Burgess B30 size (measuring 4 1/16" x 2 9/16" x 5 5/16" each). Of course, equivalent "A" and "B" batteries of other makes (those listed in the two vertical columns which include these in Fig. 2) will also serve if they are more readily available.

The individual dimensions of the four batteries selected above permit them to be arranged in a group, as illustrated at (B) of Fig. 5, so they occupy a total space not exceeding in any dimension that available in the battery compartment. Notice by the dimensions indicated, for both illustrations (A) and (B), that the space occupied is actually less in one dimension. This is to be filled with corrugated board or stiff paper.

The final step in substituting individual "A" and "B" batteries for "A-B" packs is to provide proper leads and plugs to extend the receiver battery-cable plug (or socket) to the various individual replacement batteries, so that the same basic electrical circuits will exist with individual "A" and "B" batteries as did with the "A-B" pack they replace. Fig. 6 illustrates how this is done. The Service Man has two choices: he may purchase the necessary battery plugs and himself wire them suitably into an adapter harness, or he may purchase ready-made adapter harnesses, complete with the proper plugs, ready for immediate plug-in installation.

If the Service Man prefers to make his own, he can select from a complete assortment of portable radio battery plugs made especially for this purpose. A postcard sent to such plug and adapter manufacturers as J. F. D., Eby, Bud, Alden and others will bring complete catalog sheets describing them. An assortment of typical such plugs and connectors is illustrated in Fig. 7. Radio dealer's and Service Men's kits, containing 100 or more of the most-used types of such plugs and connectors, can be had from the plug manufacturers.

Refer again to the illustrations of Fig. 4; fix them firmly in mind. A clear mental picture of the simple internal connections existing in any "A-B" battery pack assists greatly in achieving the proper connections to be provided for the individual "A" and "B" batteries on any substitution job. Notice in (C) of Fig. 4 that when the "A-B" pack is replaced by a single "A" battery and two 45-volt "B" batteries, all the adapter harness must do is provide a proper plug (or socket) for connection to the receiver battery cable socket (or plug), two extension leads to a suitable plug for the "A" battery, two leads to two suitable plugs for the "B" batteries, and a jumper wire to connect the two "B" batteries in series with each other. The simplicity of such an arrangement is apparent. In cases where two "A" batteries must be used in series to obtain the needed "A" voltage, an additional "A" battery plug and series-connecting jumper wire must be provided (Fig. 8).



Courtesy J. F. D. Mfg. Co.

Fig. 9. (*A*) Type of ready-made adapter harness for portables requiring one "A" battery and two 45-volt "B" batteries. A plug is furnished at the left for plugging into the receiver battery cable socket. (*B*) Type of harness used if receiver requires 7½-volt "A" and only 4½-volt "A" batteries of proper size are available. Note the 25-ohm voltage-dropping resistor in the A+ lead. (*C*) A special harness for replacing Philco A-B pack No. P-89 in "Candid Camera Type" sets. Small 4-prong socket receives 4-prong male plug on end of radio battery cable. Two snap fasteners on other end clip on to Eveready 467 Minimax battery, and two pigtail terminals are soldered to each end of a single standard "A" flashlight cell. (*D*) Another special "Philco" harness with 8-prong battery cable socket; 3 plugs for three 45-volt "B" batteries, and 3 plugs for three 4½-volt "C" batteries.

Fig. 8 shows the adapter harness circuit arrangements by which individual "A" and "B" batteries can be converted into the electrical equivalent of the various types of "A-B" packs. These circuits cover practically all the "A-B" pack voltage combinations commonly encountered. In each, the receiver battery cable with its plug (or socket) is shown at the left. The required adapter harness is at the right.

Notice that when the "A-B" pack originally supplies 75 volts "B," two 45-volt "B" batteries of the proper size in series are used in the substitution—giving a total of 90 volts. The 90 volts "B" voltage can be used without receiver difficulty in practically all such cases.

Notice, too, that two "A" battery alternatives are possible when the "A-B" pack originally supplied 7½ volts "A." Either a single 7½ volt "A" battery of the proper size may be used in the substitution, or ,if this is not readily obtainable, two standard 4½-volt "A" batteries of the proper size may be connected in series and a 25-ohm flexible wire-wound resistor wired in series with the A+ lead to drop the "A" voltage to the required 7½ volts. This is illustrated in the diagram at the lower left of Fig. 8. Compact 25-ohm flexible wire-wound resistors for this purpose can be secured from the manufacturers mentioned above.

Many dealers and Service Men prefer to save time by connecting the "A" and "B" substitute batteries with inexpensive ready-made adapter harnesses. Models are available for each type of portable battery sets and for farm and household radios, as well. No soldering or cutting is required—the harnesses are complete, ready to be plugged in. Simple and convenient, they are, in addition, an excellent sales opportunity for the Service Man. Fig. 9 illustrates several ready-made harnesses designed for specific conversion jobs. Notice the similarity between them and the corresponding circuits of Fig. 8. One manufacturer, J. F. D., also furnishes these units in special distributor's assortments and dealer's and Service Men's packages, each containing a balanced quantity of different harnesses chosen in proportion to their relative popularity.

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SOLVING SHORTAGE PROBLEMS In Speaker Replacements

By ROBERT G. HERZOG

EDITOR (ON LEAVE)

WITH FEW exceptions receivers in use today employ speakers of the moving coil type commonly known as dynamics. In this type of speaker a small light-weight coil is freely suspended in a strong magnetic field. This coil is supplied with electric current at audible frequencies from a step-down transformer connected to the plate circuits of the power amplifier tube or tubes. The current in traversing the windings of the speaker coil (commonly called the voice coil) sets up a magnetic field that varies in time at the same audio rate as the current. This magnetic field, in turn, reacts with the strong fixed field in which the voice coil is suspended and causes the coil to move. The movement of the coil is in reality a vibration at the audio rate at which the current varies. As the voice coil vibrates, a diaphragm attached to it also vibrates and moves the surrounding air that affects the ear and makes the sounds audible.

Dynamic speakers can be classified into two distinctive types: electrodynamics and permanent-magnet dynamics. In the electro-dynamic a coil of wire is wound around a central pole piece. A magnetic field is set up for operation of the speaker by supplying this coil with d-c from a suitable source.

The field for the permanent magnetic (p-m) speaker, on the other hand, is supplied by means of a powerful permanent magnet made of alnico, nipermag or a similar alloy.

An adequate speaker baffle is imperative for low-frequency output, the smallest dimension being equal to, or greater than ½ wave-length of the lowest frequency to be properly reproduced. The baffle should have an irregular outline so as not to exhibit sharp cut-off characteristics. Without an adequate baffle, sound pressure at low frequencies is prevented from being built up, because of the short path from front to rear of the speaker. Theoretically, at 100 cycles the shortest dimension should be about 5½ feet.

Because of these cumbersome dimensions baffles are not suited to home use and many devices have been invented to replace them. All designs are based on the theory that radiation from the rear of the speaker must not be allowed to cancel the direct radiation from the front. One class of device aims to completely dissipate the rear radiation making any cancellation impossible. There can be no openings in the speaker cabinet so the sound must be absorbed by directing it along paths lined with special sound absorbing material. Another class of service aims to make the bass notes travel such a path that they are radiated in phase with the direct front waves and are thus put to good use. The dimensions are critical in these designs and a great deal of research work has gone into them to get the present high quality reproduction. The rear high frequencies must be completely absorbed because only a very limited spectrum can be properly phased. Cancellation would begin to take place if the range were extended. Stromberg Carlson's Labyrinth is a notable example of developments in this field.

In the p-m speaker a powerful magnetic field is set up around the voice coil as a result of the shape of the magnet and the placing of the pole piece. The newer types of magnetic materials assure the permanence of this field over years of operation.

The problem of a d-c supply for the field coils of the electro-dynamic speaker, on the other hand, has always been an interesting one. The earliest types of electrodynamics employed separate field supplies. Some of these were of the low-voltage type and used a dry-disc rectifier fed from a step-down transformer; others utilized an 80 rectifier tube. RCA brought out a speaker with a 110-volt copper-oxide bridge circuit rectifier which eliminated the need for a transformer.

Most modern receivers supply the field from the main rectifier. Various methods are used. By far the most popular is the one in which the field is used as the filter choke. (See Fig. 1.) Other methods include use of the field as a screen-supply drop resistor and bleeder (Fig. 2); in the negative high voltage lead as a choke and as C-bias drop resistor (Figs. 3 and 4); or in shunt with the rectifier output.

The circuit in Fig. 1 shows the field as a choke with large electrolytic condensers to attenuate the hum. The larger the first condenser the less the speaker hum, but the rectifier has to

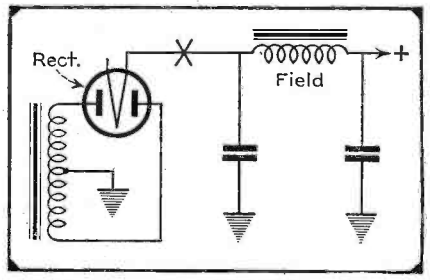
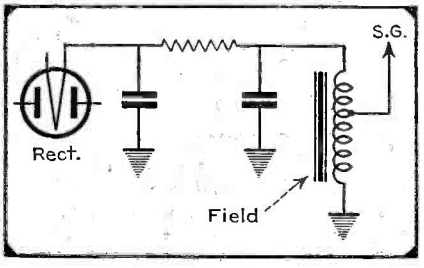


Fig. 1. The speaker field coil is used as a filter choke in this circuit, with large electrolytic capacitors to attenuate the hum.

Fig. 2, below, shows a method of using the field as a screen supply-drop resistor. Care must be exercised in measuring the resistance and drop so that neither the speaker efficiency or rectifier efficiency is impaired.



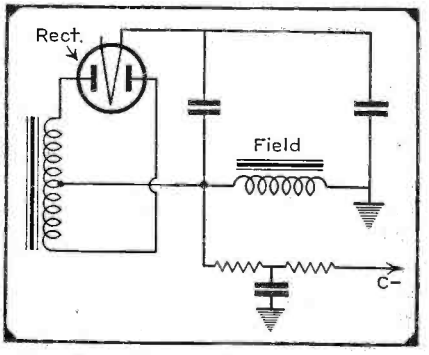
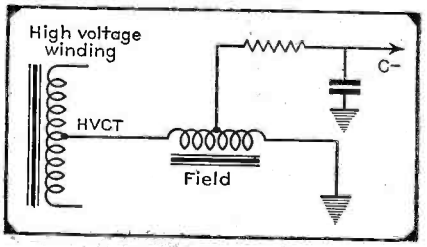


Fig. 3. (Above) The bias for the output stage has often been obtained from a resistance divider across the field coil which was connected in the negative leg of the power supply. Fig. 4 (below) shows the same application with a tapped speaker field.



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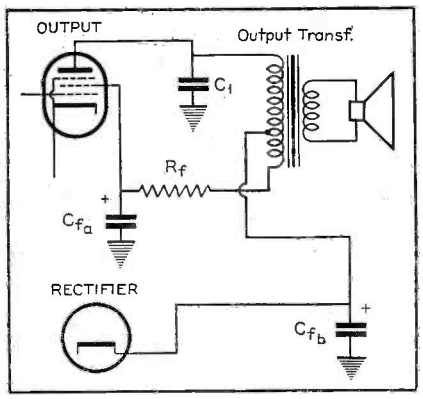

Fig. 5. Some receivers used a tapped output transformer to reduce hum. The circuit shown in Fig. 6 (right center) may be substituted where duplicate replacements cannot be obtained.

handle larger instantaneous charging currents which, if excessive, may wreck it. Where excessive speaker hum is encountered due to insufficient field filtering, insert a low value of resistance in series with the field at the point marked X in Fig. 1. The first condenser (connected away from the rectifier to the field end of this resistor), can then be increased appreciably without damage to the rectifier. Values from 50 to many hundred ohms are used for this resistor.

A tapped field, where the screen supply and bleeder currents are used to energize the coils, is shown in Fig. 2. Smoother d-c is required for this application and a filter choke is usually employed in receivers with this application. Figs 3 and 4 show the field connected in the negative leg of the power supply. In Fig. 3 bias for the output tubes is obtained by means of a resistance divider. In Fig. 4 the field is tapped at a point to provide the proper bias.

Hum

To reduce the hum in the speaker output due to field supply ripple, humbucking coils or shading rings are used. Hum voltage in the bucking coil is used to cancel that in the field coil. By carefully adjusting the number of turns in the bucking coil the fundamental frequency can be completely cancelled out. Because of the wave form distortion, however, some harmonics always remain.

Repairs

Until recently it was rarely profitable to make extensive adjustments and repairs on speakers and speaker parts. Shortages have changed all this, however. It is now not only profitable, but also patriotic to go to great ends to make the old speaker do. Because of this it is advisable for the Service Man to make a study of the different parts obtainable for speaker repairs. It is possible to obtain, through regular jobber channels, speaker voice coils; spiders of different types; and of course, complete cones; field coils and spacers.

Broken spiders can be replaced at small cost and without much difficulty. Rattles are often due to loose dust covers or poor cementing around the periphery of the cone. A good grade of speaker cement is a sure cure for these. It can also be used in cases where the flexible voice-coil leads hit up against the cone.

Where there are particles in the air gap, it is frequently possible to blow them out by using compressed air. In using compressed air, however, care must be taken that the blast of air does not injure the cone. In other

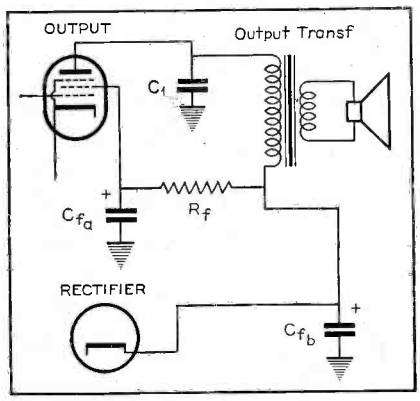

Fig. 6. This circuit can be substituted for that of Fig. 5, where duplicate replacements are not available. Condensers a or be should be increased to reduce the hum.

cases loose particles which are in the inner air gap can be removed with a thin speaker shim. A small clean camel's hair brush will often help.

Recentering of voice coils is not a new process to most Service Men. Every good shop is already equipped with complete sets of speaker shims and suitable S wrenches expressly for this operation.

In some speakers the voice coil, spider and cone are cemented together and recentering seems impossible. It should be remembered, however, that the cement used is of a special thermoplastic type which melts when heated and hardens as soon as it cools. Because of this it is possible to make adjustments to recenter the voice coil in these speakers.

The first operation is to insert at least three shims in the air gap properly spaced to hold the voice coil in the right position. It is important that metal or paper shims are used for this application since celluloid is certainly not adapted to the application of excessive heat.

Turn the speaker with the cone facing downward and hold the tip of a large and very hot soldering iron against the end of the pole piece. Keep the soldering iron in this position until the cement is thoroughly soft. This will take a minute or more. Remove the iron and allow the speaker to cool. When the shims are pulled out the coil should be perfectly centered.

This method may require some practice before you can melt the cement just enough to permit the voice coil and spider to move slightly with respect to each other but it is very effective where the difficulty is due only to an off-center voice coil.

Replacements

In a-c/d-c receivers, where the speaker field is used as a filter choke in series with the entire B supply, the coil usually has a resistance of 450 ohms or less and is wound with No. 33 to No. 35 wire. Because of this rather heavy wire speakers of this type rarely open inside the field coil.

Where the field supply in an a-c/d-c receiver is obtained by connecting the coil across the output of the rectifier the resistance used is from 2,000 to 4,000 ohms. Field coils of this type are wound with No. 36 to No. 39 wire and are more apt to open. P-ms, where available, are readily substituted for this type of circuit since after disconnecting the old speaker, and reconnecting the plate and B plus connections for the p-m, no other changes need be made.

A great deal of tolerance is permitted in making replacements in a-c receivers. A 25% variation in the resistance of the field coil will not appreciably affect reception. Even in cases where tapped speakers are employed (Figs. 2 and 3) substitutions may be made, ignoring the necessity for the tap. The proper voltage required at the tap may then be obtained by means of a resistance divider such as is done in the case shown in Fig. 4. Of course, if a tapped speaker is used,

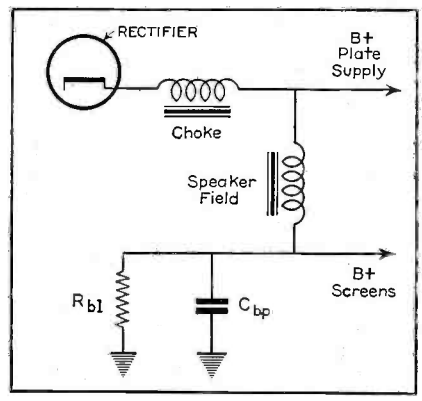

Fig. 7. A resistance may be used to replace the speaker field in a circuit where the latter is used to provide the screen drop. A p-m may then be substituted for the electro.

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TO KEEP 'EM LISTENING... HOME SETS MUST BE SERVICED

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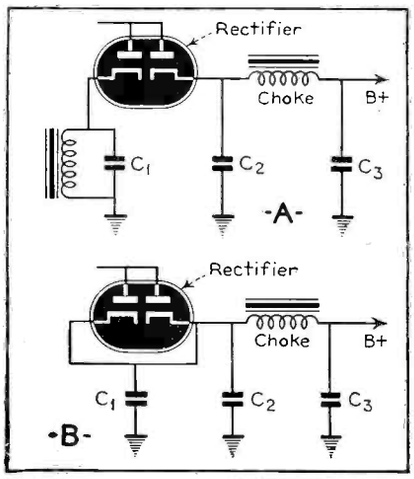


Fig. 8. In a-c/d-c sets which employ a speaker field which is connected to one of the diodes of the rectifier with a separate filter condenser, no additional parts are required.

closer tolerances must be observed.

A good many receivers of different makes were introduced recently with a tapped output transformer, such as that shown in Fig. 5, where the tap was used for hum neutralization. If replacement of such a transformer is indicated and duplicates are not available, the circuit shown in Fig. 6 may be substituted. Condensers a or b should be increased to reduce the hum level.

If a speaker, or speaker field, is replaced and a new hum bucking coil is required it is a simple matter to wind twenty to forty turns of No. 22 dcc wire over the field coil and to connect these in the proper phase, in series with the voice coil, to minimize hum.

Where the speaker field is used as a screen drop or other section of the divider circuits a resistance of the proper value can be substituted and, where available, a p-m speaker can be used instead.

There are a few cases where exact duplicate speakers must be used. With a little thought and minor changes in design practically all types of electromagnetic speakers can be replaced with p-ms. They may be fitted to most auto sets, saving from 1 to 1½ amps. battery drain when replacing an electrodynamic.

An obvious advantage is the elimination of open field problems especially in high-resistance speakers wound with very small wire. Sets used near the water, or in a damp climate are particularly prone to this trouble. Then there is no need for a hum-backing, or neutralizing coil. When a shunt field has been used, eliminating the field load lessens the current drain on the rectifier tube and also, in time, saves the customer something on the power bill. Eliminating the field loads also raises

Fig. 10. Difficulties with shortages are even evident in original receivers shipped from the factory. This Belmont Model 6D14, released many months ago, provides for the possibility of either a p-m or an electro.

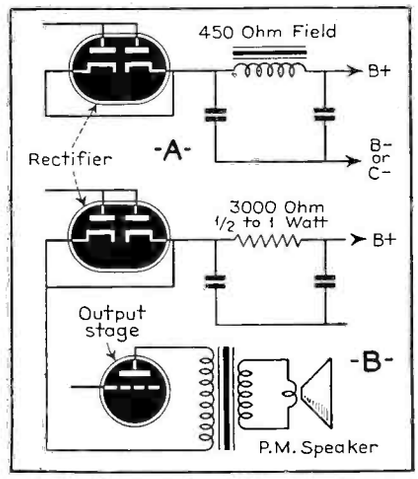


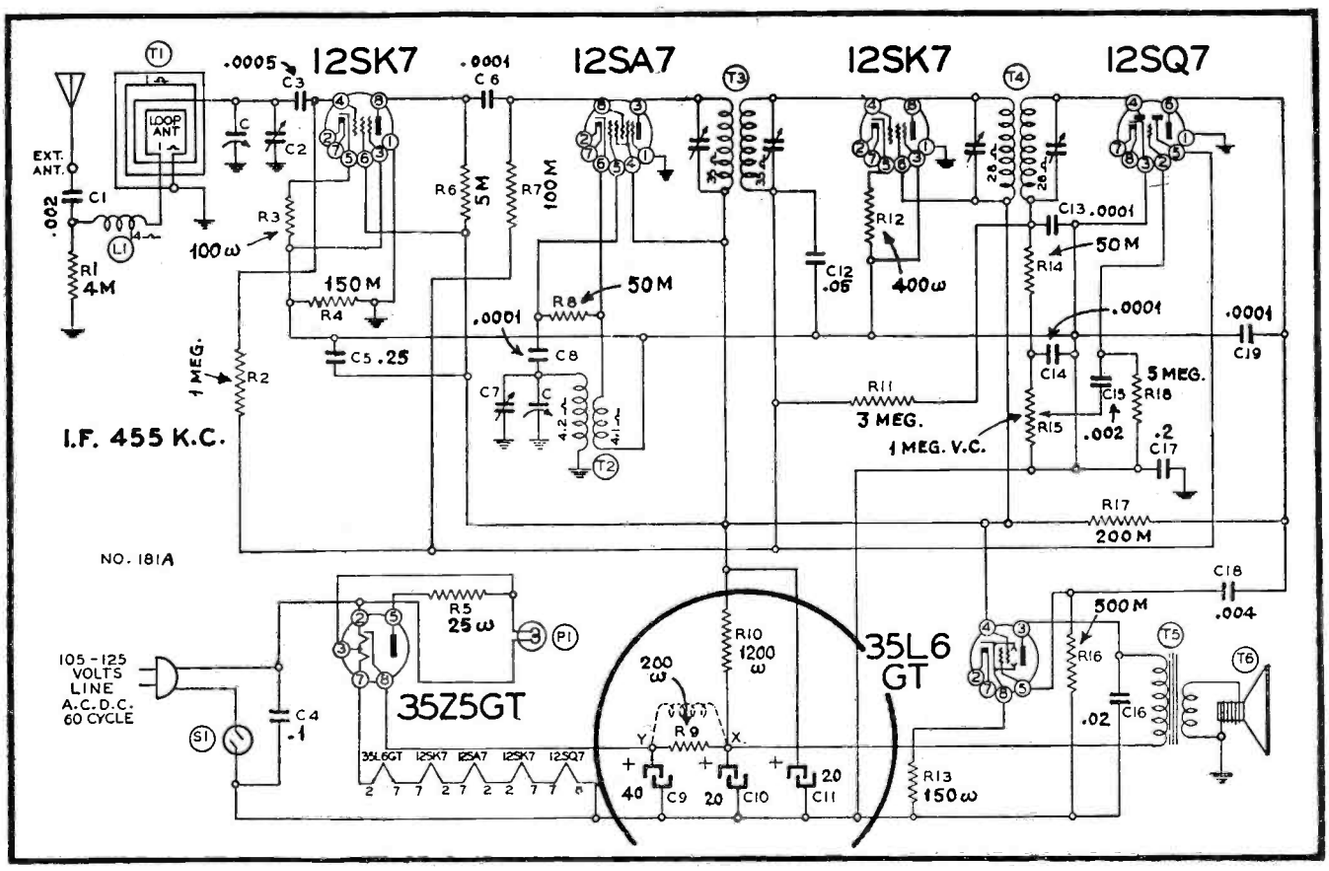
Fig. 9. A-c/d-c receivers that employ a 450-ohm, or similar, electro-dynamic require the addition of an r-c filter when a p-m is used as a substitute. It may also be necessary to increase the capacity of the filter condensers.

the B voltages, allowing greater sensitivity and increased power output.

A small stock will suffice for universal replacement purposes since there is no need of a variety of field resistances. P-ms require less space than electros, too. Hence problems of installation in close spots should be minimized. Having no field coils, there is no heat developed—an important factor in midget receivers. P-ms are fully dust-proof, eliminating the possibility of rattles due to dust particles.

With alnico and similar alloy mag-

(*Continued on page 17*)



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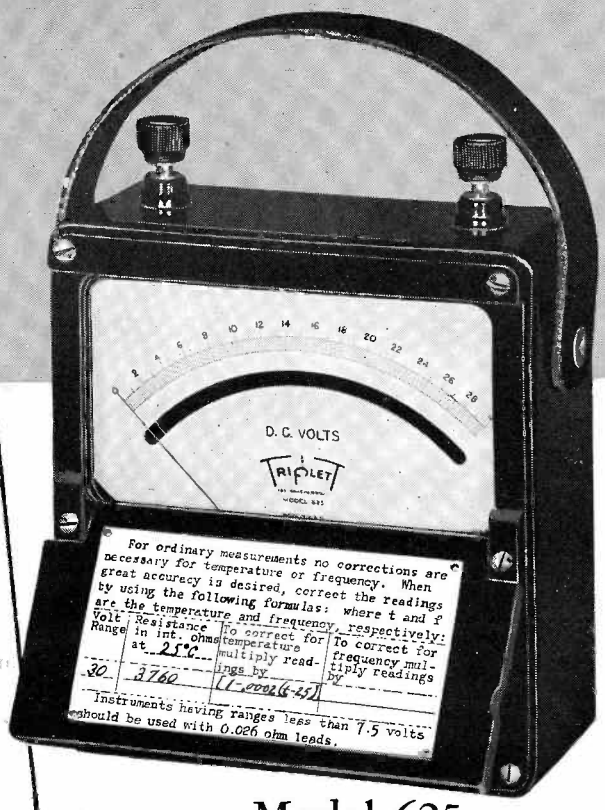

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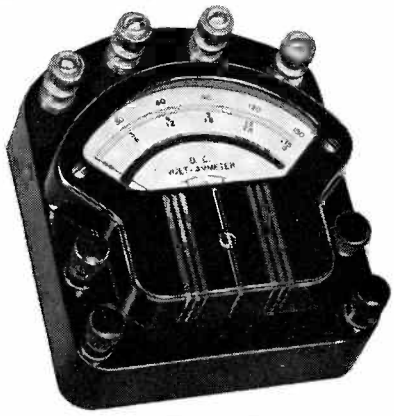

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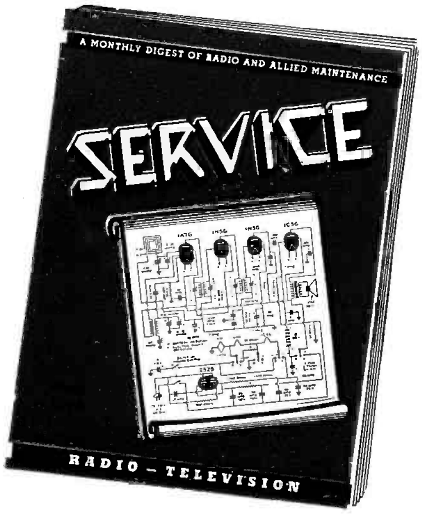

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SHORTAGES

(*Continued from page* 14)

nets, more field energy (higher flux density in the voice-coil air gap) is provided than is ordinarily available in the average size electrodynamic speaker. This will permit greater power output from the set as well as improving the sensitivity and low-frequency response of the speaker. In replacing magnetic speakers now being used in some inexpensive midgets, the improvement in sensitivity, quality and power output will be very marked. In most cases, a p-m speaker will do a better job than the electro that it replaces.

Fig. 8 shows the changes required in replacing a shunt field speaker in an a-c/dc set. At A, the field has its own separate B supply which is usually the case. The two rectifier cathodes are tied together thereby dividing the load and halving the internal resistance. The tube life will be increased after substitution and the B voltage raised a little. The shunt field filter condenser C_1 should be used to help along the B filter. If a choke had been used, it may as well be let alone, the power tube deriving voltage from the filter output. However, it may be permissible to substitute a resistor, switching the power tube to the rectifier output.

A p-m speaker may be substituted directly for a magnetic, no changes being necessary.

Summary

Receivers in use today invariably employ speakers of the moving coil type known as dynamics. These speakers may be divided into two general classes: the electrodynamic and the permanent-magnet dynamic or p-m speaker.

Direct current to energize the field coils of the electrodynamic is obtained in various ways as depicted in the circuit diagrams that accompany this text.

In replacing electrodynamics, the chief requirement is that the new speaker has a field coil that is capable of carrying the current which will flow through it and that it is also capable of dissipating the heat that this current will create. Tolerances are not critical and variations up to 25% are permissible in all types of replacement. Where the field is used as a bias supply some adjustments of resistors or slight circuit changes may be required to accommodate great variations in value of the speaker field.

In practically every instance a p-m can be used to replace an electrodynamic. Generally results obtained will be an improvement over previous operation.

PHILCO 42-1005, CODE 121-122

Pickup change: Two types of photoelectric pickups (9) were used on Code 122 models. One consisted of a metal tone arm and the other a plastic arm. When using the plastic tone arm a 3-oz counterweight (Philco Part No. 318-2863) must be used in the supporting end of the arm. A new tone arm bumper (Part No. 54-4167) is also required.

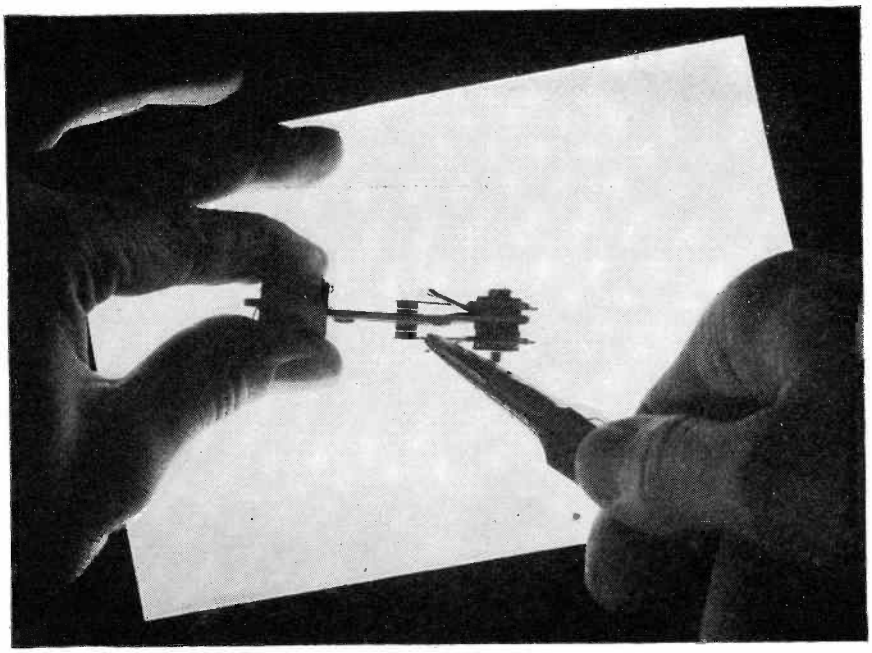
•

PHILCO 42-1015, CODE 121

Production changes: Beginning with chassis marked run 2, a filter circuit was added to the 6L6G output tubes to reduce hum. This circuit consists of a 0.1-mfd, 200-volts condenser (89) and a 100,000-ohms resistor (90). This change is shown on the schematic diagram in the service bulletin. A few early production models do not have this change.

Beginning with run 3, condenser (62) was changed from 0.006-mfd, 400-volts to 0.05-mfd, 400 volts. A few early production models do not have this change.

To avoid coupling the broadcast loop and the set wiring on Model 42-1015, it is necessary that the loop be mounted in the cabinet with the terminal having the red, or red-white lead towards the rear of the cabinet. The loop lead mentioned is connected to No. 2 terminal on the loop terminal on the rear of the chassis.



PRECAUTION
AGAINST AN UNTIMELY END

A RIPE old age is predicted for this Utah Vibrator—because of the precision adjustment of the contact points. This delicate operation, performed by skilled hands, is responsible not only for the long life of Utah Vibrators, but for their correct electrical balance, current output, and freedom from noise.

Utah contact points are adjusted to a specified clearance, with a variation of less than .0005 inches; the causes of failures so frequently found in ordinary vibrators are eliminated. This precaution avoids pitted or locked points, unsatisfactory performance and short life. Utah Vibrators are manufactured from only high quality materials, conforming to rigid standards. For example, the points are made of the best grade Tungsten, assuring the stamina to endure the most severe punishment.

It is now more important than ever that communication functions at maximum efficiency—this is your responsibility and your contribution to the defense of the nation. Now—as always—the Utah trademark is your assurance of satisfactory performance. Utah Radio Products Company, 816 Orleans Street, Chicago, Illinois. Cable Address: UTARADIO, Chicago. In the Argentine: UCOA Radio Products Company, S.R.L., Buenos Aires. In Canada: 560 King Street, W., Toronto.

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SER-CUITS

By HENRY HOWARD

SYNTHETIC bass, permeability tuning and a combination broadcast-short-wave loop circuit are among the features found in the receivers that are analyzed this month.

Ward 14BR-734B and 735B

Ward's Airline models, 14BR-734B and 14BR-735B 7 tube, 2 band a-c/d-c sets features one type of synthetic base in which a low pass filter is connected between the first audio cathode and the power tube cathode. Fig. 1 shows the circuit containing three series resistors and two shunt condensers in a double "T" type of filter. This receiver also uses a shunt speaker field and screen grid regeneration in the 12SK7 i-f stage. The pilot lamp, which is connected across half the 35Z5GT filament in the usual manner, is shunted with a 150 ohm, 1/3 watt resistor. This protects the rectifier filament in the event the pilot light blows out. This protection is at the expense of quite some illumination, however.

Fig. 1 (below), Ward's Airline 7-tube, 2-band a-c/d-c receiver. Fig. 3 (right), Truetone D4220.

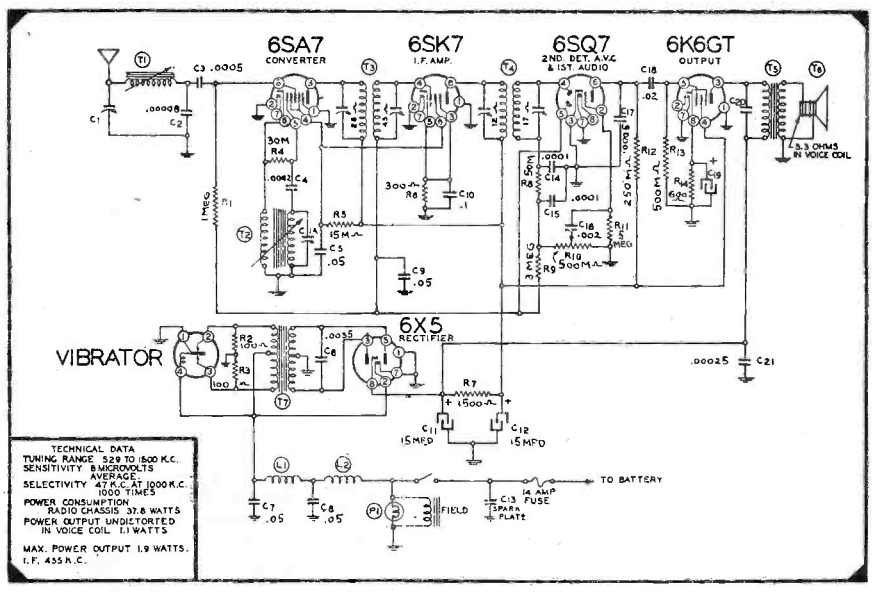
Belmont 7D22

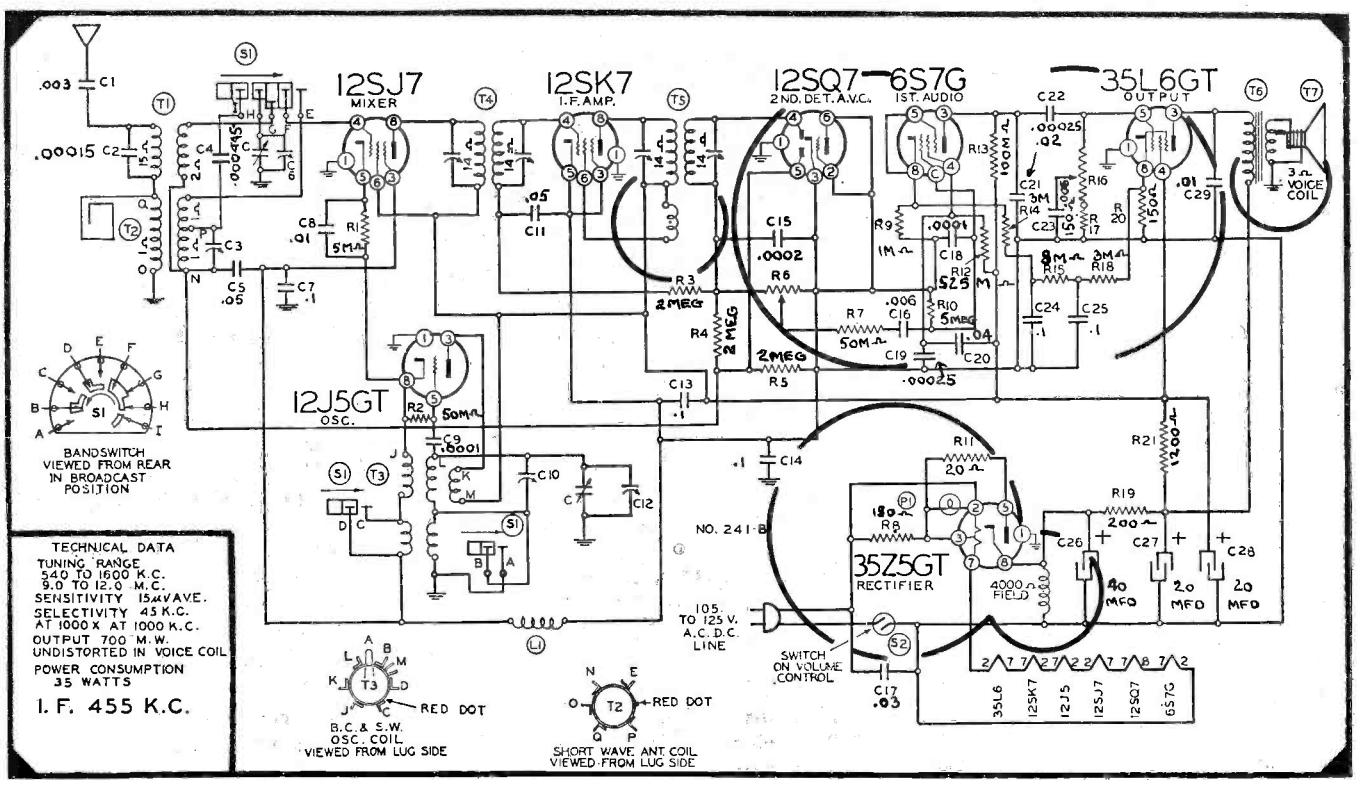
Fig. 2 shows the antenna input circuit of Belmont's model 7D22 which contains a broadcast loop and open-ended shortwave loop acting as a short standard aerial. The external antenna is connected to the loop primary which is shunted by a .00015 mfd. condenser for by-passing shortwave signals to the shortwave transformer. Note the tap on the shortwave secondary which reduces the loading due to the large tuning condenser, permitting higher impedance in the tuned circuit and, hence, sharper tuning and more gain. There is also an r-f choke in the "B" minus lead to the oscillator and converter for additional stability. The chassis is not an active part of the circuit; hence, there is more chance for stray coupling.

Truetone D4220

Fig. 3 shows a complete typical simple type of auto receiver of the lower price range using permeability tuning and a standard 4-tube lineup with rectifier. This is model D4220 of Truetone, containing four push-buttons

(*Continued on page 22*)





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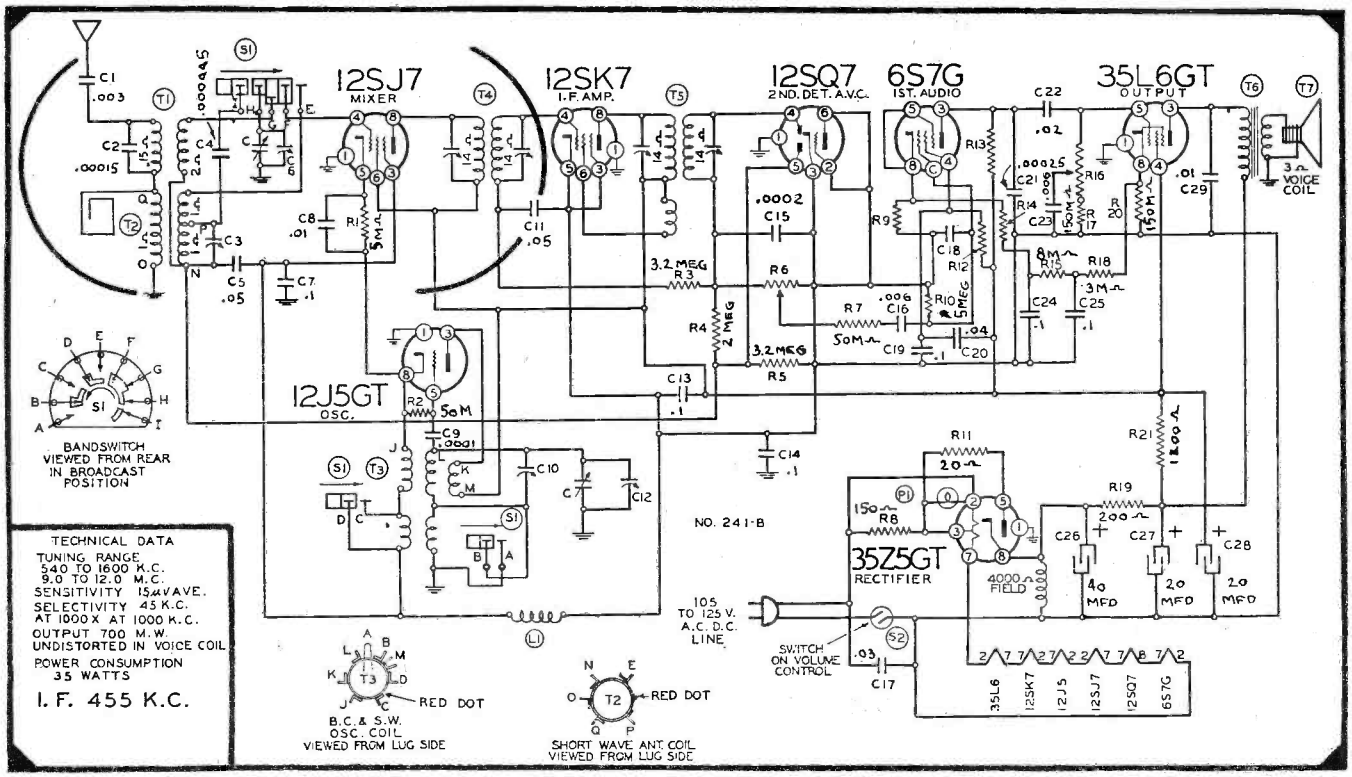
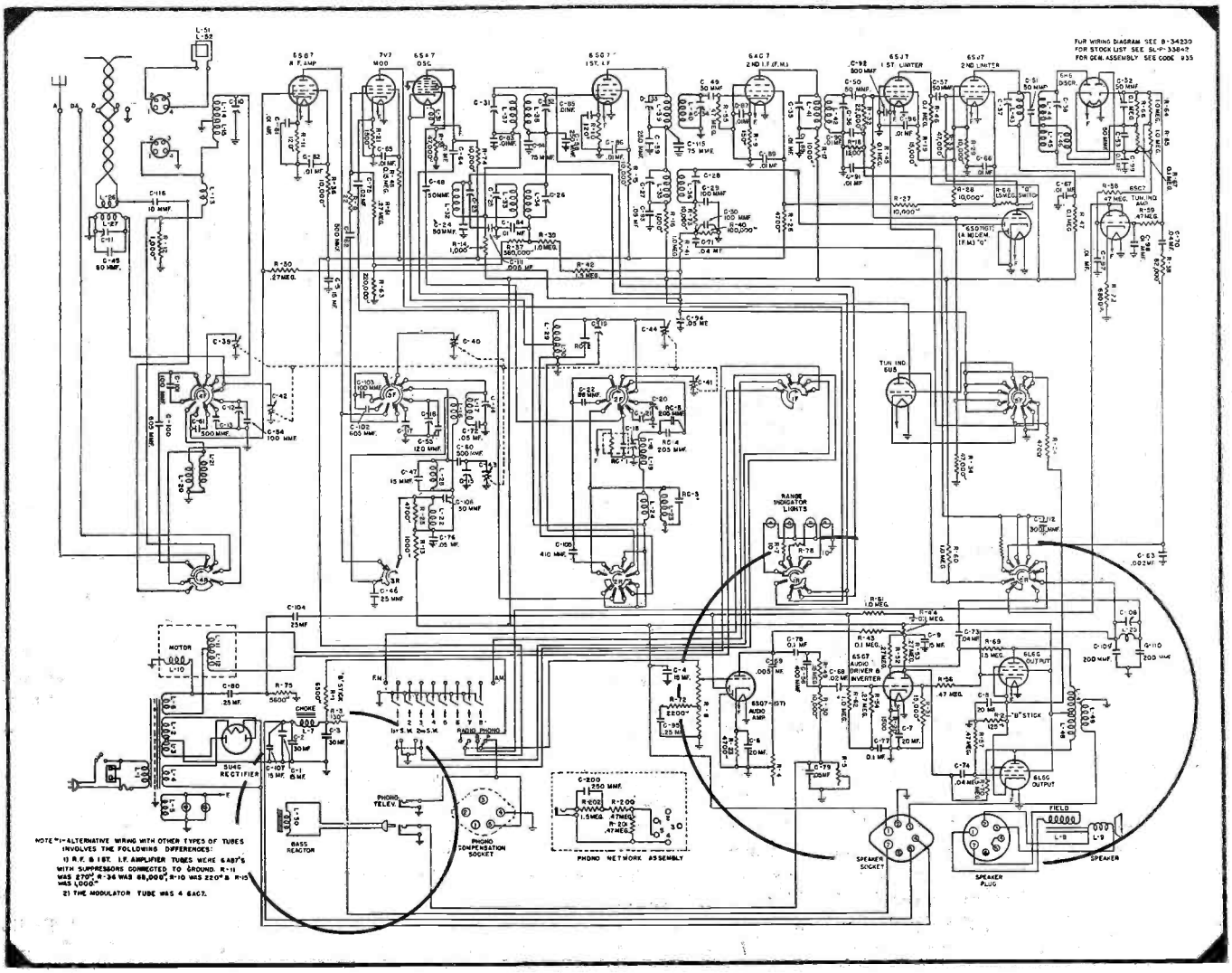


Fig. 2 (top), the Belmont 7D22, and Fig. 4 (bottom), Stromberg-Carlson's Model 935.



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Farrell Says:

By C. H. FARRELL

HEADLINES AND HEADACHES

Practically every headline one reads nowadays has a migraine factor for the business man reader. The radio servicer, reading news stories of the daily flood of regulatory ukases which are promulgated in Washington, mentally calculates the cost of the aspirin which he will have to take in order to overcome the effects of increased record keeping. For radio servicers are, as a group, notoriously averse to keeping track of such things as cost figures, running inventory records and filing systems. As I have pointed out in these despatches, this aversion is not in itself, ground for criticism, the radio servicer being, as he is, 75% avocationist and 25% vocationist. Too many of the boys are more concerned with the interesting aspects of an unfamiliar radio circuit than with the amount of moolah the repair of that receiver will bring into the till. But the lackadaisical days are gone forever—or at least for the duration of the war. The consumer service price ceilings will bring every operator of a service establishment sharply to heel. It is well worth your while to become familiar with every last detail of this Regulation. Many questions will be asked, and I have picked out some of the more usual ones. They are presented herewith in Question and Answer form:

Q. *What is the maximum price regulation for consumer services?*

A. A separate price regulation placing a ceiling on consumer services.

Q. *What is a consumer service?*

A. A consumer service under the regulation is a service rendered in connection with a commodity for the ultimate consumer such as the housewife, the motorist or the farmer. But consumer service as used in this regulation does not include an industrial or commercial service, the ceiling prices for which were set by the General Maximum Price Regulation and became effective last May 11.

Q. *What are examples of consumer services?*

A. Laundry, dry-cleaning and shoe repairs are some of the most common services performed for consumers. Others are the lubrication or repair of a private passenger car, the developing and printing of amateur films, the repair and servicing of home radio sets and electrical appliances, and the sharpening of household knives and scis-

Q. *What are the maximum prices on consumer services?*

A. The highest prices which the supplier of the service charged in March 1942.

Q. *Are prices on services standardized by this regulation?*

A. No, the regulation simply places a ceiling for each establishment at the highest price it charged for a service in March 1942. But ceiling prices will vary from shop to shop just as uncontrolled prices varied in March.

Q. *May prices be charged below the ceiling?*

A. Yes, the regulation does no more than place a top limit beyond which prices cannot go.

Q. *What are the provisions about licenses?*

A. Every person selling a consumer service is automatically licensed under this regulation, and every new seller automatically is licensed. There is no certificate or other actual license, but the seller is licensed nevertheless.

Q. *What is the purpose of the license?*

A. It is a method of enforcement. If a seller, after a warning from OPA, violates the regulation, a court of proper jurisdiction may suspend the license for as long as 12 months. Without a license it is illegal to sell services which are under this regulation.

Q. *Must a service establishment post any ceiling prices in a manner similar to the "cost-of-living" posting rules of the General Maximum Price Regulation?*

A. No, the regulation does not require any service establishment to display a list of the ceiling prices.

Q. *But does not the consumer service establishment have to make some list or report of its ceiling prices?*

A. Yes, every person supplying a consumer service over which this regulation sets a price ceiling must prepare by September 1 a complete list of the highest prices he charged for all services he supplied during March for which prices were regularly quoted in that month. This report must also show any pricing method regularly used in March, and all customary allowances and discounts.

Q. *Is this list open to inspection?*

A. Yes, on and after September 1, 1942, it must be available to anyone during business hours. A copy must also be filed with the local War Price and Rationing Board by September 10. However, a person selling a consumer service other than at retail need file only the statement with the War Price and Rationing Board, if the statement is accompanied with an affidavit that disclosure would result in substantial injury.

★ ★ ★

NRPDA TO NEDA

That greatly misunderstood individual, the radio parts distributor, may not be able to wangle an exact replacement transformer for one of the old time Majestics or Radiolas today, but that inability is not a measure of his service to you. If you think you are an orphan of the OPM storm, your mental anguish is as nothing compared to that of your parts and tube supplier. His problem is a hundred fold greater than your, for upon his shoulders falls the responsibility of obtaining sufficient replacements to keep his servicer customers functioning. When he does fall down, it is through no fault of his own. Just as you have a hard time explaining to some of your customers that the armed forces of the United States come first in production of anything which may assist in kayoing the forces of evil, so he has difficulty in convincing you that shortages of the parts you want are the fault of Old Man Mars. I know parts jobbers. I like them. I think they are doing as fine a job under difficult conditions as any group of merchants in this country. And, faced with many difficulties which seem, at the moment, insurmountable, they have not lost sight of the fact that the war will be over one day and when that happy day dawns, they want to be fitted to carry on in a post war world which, as far as the radio servicing business is concerned, will be vastly different from present concepts.

Parts Distributors have already had a taste of the importance of the electron tube in industry. They have been supplying many of our war materiel producers with scores of electronic devices which were calculated to speed up production. They know that the surface of the 'industrielectronic' market has not yet been scratched; that the electronic tube and what goes with it will be put to peace time uses on a scale which staggers the imagination. And they know that their job will be then, as it has been in the past, to encourage servicers to acquaint themselves with new electronic developments.

Recognizing this fact, it is small wonder then, that the National Radio Parts Distributors Association, in con-

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vention assembled on June 8th, changed the name of the organization to *National Electronic Distributor's Association.*

The change in name is significant. It is a harbinger of bigger and better things in the future for the radio servicer who is alert enough to sense the shape of things to come. It is a positive sign that the *American Electronic Distributor* is aware of his responsibity to you, his embryonic *ELECTRONIC SERVICERS.*

★ ★ ★

SOUND AND FURY

Because, way back in April, 1941, I wrote, in these despatches, that I could envision no acute shortage of the replacement parts and tubes necessary to keep our radio front open, I have been no little pleased at some of the recent decisions of the Office of Production Management. Many of the blatant and doleful prognostications I've heard about the crack down on civilian radio replacement parts and tubes I have dismissed as being full of sound and fury—signifying nothing. I have felt that the powers that be in Washington would never lose their sense of proportion to the extent of allowing the American Public to be less than fully informed on wartime developments. I have always considered radio as a weapon comparable with any weapon employed in fighting the war. Without the split second communication which America's 64 million radios make possible, I am certain that our war production effort could not have made the vast strides which have struck the fear of God into the hearts of Hitler and his satellites.

Therefore, the recent decision of OPM to permit the manufacture of 20 million replacement tubes during the last half of 1942 came as no surprise to me. That is tube production (for replacements) at the rate of 40 million for the current year. In 1941 the total number of replacement tubes sold in this country was 33 million. The ingenuity of the condenser manufacturers has overcome possible copper and aluminum shortages. Perhaps some of the replacements which utilize alternate materials will not meet the high standards which have prevailed heretofore but there is nothing the matter with most of them.

I repeat what I wrote in April, 1941, "I anticipate no serious shortage in those parts and tubes which are essential to keeping the nation's radios in good operating order."

☆ ☆ ☆

TIME AND SPACE

Perhaps you will have difficulty in getting railroad reservations for your vacation trip this summer, but *c'est le guerre.* Troop trains take precedence over even such crack fliers as the Twentieth Century limited. The freight trains have, thanks to good management, been hauling much greater loads in comparable equipment than they hauled in peace time or even during the last fracas. The secret has been scientific loading and routing. RCA recently announced a new and revolutionary method of packing radio tubes which is calculated to fit twice as many tubes in a given amount of shipping space than methods heretofore employed.

No dog in the manger; RCA has offered in the interest of more efficient operation of the nation's shipping facilities, to make its new packaging method available to any manufacturer or shipper.

That's the stuff of which this nation is made. That is the spirit of conservation and cooperation which spells the doom of the Unholy Axis Three!

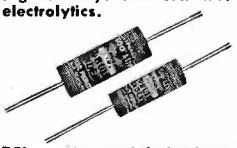
What can you do to conserve time? What can you do to conserve vital materials? What can you do to conserve shipping space?

If all the time, space and materials which it is possible for the servicing fraternity to save were saved, they could be translated into a stack of War Savings Bonds THIS high!

WHAT NOW?

Atoms are smaller, more dependable, cost less. Available in all ranges and in many combinations.

Sprague EL prong-base electrolytics are ideal for replacing can drys and can wet electrolytics.



TC's meet every tubular-type by-pass condenser need—efficiently and economically.

No one can predict what changes may have to be made in condensers, or what additional types may yet have to be eliminated to conserve vital materials for War needs—BUT . . .

The fact remains that Sprague jobbers can still supply Sprague Atom Midgets and EL prong-base dry electrolytics plus TC Paper Tubulars—and these three famous condenser types will handle practically any radio set replacement job, including replacement of most wet electrolytics. The size may be different, mounting might occasionally require some ingenuity—but you can count on Sprague quality, and that's the all important thing.

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● That well-known Aerovox symbol shows resistance as well as capacitance. And that means the Aerovox line of resistors—fit companions indeed for Aerovox condensers. Wire-wound power resistors, fixed and adjustable, 10 to 200 watt ratings; lacquer-coated carbon resistors; insulated-molded carbon resistors—all Aerovox labelled and backed by the Aerovox reputation. ● Ask your jobber for Aerovox resistors as well as Aerovox condensers. ● Ask for latest catalog—or write us direct.

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Don't FALL for this one!

Numerous complaints have recently reached us that subscription salesmen, who have no connection with SERVICE MAGAZINE, are offering subscriptions to SERVICE and then delivering another radio publication.

Beware of this subterfuge!

SER-CUITS

(*Continued from page* 18)

which operate on the main tuning element. It as an average sensitivity of 8 microvolts, undistorted power output of 1.1 watts and a selectivity 1,000 times down at 47 kc from resonance at 1,000 kc.

In many of the new sets, including those of this series, the voice coils are grounded. This represents a new trend, for while we were accustomed to seeing some receivers so wired, it was not the usual thing.

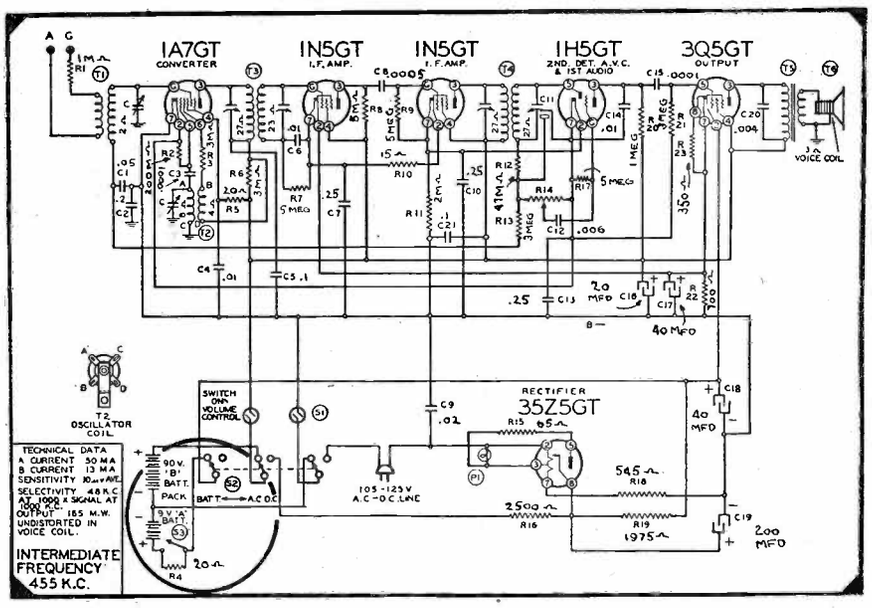
Belmont 11A25

Belmont model 11A25 phono job offers some pertinent information on motor and turntable lubrication. No lubrication is required in the motor as oilless bearings are used. These bearings are made of an alloy with the oil squeezed in and are very satisfactory except under extremes of temperature (which are not encountered in phono operation). Turntable spindle bearings do not require lubrication for about a year after which they should be oiled with one or two drops of a light grade oil. Do not over-oil! This is a common mistake.

Stromberg Carlson 935

Fig. 4 shows the audio system of Stromberg Carlson's model 935, a 16 tuber with f-m. Starting with a 6SQ7 1st audio, the signal runs through a filter, or equalizer, consisting of a .15 meg. in parallel with 400 mmfd. to the first section of a 6SC7. A tone control with a plug-in bass choke appears here in series with 10,000 ohms to grid. From the 6SC7, the signal goes through a low bass filter consisting of a tuned circuit and two shunt condensers (not unlike a tuned power supply filter) to the first 6L6 power tube. A 1.5 megohm feedback resistor is used from plate to plate. The second section of the 6SC7 serves as an inverter deriving its voltage from the 6L6 grid through a dropping resistor. All cathodes, including the push-pull output tubes, are heavily by-passed to ground for low audio frequencies. This is unusual, for the trend seems to be toward allowing a bit of degeneration here and there by leaving one or more cathode resistors unby-passed. It is quite unusual to find a push-pull stage by-passed.. In a balanced stage, all even harmonics are cancelled but it is still possible for odd harmonics to get through. Thoroughness requires the by-passing.

Fig. 5 (bottom). The Belmont 6P11 6-tube battery portable.



Belmont 6P11

In Fig. 5, we have the Belmont 6P11 6-tube battery portable, with an economizer switch and resistor in the 9 volt "A" battery circuit rather than in the "B" circuit as we commonly see it.

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INDUSTRY NOTES

WARTIME CONDENSER CATALOG

This is war, is the keynote of the new 1942 Aerovox Catalog just off the press. Starting out with a cover that reflects the stern atmosphere of the huge plant working day and night on the radio fighting and home fronts, the catalog lists those essential condensers, resistors and test instruments in popular demand and therefore still produced, stocked and available for prompt delivery. A further wartime note is the inclusion of several pages of motor-starting replacement capacitor listings, in acknowledgment of widespread and growing demand for refrigerator maintenance. A copy of this catalog may be had by addressing Aerovox Corporation, New Bedford, Mass., or through the local Aerovox jobber.

* * *

SYLVANIA DISPLAY FEATURES OCD THEME

A new window display for radio tube servicemen, featuring the headline "On the Alert to Keep Radios Working," has been produced by Sylvania. The aim of the display is to build up the radio serviceman in the eyes of his home community as a servant enlisted in the vital business of home defense.

* * *

WAR BOND AND RADIO TUBE POSTER

A new War Bond and Radio Servicing Window Streamer has been released by Sylvania to servicemen through jobbers. Copy reads, "For the Protection of Your Country, Buy United States War Bonds and Stamps—For the Protection of Your Radio, Let Us Keep It In Service with Sylvania Radio Tubes."

* * *

NEW RCP CATALOG

New RCP instruments for laboratory and production use, particularly for wartime uses, are described in the latest Radio City Products bulletin No. 126.

Typical of the new RCP models is a sensitive Electronic Limit Bridge for precision resistance testing, and a highly versatile multitester for quick and accurate production line tests.

Copy of catalog will be sent on request to 127 W. 26 St., New York City.

* * *

NEW TUBE PACKING METHODS

A revolutionary new principle of packing radio tubes has been developed by Charles I. Elliott, a 27-year packing engineer, for RCA.

By adopting the new method, RCA alone is saving some 120 tons of packing material a year, and is able to ship approximately twice as many tubes in a boxcar or truck, thus halving the need for critical shipping space. The new method supplants packing, handling, storing and shipping practices which have been common for many years.

To extend the value of the new packing principle more quickly, RCA has granted patent rights to the new type cartons to other tube manufacturers.

The American Standards Association is studying the possibilities of setting up an American War Standard covering the packaging of electronic tubes as a result of RCA's pioneering effort.

With this new system, it is possible to pack 100 tubes in a sturdy carton for shipment while protected in two single piece heavy carboard trays, as against the many pieces of packing material formerly required to pack the same number of tubes. The new trays are used to transport the tubes during the manufacturing and testing processes, where they were formerly handled in bulk.

A further improvement in the handling of the smaller types of receiving tubes has been made in the form of a "clip" of cardboard which holds 10 tubes. During testing, warehousing and branding operations, the "clip" of 10 tubes is handled as a unit. However, when the time comes for

YOU CAN'T WORK ANY HARDER
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Today servicemen are over-loaded with work and worrying how they're going to keep up with the rush.

Now, there's a limit to the night work you can do—But, there's no limit to the increased production you can get from greater efficiency.

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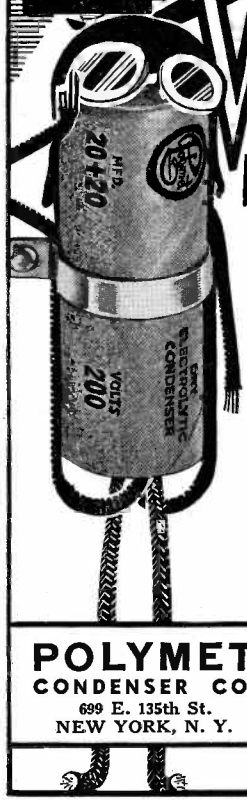

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The Mark of SOUND VALUES *in Accessories and Supplies*

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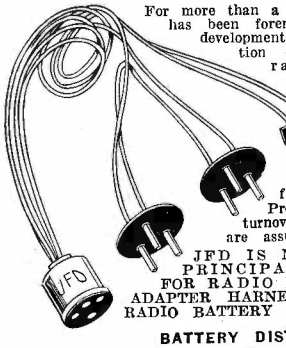
A Practical Solution to a Pressing Problem !

With combination "AB" Battery Packs harder to get—separate standard "A" and "B" batteries are still easily obtained. In practically every case, radio sets designed to use combination "AB" packs can be adapted for separate "A" and "B" batteries by means of JFD Adapter Harnesses. No soldering — no cutting — just plug in.

It's more economical to users—It's easier—It's more profitable to dealers.



For more than a decade JFD has been foremost in the development and promotion of practical radio parts equipment. Each year more leading distributors feature JFD Products. Fast turnover and profits are assured.

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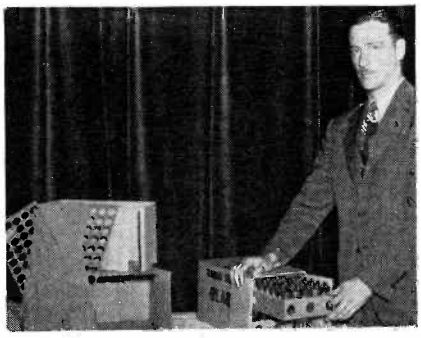


the tubes to be packed into individual cartons for shipment, the "clip" is torn into 10 pieces along perforated lines, to become the interior support for each tube in its individual carton. Further, the old 31-piece glass tube carton had resolved itself into a smaller, eleven-piece box.

Perhaps most ingenious of all the new packing methods is that designed for "kit" packing of tubes, used to provide in one package the several types of tubes required for factory assembly of radio equipment and the tubes needed as replacement parts. It was formerly necessary to keep a stock of all sizes of kit packages. Now one single size box is provided for all types of kits. It is changed in size and shape by being torn the proper way along carefully designed perforated lines. Larger packing cases in which the kits are shipped are made to telescope, so that they can be made larger or smaller as needed.

"All the new containers are fabricated so that they can be laid out flat," explained L. E. Mitchell, Manager of the Industrial Eng. Dept., under whom Mr. Elliott worked. "None of them is stitched or glued. The result is that empty cartons can be stored in one tenth the space formerly required. Further, we are able to have the empty cartons returned from our customers time and time again at nominal expense, still further increasing savings in strategic materials, facilities and manpower."

* * *

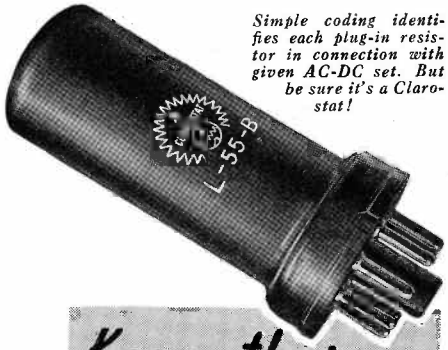
KEN-RAD MERCHANDISING MATERIAL

The Ken-Rad Tube & Lamp Corporation, Owensboro, Kentucky, has launched a campaign for dealer use, coupled with the largest program of trade paper advertising in several years. A wealth of promotional pieces are offered in a new portfolio carrying on the "Ken-Rad on Parade" theme.

Among the display material offered are four new display cards, four window streamers, a new series of window cutouts, and a plastic animated tube display. An attractive authorized dealer wall plaque is also among the new material available.

As in previous years a full line of year-

Simple coding identifies each plug-in resistor in connection with given AC-DC set. But be sure it's a Clarostat!



Keep those **AC-DC Sets** *perking . . .*

★ Those burnt-out plug-in tube resistors in many AC-DC sets are readily and profitably replaced with Clarostat Universal Types, which take care of most replacement requirements. By using these Universal Types you are cooperating with the war effort. ★ Ask your Clarostat jobber for those plug-in resistors you need for given sets.

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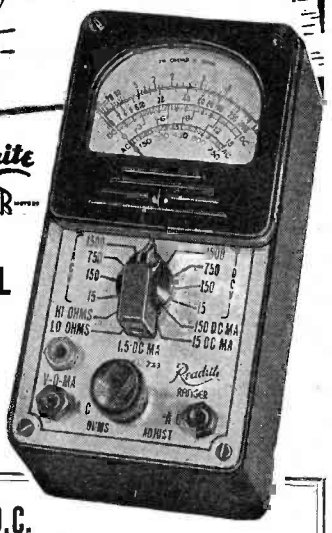

Readrite Ranger

MODEL 739

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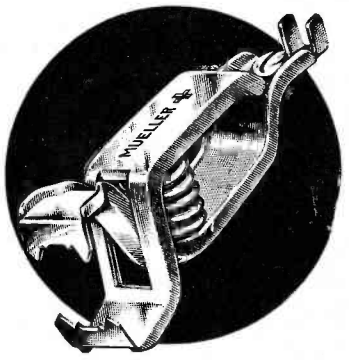
MODEL 738 . . . DC Pocket Volt-Ohm-Milliammeter. Dealer Net Price.....$8.25

WRITE FOR CATALOG

SECTION 717 COLLEGE DRIVE

READRITE METER WORKS, Bluffton, Ohio

MUELLER



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- A complete line with

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Send for free samples and catalog 806

Mueller Electric Co.

1565 E. 31st St. Cleveland, Ohio

round merchandising helps are also offered including clocks, counter displays, shop garments, newspaper ad mats and technical bulletins.

Dealers can secure copies of the "Ken-Rad on Parade" portfolio from Ken-Rad jobbers or direct from the factory at Owensboro, Kentucky.

* * *

SHURE'S NEW BOOKLETS, CATALOGS

"Long Live Your Microphone" is the title of an interesting new 4-color 16-page booklet prepared and published by Shure Brothers, 215 West Huron Street, Chicago, Ill.

This unusual booklet, an important contribution to the War Conservation Plan, tells in story and picture "how to get the best service from your Microphone." There are helpful hints on the use and care of Crystal, Dynamic, and Carbon Microphones . . . practical pointers on Feedback, Cable, Plugs, Output, Response, and other valuable information.

All the material and data are based on actual statistics from the Shure Service Department, and make it a practical guide for microphone users.

The newest Shure Catalog shows the new Shure line which has been simplified to meet today's problems. Information is presented in concise practical form. Technical data is given on Shure's dynamic, crystal, and carbon microphones for use in Ordnance Plants, Army Camps, Air Terminals, Broadcast Stations, Police Mobile and Station Transmitting Equipment, Industrial War Factories, OCD Control Centers, and all other important microphone applications.

An interesting story also tells how microphones are accurately measured.

Copies of the catalog or booklet are available free of charge.

* * *

PHILCO DISPLAY AIDS CONSERVATION

An attractive counter display for dealers listing "15 Don'ts" to conserve the life of the average radio has been released by Philco.

The displays were designed and sponsored by Robert F. Herr, vice-president in charge of service for Philco Corporation. Approximately 5,000 of them have been made available to Radio Manufacturers Service members all over the country

* * *

SYLVANIA TUBE DIVISION CHANGES

H. Ward Zimmer, general manufacturing manager, has been appointed general

How to Step Up

SYLVANIA SERVICEMAN SERVICE

by FRANK FAX

FOR some time Sylvania has been trimming its line of tubes so as to ease the replacement problem. In many cases, by multiple etching, we've combined two or three tubes in one.

That means that on many service calls where formerly you needed several types of tubes, you can now do a good job with just one type.

But that's not all. Several slow-moving tubes have been lopped off. That should speed up turnover and streamline your inventory.

To help you get the maximum use and benefit out of these changes, we've prepared a Tube Simplification Chart. This gives a complete list of the Sylvania Tubes for which replacements are available, along with the substitute best adapted for each.

These charts are available at your local jobber's. Better get one right away so you can put your tube stocks on a war footing now.

And while you're at it, take a good squint at that line-up of punchy sales helps below. Check off the ones you need and see your jobber about them. If he can't supply you write to me in care of Hygrade Sylvania, Emporium, Pa. Dept. S-7.

1. Window displays, dummy tube cartons, timely window streamers, etc. *(From your Sylvania jobber only)*
2. Counter displays
3. Electric clock signs
4. Electric window signs
5. Outdoor metal signs
6. Window cards
7. Personalized postal cards
8. Imprinted match books
9. Imprinted tube stickers
10. Business cards
11. Doorknob hangers
12. Newspaper mats
13. Store stationery
14. Billheads
15. Service hints booklets
16. Technical manual
17. Tube base charts
18. Price cards
19. Sylvania News
20. Characteristics sheets
21. Interchangeable tube charts
22. Tube complement books
23. Floor model cabinet
24. Large and small service carrying kits
25. Customer card index files
26. Service garments
27. 3-in-1 business forms
28. Job record cards (with customer receipt)
29. "Radio Alert" Postcards
30. Radio Caretaking Hints to the Housewife

SYLVANIA

RADIO TUBE DIVISION
HYGRADE SYLVANIA CORPORATION

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manager of operations of the receiving tube division of Hygrade Sylvania which includes three plants in Pennsylvania and one in New England. In continuing his general manufacturing managership, he will be in charge of equipment design and production, and general division purchasing.

R. M. Wise, chief radio tube engineer, has been named general manager of operations, special and large tube division.

* * *

R.C.P. VACUUM TUBE VOLTMETER

Accurate measurements throughout the entire audio frequency range, including the ultra-high audio frequencies, are now said to be simplified by a new Model No. 666, a vacuum tube voltmeter, designed by Radio City Products Co., 127 W. 26th Street, New York City.

Essentially a peak type of voltmeter, Model 666 has a constant input impedance resistance of 16 megohms. Although designed for 105-130 volt, 60 cycle operation, provision has been made for external battery operation through appropriate terminal connections and a throw-over supply switch. The instrument is equipped with a 4½-inch rectangular meter having a movement of 0-200 microamperes.

Ranges are 0-3-6-30-150 volts. Tubes used are type 6K6GT, 6X5GT, 6H6 and VR105-30. The latter is a voltage regulator, eliminating errors due to line voltage fluctuations.

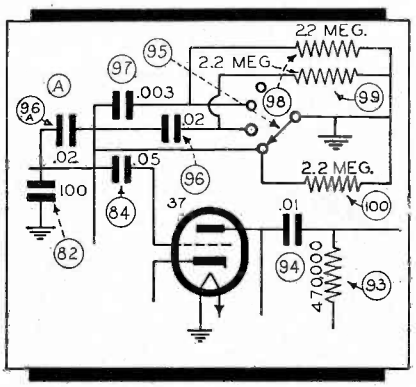
CASE HISTORIES

PHILCO 42-1016, CODE 121

Tone control change, run No. 4: Remove 0.004-mfd condenser (96) and replace with a 0.02-mfd, 400-volt.

Remove 0.01-mfd condenser (96A) from its present location and connect a wire from switch contact to terminal panel lug. Change value of 96A to a 0.02-mfd, 400-volt condenser and reconnect from the plate contact of the Type XXFM tube socket to No. 6 contact of 6L6G tube (dummy lug) socket.

Remove the wire from the grid contact of the Type 37 tube socket which comes from the treble tone control wiring panel. Reconnect this wire to No. 6 contact (dummy lug) of the Type 6L6G tube socket next to the Type XXFM tube. Connect a 10-mfd, 25-volt condenser from the cathode of the Type 7C6 tube to ground.



RCA V105

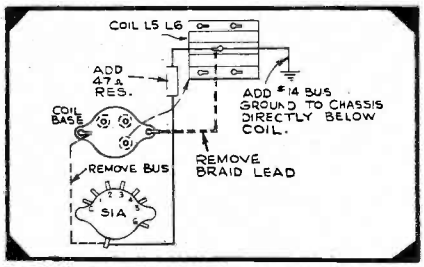
Using electromagnetic speaker replacement: RL86A3 electromagnetic speaker can be used as a replacement for RL81B4 p-m speaker in Model V105 by wiring in the field coil and output transformer as shown in accompanying diagram. The original output transformer can be used by taping up the black (tap) lead.

In this particular model, it is necessary to solder a jumper across contacts 8 and 9 on the front section of the radio-phono switch. This keeps the first detector and i-f tubes in operation when the switch is in "phono" position, and thus maintains sufficient current through the field coil for adequate excitation.

The customer should be instructed to tune the set to a quiet point on the dial to prevent radio break-through for phonograph operation.

RCA 167, 167A TEST OSCILLATOR

Dead spots on h-f band: Dead spots or failure to oscillate on the high-frequency band in the Model 167 or 167A test oscillator may be corrected by inserting a 47-ohm, ¼-watt resistor, and making slight changes as shown below.



PHILCO 42-1008, CODE 121-122; 42-1009, CODE 121-122

Production changes: Two types of phonographic reproducer tone arms (90) were used on the record changer. Tone arm Part No. 35-2518 is made of metal die cast material and Part No. 35-2540 a plastic material. Since the weight of each tone arm is different, two counter

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weights are required. The aluminum arm requires a 1½-ounce weight and the plastic arm a 3-ounce weight.

To improve the performance of the phonograph reproducer light oscillator circuit, the oscillator transformer (16) was changed from Part No. 32-3785 to 32-3866. The wiring lug arrangement as shown in the service bulletin applies to both transformers.

Circuit differences: Production Code 122 on Models 42-1008 and 42-1009 differs from Code 121 in several circuit parts. The service information in Radio Service Bulletin 401 for Code 121, with the exception of these parts, apply to Code 122. The circuit changes are as follows:

0.2-mfd condenser (56) is replaced with a 10-mfd condenser in Code 122 chassis.

2,200-ohm resistor (57) is changed to 3,300 ohms.

Power transformer (78) (Part No. 32-8129) is changed to part No. 32-8217. Transformer Part No. 32-8217 does not have filament winding "A" for the 7C6 oscillator tube as shown in Bulletin 401.

In Code 122 the 7C6 phonograph oscillator tube filament is connected to filament winding B of transformer (Part No. 32-8217) one connection of the tube filament is grounded.

•

PHILCO 42-123, CODE 121

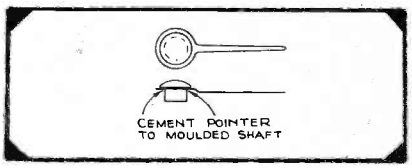
Microphonics: To prevent audio microphonics resistor (26) 10,000 ohms was changed to 4,700 ohms.

•

RCA 6X2, 24BT1-2

Loose dial pointer: Expansion and contraction due to temperature changes may cause the metal dial pointer to become loose on the molded button shaft.

This condition has been corrected in production by fastening pointer with "Du Pont Household Cement" as below.



•

RCA LITTLE NIPPER

Burned out dial lamp and shunt resistor: The first run of these sets used a 35Z40. Replarce with a 35Z5 and connect dial lamp terminals across the tube pins designed for the dial lamp. It is not necessary to replace the shunt resistor. *A. Knickiner*

•

SILVERTONE 7081

Chassis Nos.: Chassis identified as 101.636-1 are the same as 101.636, except that the loop is wound directly on the cabinet frame and covered by the cabinet covering. The loop is of low impedance requiring the addition of an antenna loading coil. The range has been extended to cover 540 kc.

•

RCA RP160

Sapphire Pressure: The correct sapphire pressure in RP160 is approximately 1¼ ounces. The pressure is governed by a spring inside the end of the pickup arm. Owing to the fact that both aluminum and zinc castings (with difference in weight) have been used for the arm and the crystal, and also that only the zinc crystal is supplied for replacement, it is necessary to check the sapphire pressure whenever either the crystal or the arm is replaced.

The zinc arm is identified by the letters "ZN" after the drawing number inside the arm. The zinc crystal is identified by the letters "ZN" molded at the rear end of the cartridge.

•

PHILCO 42-395, CODE 121

Improving i-f filtering: To improve the i-f filtering of the plate voltage supply, condenser (47) was changed from 0.05 mfd.

In GOOD *Company*

Keeping in good company today means, first, keeping in line and in step with Uncle Sam. It is well to remember, also, that the use of Astatic Crystal Microphones, Pick-ups, Cartridges and Recording Heads, keep radio service men and dealers in "good company." The name "Astatic" stands for dependability. *Shortage of certain materials makes it necessary that all purchases of Astatic Pickup or Microphone Cartridges be accompanied by old cartridges of similar type.*

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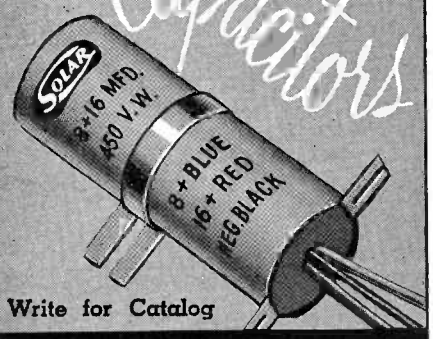

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JOTS & FLASHES

. . . congrats to Sam MacDonald of Philadelphia on reelection as Pres. of The Representatives . . . also Irv Aaron of Milwaukee as V.P. . . . Dave Sonkin of N. Y. as Secretary and Dan Bittan, also of N. Y., as chairman of the board . . . be sure to write to Aerovox for your copy of their new wartime condenser catalog . . . you'll need it . . .V. H. Fraenckel appointed to G-E radio, television and electronics department . . . Charlie Stimpson, publisher of Radio Amateur Call Book, now Lieut. Stimpson, U.S.N.R. . . . you'll want Ohmite's new stock catalog No. 18 . . . full of vital data on rheostats and resistors . . . write to Ohmite for your copy . . . qualified service shops can now tie up with G-E's new service plan . . . identification through plaque featuring G-E electronic radio tubes . . . write to General Electric, Bridgeport, Conn., for complete information . . . new catalog offered by J. W. Miller Co, Los Angeles featuring radio interference filters and coils for mobile equipment . . . Carlton Lamp Corp., Newark, N. J., releases new catalog on miniature incandescent lamps . . . bought war bonds recently . . . better had . . . at least 10% of your weekly earnings . . . your Uncle Sam needs your help . . . good news for you . . . Al Ghirardi's feature articles will appear in all issues of SERVICE during balance of 1942 . . . you can't afford to miss a single one of them . . . Henry C. L. Johnson appointed advertising manager Hygrade-Sylvania tube division . . . great stuff, Henry . . . be sure to read all advertisements in SERVICE every month . . . those manufacturers who think enough of your patronage and good will to keep advertising contact with you, even though they're operating "all out" on war production, deserve your confidence and consideration now and in the future . . . ask yourself and answer honestly—have you contributed your share of scrap rubber and metals to the war-drive . . . better make another thorough check . . . you'll want Shure's new microphone catalog . . . it aids in selecting proper mikes for war and vital civilian use . . . Paul V. Galvin re-elected president of RMA . . . George Barbey, president of NRPDA re-elected . . . new approved name for NRPDA now National Electronic Distributors Association (NEDA) . . . national headquarters of RSA suspends for the duration of the war . . . C. L. "Muggs" Pugh, Stancor jobber s.m., back at his desk after flying trip East . . . Bob Herzog, editor of SERVICE, on leave . . . entered government service July 1st . . .

P. S. W.

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U. S. NAVY OFFICIAL PHOTOS

UTC CASE HISTORIES

Laboratory File No. S14-523	Laboratory File No. S14-312	Laboratory File No. T16-399	Laboratory File No. S9-474
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This unit helps "keep them flying." A UTC redesign combined two units in one . . . reduced quantity of critical materials 50% . . . reduced weight and size 40% . . . reduced installation time 60% . . . reduced possible trouble points 50%.	This unit maintains ground communications at a more efficient level. Now plastic housed. Critical materials reduced 50%. UTC design reduced possible trouble points 50% . . . reduced difficulty of operation 50%.	This unit is used at a number of points in aircraft communication. A UTC design reduced quantity of critical materials used 20% . . . reduced weight and size 20% . . . reduced possible trouble points 50%.	This unit is a component in a piece of aircraft equipment. A UTC design reduced quantity of critical materials 60% . . . reduced weight and size 60% . . . made possible a similar reduction of size and weight in the complete equipment of which it is a component.

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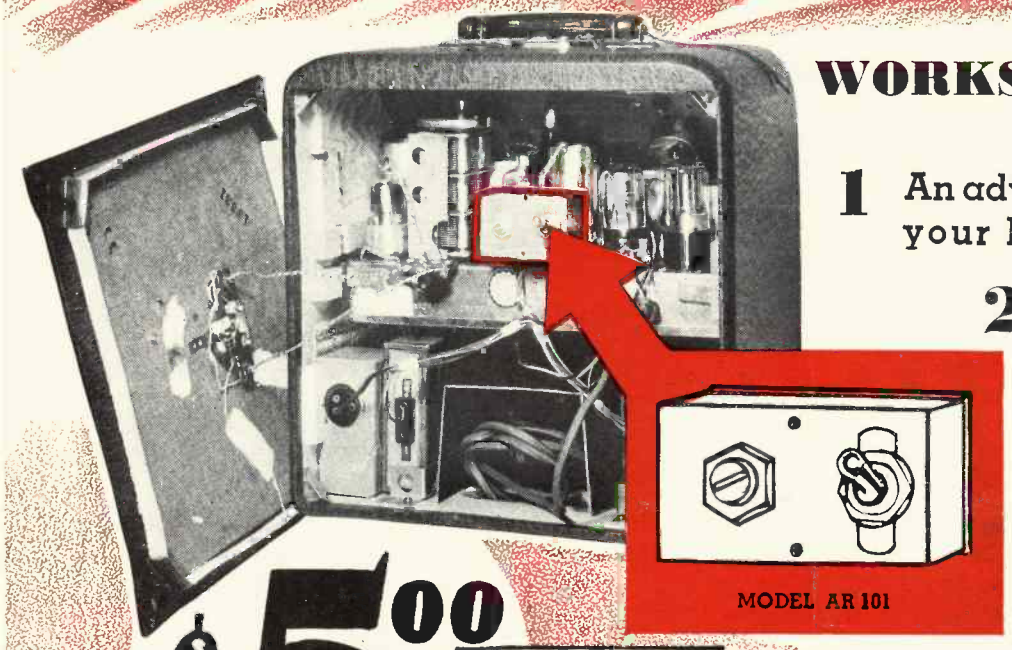

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2. Radio stations going off the air are usually the first indications of attack.
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Because a radio signal can be used as a direction guide, your key radio broadcasting station will go off the air promptly at the very first warning of attack. During normal day or evening hours when you are listening to your radio, you would immediately know this; but during the hours that you are asleep or not listening to your radio set, your radio would be off. National Union Air Raid Alarm hooked into your radio set and left on in accordance with the operating instructions will set up a loud and intensive howl whenever the station to which it is tuned goes off the air.

During one of the early air raid alarms in Los Angeles, owners of radio sets equipped with this device had notice from six to ten minutes before the alarm sirens sounded in the city.

This device used on your radio set will insure hearing in your home where, because of weather or other local conditions, noise of sirens might not be noticeable.

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After installation it is extremely simple to check. Simply tune in a station, throw the switch to alarm at which time it should remain silent. Then tune the station out so no station is being received and the device should sound a loud siren-like tone. To stop this alarm, throw the air raid alarm switch to the silent position.

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